Sept. 5, 1939. E. RUSKA 2,171,766

MEANS FOR FASTENING ELECTRODE SYSTEMS IN BRAUN TUBES

Filed July 1, 1936

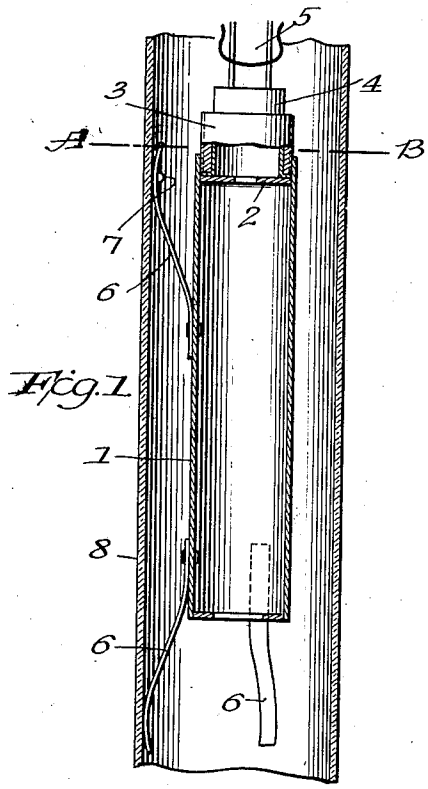


Fig. 1.

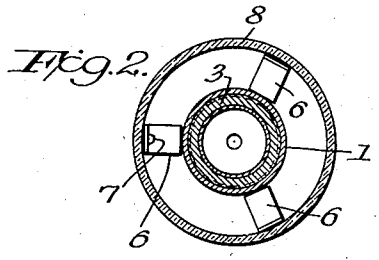
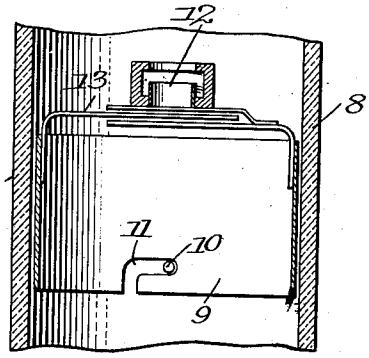


Fig. 2.

Fig. 3.



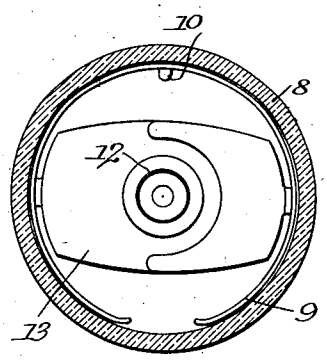
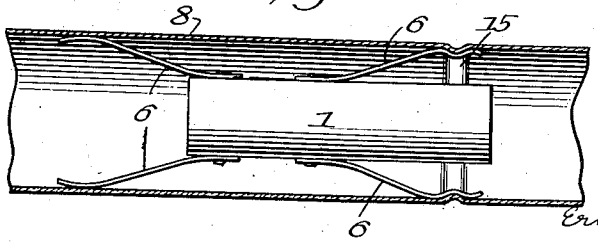


Fig. 4.

Fig. 5.



Inventor
Ernst Ruska

By Lippincott & Metcalf Attorneys

Patented Sept. 5, 1939 2,171,766

UNITED STATES PATENT OFFICE

2,171,766

MEANS FOR FASTENING ELECTRODE SYSTEMS IN BRAUN TUBES

Ernst Ruska, Berlin-Zehlendorf, Germany, assignor to the firm Fernseh Aktiengesellschaft, Zehlendorf, near Berlin, Germany

Application July 1, 1936, Serial No. 88,486
In Germany July 9, 1935

2 Claims. (Cl. 250—141)

The invention relates to means for mounting in the interior of electron ray tubes the electrode systems used therein and especially the accelerating control and intensity control systems used in image scanning and image reproducing tubes.

In making Braun tubes the problem arises of firmly positioning the electrode system as a unit prior to fusing the cathode in place, and, if required, the Wehnelt cylinder.

In order to fasten the electrode system with simple connecting means but in an accurate manner in the neck of the tube, the neck of the tube, in accordance with the invention, is provided either with an inwardly pressed groove or outwardly extending protuberance extending annularly around the neck or else with inwardly extending depressions or outwardly formed proturberances disposed in one or more locations in the same or different planes perpendicular to the axis of the tube. A conical or cylindrical stud may also be arranged to extend inwardly. Springs are laid in or over the grooves or proturberances, said springs being associated with a portion of the electrode system and fitting positionally accurate into the groove when the springs are provided wtih cooperating depressions or cross-grooves. If proturberances or studs are provided on the wall of the neck the hole in the spring, when the electrode system is inserted, snaps into engagement over such studs. Inwardly extending grooves or proturberances have the advantage that the exterior of the tube remains smooth. This makes it possible to permit the exterior cross-deflecting and collector system to be snugly applied to the neck of the tube.

A single stud has the advantage that care need be taken only with respect to its axial position. In providing a plurality of peripherally distributed studs the angular separation must be carefully considered and this renders the production more difficult. However, this system effects a more rigid seating of the system in the neck of the tube.

The electrode system, which, for example consists of the anode tube, Wehnelt cylinder, and cathode, rests, in accordance with the invention in resilient fashion against the neck of the tube and hence, in most cases, also against the conducting interior coating of the neck, and in such a manner that the indented groove positionally retains the system in axial relation or else the stud not only axially positions it but also insures it against turning. Both factors are important, in order, for example, when the cathode and Wehnelt cylinder are fused in place, to make sure that no subsequent positional change occurs owing to the forces acting on the system, (such as gravity, traction caused by the glass, etc.). The resilient portions, such as leaf springs, or a spreading ring, may be fastened to any desired portion of the electrode system, e. g. to the periphery of a tube, to a diaphragm, or to an insulating portion. The anode voltage in such a tube may be led in by known means, either through a separate lead-in disposed on the side of the tube leading to the interior coating of the tube, or through the base of the tube (e. g. in the case of single socket mounting).

In the accompanying drawing:

Fig. 1 shows a means for fastening the electrode system to the neck of the tube in accordance with the invention.

Fig. 2 is a section on line A—B of Fig. 1.

Fig. 3 is a spreading ring electrode as used for fastening the electrode system to the neck of the tube.

Fig. 4 is a top view of Fig. 3.

Fig. 5 shows a tube neck provided with internally directed protuberances.

In Fig. 1 the numeral 1 designates an anode tube with the anode 2 disposed therein. An insulating connecting member (screw ring) 3 is screwed into the upper end of the anode tube, said ring being adapted to effect the accurate coaxial positioning of the cathode or Wehnelt cylinder 4 and anode tube 1. 5 is the pressed foot of the tube. The anode tube 1 carries three leaf springs 6 distributed in 120° separations around its periphery and which extend in the axial direction of the tube, said springs however being bent off at an angle from the anode tube at both ends and carrying a slightly curved portion directed towards the anode tube. The springs are fastened to the anode tube by means of two or more screws, rivets, or spot welds lying within the angularly bent off free resilient ends. At least one of the springs has an opening which engages over the protuberances 7 on the glass wall 8. The material of the spring must be completely non-magnetic and must not lose its elasticity during the usual making temperatures chromium-nickel, "contracid-beryllium" alloys, etc. being suitable). The same requirements are indicated for the material of which the spreading ring electrode described below its made. Obviously other portions of the electrode system, e. g. the individual electrodes or deflecting plates or deflecting coils as well as electrode supports and lead-ins or even insulating portions with

which the remaining system is rigidly connected may be provided with springs and supported in the described manner in the neck of the tube so that they aid in retaining the remainder of the system. Likewise, springs may be distributed around the periphery in a plurality of different planes (especially two planes) perpendicular to the neck, said springs under certain conditions being of different potential when attached to different electrodes.

The spreading ring electrode **9** shown in Fig. 3, for example an anode, may be provided like the individual springs, with one or more holes or depressions into which the studs or protuberances engage and thus serve to hold them in place. However, the spreading ring may cooperate with one or more internal studs **10** of the neck after the fashion of a bayonet fastening. For this purpose the ring is then provided with one or more right angle slots **11**.

The cross yoke **13** which serves for holding the anode diaphragm **12** is bent out from the spreading ring at right angles to the ray axis and tube axis, or is fastened at right angles to the spreading rings, e. g. by welding or riveting.

In Fig. 5 the tube neck **8** is provided with a protuberance **15** over which the springs **6** of the anode tube **1** snap. The fastening means of the invention is especially applicable to tubes in which the deflecting system consists of coils which are forced exteriorly over the neck of the tube. However, it is also possible to dispose the complete electrode system inside the tube without difficulty. Nevertheless in that case it is preferable to provide not only one spring which engages in a stud or groove, but rather a plurality of springs which, if desired, may also be attached to different parts of the electrode system.

I claim:

1. In a tube of the Braun type, an envelope having a protuberance projecting inwardly thereof, a source of electrons adjacent an end of said tube and on the axis thereof, elongated anode structure in said tube, means for mechanically coupling said anode structure at one end with said source of electrons to form a unitary electrode assembly, means for anchoring said electrode assembly at the aforementioned end of said tube, and spring means disposed about said anode structure in contact with said tube and engaging said protuberances for alining the remainder of said elongated anode structure with said source of electrons along the axis of said tube and maintaining said anode against displacement while in the process of assembly.

2. In a tube of the Braun type, a source of electrons adjacent an end of said tube and on the axis thereof, elongated anode structure in said tube, means for mechanically coupling said anode structure at one end with said source of electrons to form a unitary electrode assembly, means for anchoring said electrode assembly at the aforementioned end of said tube, a protuberance on the inner wall of said tube and means for alining the remainder of said elongated anode structure with said source of electrons along the axis of said tube and maintaining the same against displacement during the process of assembly comprising a plurality of leaf springs disposed about and attached to said anode and having free ends contacting the inner wall of said tube with at least one of said leaf springs interlocking with said protuberance.

ERNST RUSKA.