Nov. 22, 1960 V. S. BAWDEKAR 2,961,567

THERMIONIC VALVES

Filed March 23, 1959

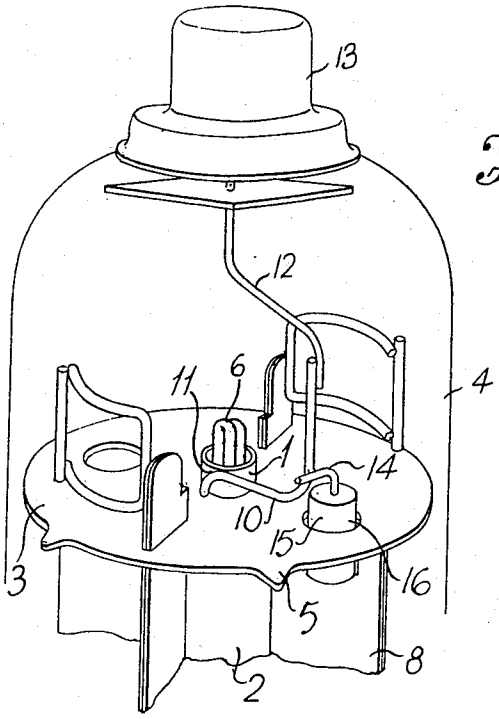

Fig. 1

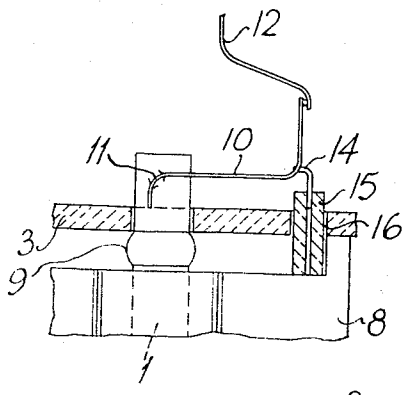

Fig. 2

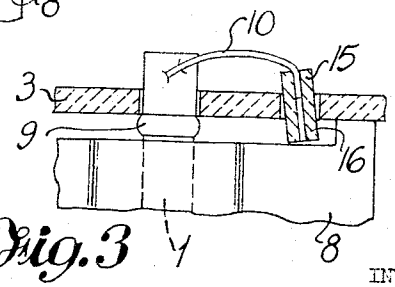

Fig. 3

INVENTOR
VAMAN SHANTARAM BAWDEKAR

BY Larson and Taylor

United States Patent Office 2,961,567
Patented Nov. 22, 1960

2,961,567

THERMIONIC VALVES

Vaman Shantaram Bawdekar, London, England, assignor to Siemens Edison Swan Limited, London, England, a British company

Filed Mar. 23, 1959, Ser. No. 801,265

Claims priority, application Great Britain Apr. 10, 1958

2 Claims. (Cl. 313—270)

This invention relates to thermionic valves and particularly concerned with the maintenance of the spacing between a tubular cathode and a surrounding anode whilst at the same time preserving a high degree of insulation between them.

It is the usual practice, in thermionic valves of the kind having a tubular cathode and a surrounding anode of tubular form coaxial therewith, to maintain the cathode concentrically within the anode by means of mica spacers located at opposite ends of the anode, the mica spacers having apertures through which the ends of the tubular cathode project. It is necessary to fasten the cathode to the spacer at the end of the anode remote from the base of the valve so as to prevent relative movement axially of the cathode between the cathode and the spacer.

In some valves where a high degree of cathode-anode insulation is required, such as booster diodes, it is essential that any metallic means used to fasten the spacer to the cathode should not reduce cathode-anode clearance and de-grade the insulation between these electrodes.

The object of the invention is to provide a method of securing the cathode tube to the mica spacer in a manner which will avoid any reduction in the insulation between the anode and the cathode.

In a thermionic valve having a tubular cathode and an anode surrounding the cathode, the cathode being held within the anode by means of at least one mica spacer which engages the anode and is apertured to receive the cathode, according to the invention, the cathode is provided with a projection which locates it against the spacer, and the spacer is held towards the projection from the cathode by means of a metal member secured to the cathode tube at a region spaced along the tube from the projection, the metal member extending towards the projection and abutting directly or indirectly against the face of the mica spacer remote from that which engages the projection. The metal member may extend along the surface of the cathode tube to which it is secured so as to engage the mica spacer in the immediate vicinity of the cathode tube; alternatively, it may be arranged to extend from the cathode tube to engage an insulating member preferably of ceramic material which is positioned within an aperture in the mica spacer displaced from that through which the cathode tube extends, and rests on a section of the anode or any other convenient part of the electrode structure.

In a preferred construction a combination of these two features is employed the metal member being secured to the cathode intermediate its ends, one end of the metal member beyond the region at which it is secured to the cathode tube extending towards the mica spacer to retain it against the projection on the cathode tube, whilst the other end of the metal member is utilised to form the conductive connection to the cathode and is supported against movement by engagement with an insulating member engaging an aperture in the mica spacer and resting on a section of the anode or any other convenient part of the electrode structure.

The improved effect by these alternative constructions resides in the fact that the wire or strip does not extend along and in contact with the surfaces of the mica and does not therefore reduce the insulation value of the mica spacer between the cathode and the anode.

The invention will now be described with the aid of the accompanying drawing, in which

Fig. 1 is a perspective view of one end of a cathode anode assembly suitable for use in a booster diode,

Fig. 2 is a cross-section of part of the electrode system to an enlarged scale to show the construction of the retaining means for the mica spacer, and

Fig. 3 is a view similar to Fig. 2 of an alternative arrangement.

Referring to Fig. 1, we have illustrated the upper end of the electrode system of a booster diode showing the tubular cathode **1**, located within a surrounding tubular anode **2**, the relative positions of the anode and cathode being maintained by means of a mica spacer **3**. Spacer **3** is shown as being arranged to engage at its periphery the inner wall of the envelope **4**, the mica spacer being formed with angularly displaced projections **5** which bear against the inner wall of the envelope **4**. The tubular cathode is provided with a heater **6**. The cathode tube **1** is coated with a suitable electron-emissive material on that part of it which extends through the anode **2**.

Anode **2** is provided with radially extending fins **8**, of which four are shown, the fins serving both to assist thermal radiation from the anode and to locate the spacer **3** through apertures in which the upper ends of the fins **8** project. A similar spacer will be provided on the lower end of the anode, not shown, and retained in position in any suitable manner.

Cathode **1** extends through a central aperture in the spacer, and the spacer is located by providing it with an annular projection **9** shown in Fig. 2. In order to retain the projection **9** against the mica spacer **3**, according to the invention, a wire **10** is secured to the cathode tube at **11**, e.g. by welding, at a region spaced along the tube from the projection **9**, the end of the wire **10** extending towards the projection **9** and abutting directly against the face of the mica spacer **3** remote from that which engages the projection **9**. The end of the wire **10** thus engages the mica in the vicinity of the cathode and does not extend along the surface of the mica to reduce the insulation value thereof. Beyond the point of connection **11** to the cathode tube **1**, wire **10** extends substantially parallel to the surface of the mica and is then bent upwardly to engage with connection **12** which is sealed through the wall of the envelope **4** to make contact with an external metal cap **13** which constitutes the cathode terminal.

In order to relieve the connection **11** from stress during the manufacture of the valve, wire **10** is supported by a wire **14** which is welded to the wire **10** and the end of which is inserted into an insulator **15** received in an aperture **16** in the mica spacer **3**. Insulator **15** is conveniently in the form of a short ceramic tube or bushing, the lower end of which rests on one of the anode fins **8**. The presence of the wire **14** steadies the wire **10** in position during manufacture of the valve and facilitates the making of the connection between the wire **10** and the cathode connection **12**.

In the alternative construction shown in Fig. 3 wire **10** is secured as by spot welding, to the cathode tube at **11**, as before, but the remote end of the wire **10** extends into the insulator **15** which is now arranged to engage the aperture **16** in the spacer **3**. In this alternative construction the projection **9** on the cathode is held against the mica spacer **3** by the springiness in the wire **10** combined with the reaction of the anode fin against the insulator **15** in the aperture **16**. Again, in this con-

struction, the wire connection 10 does not lie along the surface of the spacer 3 and thus effects no diminution of the insulation value of the spacer as between the cathode and the anode.

What I claim is:

1. A thermionic valve having an envelope containing a tubular cathode, an anode surrounding said cathode, said anode having radially disposed radiating fins extending therefrom, a mica spacer engaging the ends of said fins and having an aperture within which said cathode is located, said cathode having a peripheral projection to engage said spacer, and means for retaining said spacer against said projection comprising a conductor secured to said cathode at a region spaced along said cathode from said projection, one end of said conductor being in abutting engagement with the face of said spacer remote from said projection and the other end of said conductor being extended to form a lead to said cathode terminating externally of said envelope, a ceramic bushing located in an aperture in said spacer to engage an end of one of said fins, and a metal strap secured to an intermediate part of said conductor between its connection to said cathode and said envelope, said strap frictionally engaging said ceramic bushing.

2. A thermionic valve having an envelope containing a tubular cathode, an anode surrounding said cathode, said anode having radially disposed radiating fins extending therefrom, a mica spacer engaging the ends of said fins and having an aperture within which said cathode is located, said cathode having a peripheral projection to engage said spacer, and means for retaining said spacer against said projection comprising a conductor secured to said cathode at a region spaced along said cathode from said projection, a ceramic bushing located in an aperture in said spacer and engaging an end of one of said fins the end of said conductor making frictional engagement with said bushing and being so resiliently formed between said cathode and said bushing as to cause the projection on said cathode to abut against the face of said spacer remote from the connection between said conductor and said cathode.

References Cited in the file of this patent

UNITED STATES PATENTS

2,111,602	Ronci	Mar. 22, 1938
2,736,835	Van Tol	Feb. 28, 1956