Dec. 22, 1931. V. K. ZWORYKIN 1,837,745

VACUUM TUBE

Filed Oct. 9, 1926

Fig. 1.

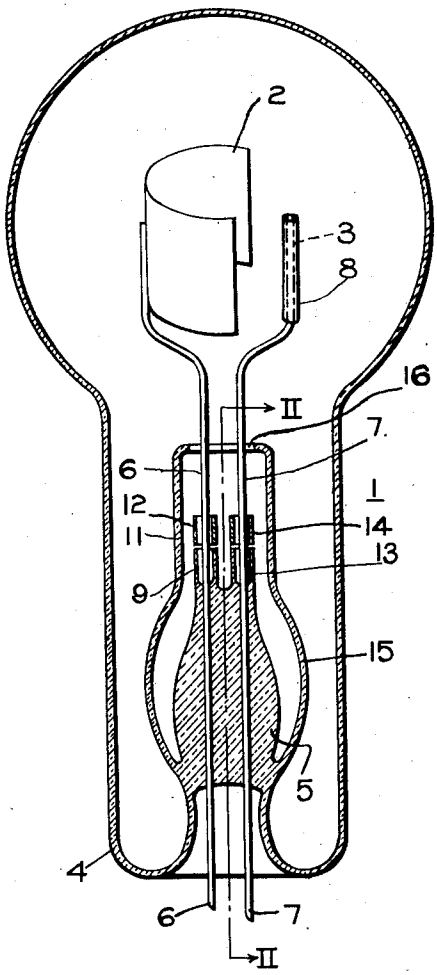


Fig. 3.

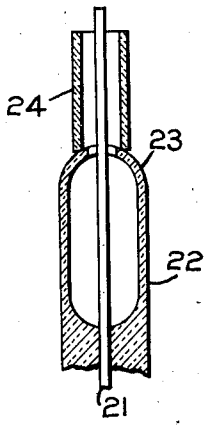


Fig. 4.

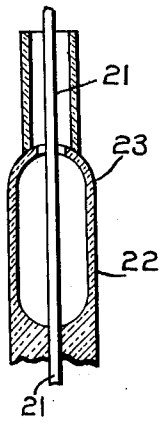
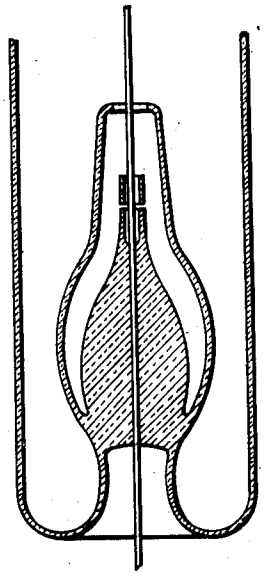


Fig. 2.



WITNESSES:

A. G. Schiefelbein

F. W. Goldsborough

INVENTOR

Vladimir K. Zworykin

BY

Chester G. Baar

ATTORNEY

Patented Dec. 22, 1931 1,837,745

UNITED STATES PATENT OFFICE

VLADIMIR K. ZWORYKIN, OF SWISSVALE, PENNSYLVANIA, ASSIGNOR TO WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA

VACUUM TUBE

Application filed October 9, 1926. Serial No. 140,485.

My invention relates to vacuum-tube devices, and more particularly to devices of the type in which a metallic vapor is either purposely or unavoidably present, and devices of the type in which the operation thereof gives rise to vapors that tend to condense and form conductive coatings.

It is an object of my invention to provide an improved electrode-supporting element for use in vacuum-tube devices.

Another object of my invention is to provide an electrode-supporting element having means incorporated therein for preventing metallic, or other deposits, from forming leakage paths between contiguous electrodes.

Another object of my invention is to provide an electrode-supporting element having a shield incorporated therewith for preventing the deposition of metallic or other conductive coatings thereon.

Still another and more specific object of my invention is to provide a vacuum-tube electrode-supporting press comprising means for automatically removing conductive deposits as fast as they form in locations where the leakage caused thereby is disadvantageous.

In substantially all of the present day thermionic tube devices, and in many photoelectric cells, it has become customary to support the electrodes from a single glass element generally known as a "press". The electrode supports are generally rather closely spaced where they emerge from the press and, when in use, a potential difference is usually applied between certain of them.

In devices, such as photoelectric cells making use of potassium, considerable difficulty has been experienced from leakage between electrodes, caused by the deposition of volatilized potassium on the press. It is often noted, in addition, that the use of magnesium as a "getter" is quite likely to cause an undesirable film of magnesium to be so deposited on the press as to form leakage paths. Material volatilized from incandescent filaments also occasionally condenses on the press and interferes with the proper functioning of the device.

According to my invention, an electrode-supporting press is provided with a shield for preventing the deposition of conducting material thereon. I interpose also a device between contiguous electrodes for automatically removing a conducting film as fast as it forms, the energy for actuating the cleaning device being derived from movements of the tube, as a whole, when handled.

The novel features which are considered characteristic of this invention are set forth with particularity in the appended claims. The invention itself, however, both as to its organization and its method of operation, together with further objects and advantages thereof will best be understood by reference to the following description, taken in connection with the accompanying drawings, in which,

Fig. 1 is a sectional view of a photoelectric cell embodying a preferred form of my invention,

Fig. 2 is a sectional view along a line corresponding to the line II—II of Fig. 1, and

Figs. 3 and 4 are sectional views of alternative forms of the cleaning device.

In order to more clearly explain the application of my invention to a vacuum-tube device, I have shown, in Fig. 1, the manner in which it may be applied to a photoelectric cell containing potassium vapor. The cell comprises a glass envelope 1 having one portion thereof enlarged to accommodate a photoelectrically active cathode 2 and a cooperating anode 3. The end 4 of the envelope opposite the enlarged portion is provided with a re-entrant press, or stem 5, through which passes an electrode support 6 affixed to the cathode, and an additional support 7 for an anode 8. In the specific form of tube chosen for illustration, the anode 8 may obviously be merely a continuation of the supporting standard, while it is also feasible to utilize a deposit on the surface of the envelope as the cathode.

At the point where the cathode support 6 emerges from the press, it is surrounded by a small tube-like element 9 continuous with the press material. The upper edge 11 of this element is ground to a smooth surface, and a short piece 12 of tubing rests thereon and surrounds the cathode support 6.

The lower edge of the short, detached, piece 12 of tubing is preferably slightly roughened, for a purpose that later will be explained.

The anode support 7 is also surrounded by a fixed tube-like element 13, and is similarly provided with a detached, short piece 14 of tubing.

In order to prevent, in so far as practicable, the deposition of conductive material on the press adjacent to the points of emergence of the electrode supports, a shield 15 is provided to entirely surround the press 5. The electrode supports 6 and 7 extend through a restricted opening 16 in the upper portion of the shield, which opening is made sufficiently small to prevent the detached portions 12 and 14 of tubing from passing therethrough.

When in use, it is obvious that the photoelectric cell will be necessarily subjected to a certain amount of handling. The detached portions of tubing, being somewhat larger in internal diameter than the electrode supports, will move around on the supporting tubes 9 and 13 and will exert a grinding and cleaning action on any conductive material that may be deposited thereon. The upper edges of the fixed tubes thus being kept clean, electrical leakage between the electrode supports is prevented.

It is not essential that the fixed tubes rising from the press be provided with upper edges at right angles to the tube axis, it having been found that the modifications illustrated in Figs. 3 and 4 are equally effective.

Referring specifically to Fig. 3, the electrode support 21 is surrounded by a fixed tube 22 having a rounded upper edge 23. A detached tube, or bead 24, is loosely mounted around the electrode support, and rests on the rounded surface of the fixed tube. When the device is handled, the detached tube, being free to move relatively to the fixed tube, exerts a grinding, or cleaning action on the rounded surface thereof.

In Fig. 3, I have shown the lower edge of the detached tube or bead substantially at right angles to the axis of the tube, which construction causes the cleaning action to be accomplished by the inner sharp edge of the bead.

The lower end of the bead may also, if desired, be beveled as illustrated in Fig. 4, which permits it to make contact with an appreciable amount of the surface of the fixed tube. Either the latter modification, or that illustrated in Fig. 3, is effective to keep the upper portion of the fixed tube from becoming covered by a conductive coating.

Although I have illustrated and described certain specific embodiments of my invention, I am aware that obvious modifications thereof will be apparent to those skilled in the art, and my invention accordingly is not to be limited except insofar as is necessitated by the prior art and by the spirit of the appended claims.

I claim as my invention:

1. In combination, a discharge device comprising a plurality of standards adapted to support electrodes, an element in which said standards are mounted, and means, including an element actuated by movements of the device as a whole, for keeping free from conductive deposits a portion of the standard-supporting element.

2. In combination, a press, a plurality of electrodes supported from said press, means for shielding said press from the deposition of conductive material, and means for automatically cleaning a portion of the press between electrodes.

In testimony whereof, I have hereunto subscribed my name this 2nd day of October, 1926.

VLADIMIR K. ZWORYKIN.