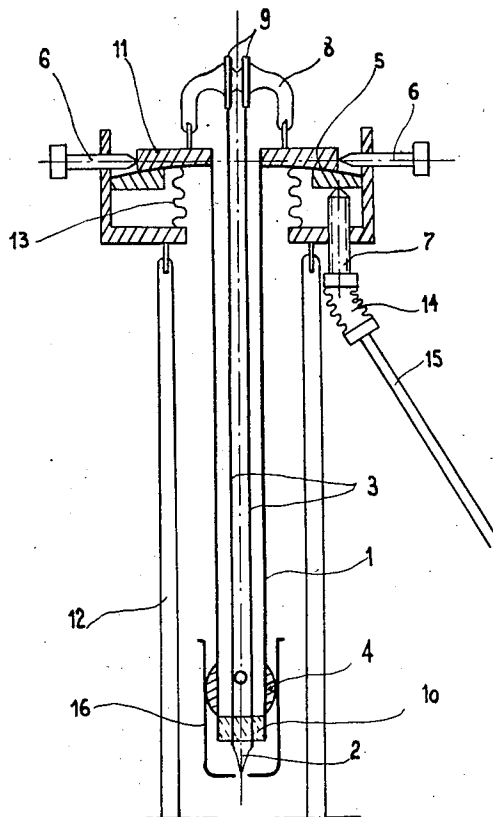


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H. BLATTMANN ET AL
DEVICE FOR THE REGULATION AND CENTERING UNDER
VACUUM OF A FILAMENT FOR A WEHNELT CATHODE
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Inventors

HENRI BLATTMANN
AND HENRI BRUCK

BY *John D. Brady*
ATTORNEY

UNITED STATES PATENT OFFICE

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DEVICE FOR THE REGULATION AND CENTERING UNDER VACUUM OF A FILAMENT FOR A WEHNELT CATHODE

Henri Blattmann and Henri Bruck, Paris, France,
assignors to Compagnie Generale De Tele-
graphie Sans Fil, a corporation of France

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1

This invention relates to a device for the regulation and centering under vacuum of a filament for a Wehnelt cathode.

In the electron gun of a cathode ray tube, the exact position of the filament with respect to the Wehnelt cathode, is of extreme importance. Now the preliminary centering of the filament, the connection of the filament to the current supply conductors, as also the use of cartridges containing the filament previously centered, present numerous inconveniences due in particular to the fact that the electric connection of filament and current supply is often defective, that the cartridges are not always strictly calibrated, and the like.

The present invention refers to a device which permits, while operating, the axial regulation of the filament, as also its centering with respect to the Wehnelt, without it being necessary to take any special precautions on the mounting of the filament; on the other hand, with the device according to the invention, the preliminary evacuation of the residual gases in the filament is no longer indispensable.

The accompanying drawing represents by way of non-restrictive example an embodiment of the regulating device according to the invention.

The invention is directed to a vacuum tube with a focalized electronic pencil, that is, an electronic discharge subject to an electro-optical action of an electric or magnetic field, whose effect consists in obtaining a spot which is as precise and small as possible. The invention applies particularly to electronic microscopes, electronic analyzers, serving particularly to reveal the internal structure of a sheet of any material over the surface of which the electronic pencil is directed, iconoscopes, and, also, oscillograph cathodes of television and measurement of instruments of high precision.

Hitherto the focalization has been obtained by acting on the field of the electronic optic by means of arrangements present outside of the tight ampule, and which causes to vary considerably the current or the voltage applied on the electronic lenses. This method of regulation, however, has been found insufficient for insuring a perfect and stable focalization, and, according to this invention, focalization effected by a mechanical regulation of the position of the cathode relatively to the electrodes of the electronic optic, and, more particularly, relatively to the Wehnelt cylinder, which usually presents itself in the form of a pot pierced with an axial hole, opposite of which there is lodged the emissive face of the

2

cathode. The latter may be of the emissive-filament type (that is, with direct heating); it may also be of the indirect type, and possess a heating filament placed in the interior of the tube covered with an emissive substance. The Wehnelt cylinder, which is frequently termed the "control electrode," is usually brought to the same potential as the cathode, or even to a more negative potential, and it acts electrostatically on the electrons in the sense of a suitable distribution of the space charge and their concentration in the direction of its opening. Applicants provide for two regulations of the cathode, that is, in the axial direction for the purpose of insuring a good focalization, and in the lateral direction for the purpose of preventing deformation of the spot, and particularly for preventing astigmatism. These regulations can only be carried out correctly with the help of a constant supervision of the spot. Hence it is necessary to carry them out in a tube under operation, and of resolving the difficulty of displacement in the interior of the cathode without compromising the vacuum of the tube.

Referring to the drawing in detail the filament 2 is mounted on an insulating support 10, for example of steatite, which is at the extremity of a rigid metallic tube 1 in which are arranged the two current supply conductors 3; the latter terminate at two passage conductors 9 which pass through the part 8 integral with the wall of the enclosure of the vacuum tube.

The tube 1 has a spherical reinforcement 4 which allows the axial guidance thereof or the rotation in the Wehnelt cylinder 16. The centering of the whole about a point O located on the axis of the Wehnelt cylinder is carried out externally and even during the operation of the vacuum tube, due to a spherical sliding path 5 having O for its centre, and manipulated by screws such as 6, arranged all round the part 11 which supports the filament carrier tube 1 and which is connected to the body of the vacuum enclosure 12 by the intermediation of a flexible undulated wall 13. Finally, the screw 7 also manipulated from the outside by means of an operating rod 15 acting through an undulated diaphragm 14, serves for the axial regulation of the filament, allowing its displacement along the axis of the Wehnelt cylinder 16.

If the undulated or corrugated diaphragm 13 is sufficiently rigid, the spherical swelling 4 of the tube 1 may be omitted, and the regulation may be proceeded with as before by again acting on the screws 6 and 7. For the sake of simplifica-

tion, there may also be employed, in place of a spherical sliding path 5, a flat sliding path.

In any case, the centering and the axial regulation are thus carried out independently one of the other. Furthermore, the device is regulated during the running of the vacuum tube, seeking, for example, to obtain the maximum brilliance of the track or mark of the beam on the fluorescent screen.

While we have described our invention in one of its preferred embodiments we realize that modifications in construction may be made and we desire that it be understood that no limitations upon our invention are intended other than may be imposed by the scope of the appended claims.

What we claim is:

1. In a high vacuum apparatus of the type using a focalized electronic beam, a vacuum-tight envelope having an immobile part, a rigid movable piece having both lateral and axial movement forming a part of said envelope and connected permanently to the immobile part of the envelope through a flexible and deformable vacuum-tight piece, an emissive cathode inside of the said envelope rigidly fastened to the said movable piece, and means associated with the said envelope and exposed externally thereto for controlling the position of the said movable piece so as to displace it both laterally and axially relative to the axis of the apparatus.

2. In a high vacuum apparatus of the type using a focalized electronic beam, a vacuum-tight envelope having an immobile part, a rigid movable piece having both lateral and axial movement forming a part of said envelope and connected to the immobile part of said envelope by means of a flexible and deformable vacuum-tight piece, an electronic gun inside of the said envelope comprising a mobile emissive cathode and a fixed control cylinder surrounding said cathode, means for supporting said cathode rigidly to the said movable piece of the envelope, and means associated with the said envelope and disposed externally thereto for controlling the position of the said movable piece so as to regulate laterally and axially the cathode position relative to the axis of the said control cylinder.

3. A high vacuum apparatus as set forth in claim 2 in which the immovable part and the movable piece of said envelope are connected through a corrugated sleeve which is extensible and flexible.

4. A high vacuum apparatus as set forth in

claim 2 in which said control cylinder has an aperture located axially thereof opposite the cathode for emitting electrons in a controlled beam.

5. A high vacuum apparatus as set forth in claim 2 in which the means associated with said envelope and disposed external to it act on said movable piece so as to displace it to either of two separated positions, and in which separate means are associated with said envelope external thereto and acting directly on the movable piece for displacing the movable piece in a transverse direction.

6. In a high vacuum apparatus of the type using a focalized electronic beam, a vacuum-tight envelope having an immobile part, a rigid movable member having both lateral and axial movement forming a part of said envelope, an extensible and flexible corrugated vacuum-tight membrane of a sleeve form connecting said member to the immobile part of the envelope, a control cylinder for an electronic gun in the inside of the said envelope, said control cylinder having an axially disposed aperture therein, an emissive cathode disposed inside of said control cylinder symmetrically to the axis thereof and in alignment with the axially disposed aperture therein, a supporting rod extending parallel to the axis of said cylinder, means fastening the cathode to the movable member of said envelope, a support piece external to the envelope and providing a slidable surface on which said movable piece is laterally displaceable, a frame fixed to and outside of said envelope for mounting said support piece, and a plurality of regulating means associated with the said frame, one of said means acting on the support piece in the direction of the control cylinder axis, and the other acting directly on the said movable member for adjustably displacing it laterally of the said axis.

BLATTMANN, HENRI.
HENRI BRUCK.

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