Feb. 15, 1944. I. E. MOUROMTSEFF ET AL 2,341,941

VACUUM DISCHARGE DEVICE

Filed July 18, 1941

Fig. 1.

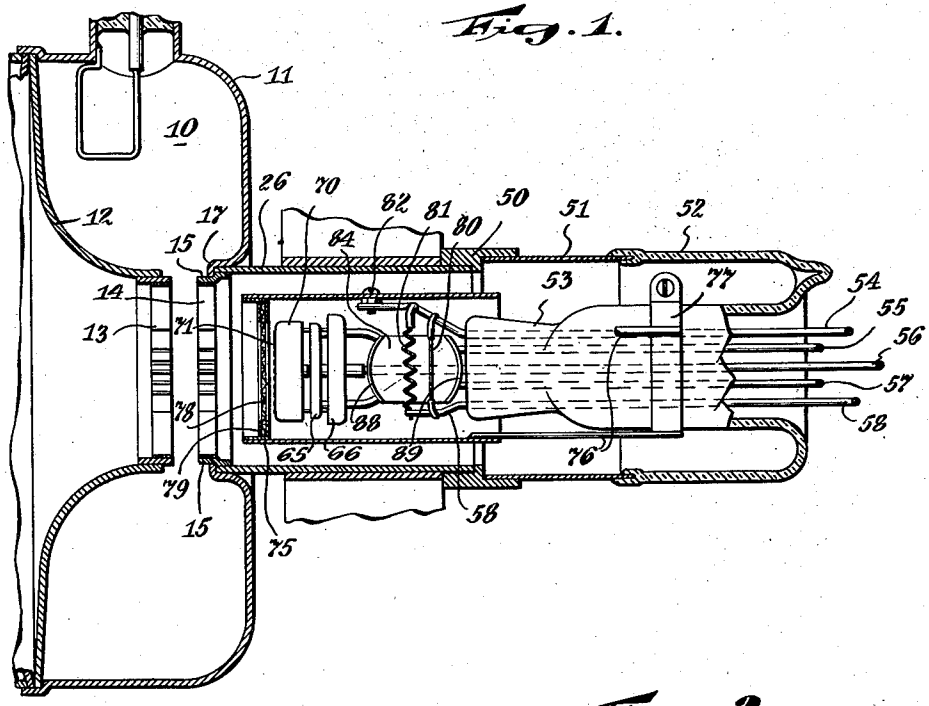


Fig. 2.

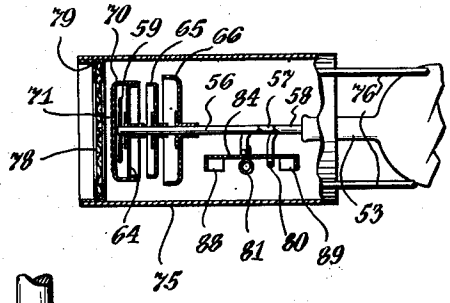
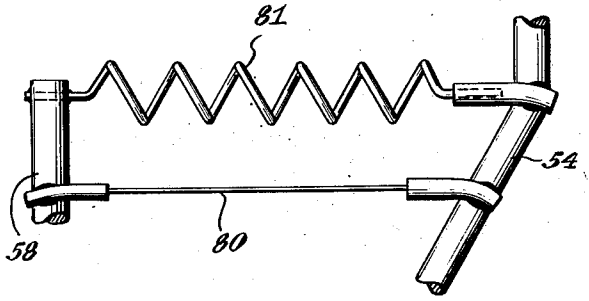


Fig. 3.



INVENTORS
I. E. MOUROMTSEFF
G. M. DUNNICK.
BY
ATTORNEY

Patented Feb. 15, 1944

2,341,941

UNITED STATES PATENT OFFICE

2,341,941

VACUUM DISCHARGE DEVICE

Ilia E. Mouromtseff, Montclair, and George M. Dinnick, Bloomfield, N. J., assignors to Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., a corporation of Pennsylvania

Application July 18, 1941, Serial No. 402,961

4 Claims. (Cl. 250—27.5)

Our invention relates to vacuum discharge devices and particularly to such devices having extensive metal walls and elements.

An object of the invention is to provide means for absorbing gas after the tube has been sealed off.

Another object of the invention is to effectively shield electrode structure from getter flashes.

Other objects and advantages of the invention will be apparent from the following description and drawing in which:

Fig. 1 is a view mainly in cross-section of a preferred embodiment of our invention as applied to a hollow body resonator.

Fig. 2 is a cross-sectional view at right angles to that of Fig. 1 of the cathode and grid structure.

Fig. 3 is an enlarged view in elevation of the getter arrangement of Figs. 1 and 2.

Vacuum discharge devices utilizing extensive metal walls and elements present difficulties in being properly out-gassed. This is especially true where only a small portion of the wall can be heated during exhaust by direct bombardment of electrons.

Where such a device may be overloaded in operation small amounts of gas may be released from tube parts including the metal walls with possible damage to the oxide coated cathode and possible variation in the operating characteristics of the device. It is one of the objects of our invention to provide means for easily and quickly cleaning up this released gas in the field without the necessity of opening the device.

In its most specific form our invention provides two or more getters in parallel and one of these getters has a much higher resistance so that the voltage applied thereto may be gradually raised until the one getter flashes partially or completely and the other left for future use in the field to be flashed with a higher voltage.

In Fig. 1 we disclose a hollow body resonator or oscillator 10 to which the invention is particularly adapted. This resonator 10 comprises two shells 11 and 12 of copper secured vacuum-tight to each other and forming a somewhat doughnut shape with two parallel grids 13 and 14 in the center. For most applications a second hollow body resonator having similar grids is attached to the first resonator and a collector is placed adjacent the last grid to receive the electrons. The resonators and collector are of metal, preferably of copper, sealed together vacuum-tight as by silver-soldering. Such an arrangement is disclosed in our copending application for "Combined air jacket and tuning mechanism for resonators," Ser. No. 402,959, filed July 18, 1941. The phases of our invention which we desire to emphasive in this application are the getters for providing gas clean-up and also the cathode structure for providing an adequate stream of electrons.

The grid 14 is secured in a ring 15 and the adjacent peripheral edge 17 of the oscillator 11 is bent towards this ring to pinch therebetween a cathode sleeve 26. This cathode sleeve 26 has a ring 50 secured to its exterior edge and this ring, in turn, has secured thereto a cylinder 51 of a nickel-cobalt-iron alloy sold under the trade name of "Kovar" which is especially adapted for sealing vacuum-tight into glass. To this cylinder is sealed a reentrant glass seal 52 of borosilicate glass having a press 53 through which are sealed the five leads 54, 55, 56, 57 and 58. Three of these leads extend to the heater 59 disclosed in Fig. 2 which is wound bifilar. This bifilar winding is preferably of the flat pancake spiral form although other forms may be used. A plurality of cup-shaped heat shields 64, 65 and 66 are preferably placed just in back of this cathode heater 59. The cathode itself preferably comprises a cup-shaped member 70 coated on its flat outer surface with an electron emitting coating 71, such as the standard barium, strontium and calcium oxide coating. The cup-shaped member 70 and the first heat shield 64 preferably interfit to enclose the heater 59. Surrounding the cathode just described and within the cathode sleeve 26 is a second cylinder 75 as a grid support. This grid cylinder 75 is supported by standards 76 from a band 77 on the reentrant glass press 52. The grid proper 78 is supported at the inner portion of the grid cylinder 75 and is closely parallel to the electron-emitting material 71 on the cup-shaped cathode 70. This grid 78 is preferably of a very light, fine woven mesh wire of approximately 1 or 2 mils. The grid 78 has a binding ring 79 securing it in the grid cylinder 75.

In order to insure a vacuum inside our device, we preferably include a getter arrangement for absorbing the last traces of gas which may be evolved from the walls or other elements of the device, after the device has been sealed off. We utilize a connection such as the extension of the wire 58 through the press 53 and attach to it at spaced points two or more getter wires 80 and 81 of different resistances. The resistance of one of these may be about four times the other for example. The other end of these getter wires

may be attached to one of the other leads such as the wire 54 making a connection to the grid cylinder 75 as at 82. The wire may be of approximately 5 mil iron enclosing approximately 20 mil barium as a getter substance. The wire with its getter substance is, for brevity, referred to in this description and in the following claims as the getter. The wire 81 may be a straight piece of wire and the wire 81 may be coiled to provide the greater or multiple resistance of the first getter. The wire of low resistance such as 80 may be flashed first at the final stages of assembling the device. If desired, this getter 80 may be only partially flashed and part left for future use. The other getter 81 is preferably left intact as our experience has shown that the device may be overloaded at times and some gas releases from the walls or seeps therethrough during this overloading. The second getter can be flashed in the field to clean up this gas.

Of course, more than two of these getters may be utilized if desired in which case the resistances are still further increased. We also preferably place these getters in the rear of heat shields 65 and 66 for the cathode and also preferably provide a heat shield 84 facing the cylindrical side of the grid cylinder 75 and having a flange 88 to prevent the getter substance reaching the cathode structure and another flange 89 to prevent the getter substance from reaching the press 53.

Although we have shown and described a specific embodiment of our invention, we do not desire to be limited thereto, as various other modifications of the same may be made without departing from the spirit and scope of the appended claims.

We claim:

1. An electronic device having leads therein and two getters connected in parallel across two of said leads said getters having different electrical resistances.

2. An electronic device having leads therein and two getter wires connected in parallel across two of said leads one of said getter wires being longer and presenting greater electrical resistance than the other whereby an increasing current applied to both simultaneously flashes one before the other.

3. Cathode structure comprising an oxide coating and means for cleaning up gas to prevent the contamination of said coating comprising a plurality of getter wires in parallel, and a shield coextensive lengthwise with said wires and open at ends of said wires preventing said getter wires from flashing on said oxide coating.

4. Cathode structure comprising a press, a plurality of leads through said press, a cathode supported on some of said leads, two getters in parallel across two of said leads, a shield for said getters, said shield having a flange preventing flashing of said getters on said cathode and another flange preventing flashing of said getters on said press.

ILIA E. MOUROMTSEFF.
GEORGE M. DINNICK.