May 30, 1939. G. W. WARREN 2,160,044

ELECTRODE SPACER

Filed Jan. 25, 1939

Fig. 1

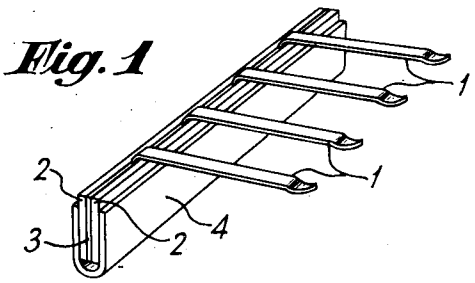


Fig. 2

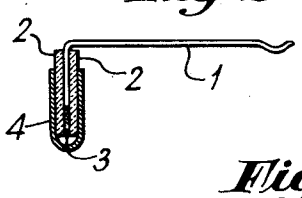


Fig. 3

Fig. 5

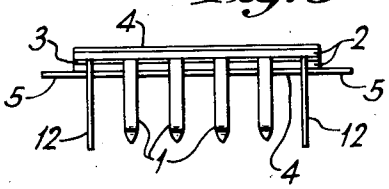


Fig. 4

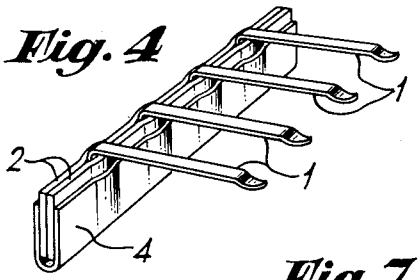


Fig. 6

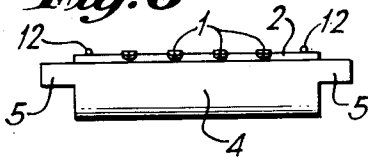


Fig. 7

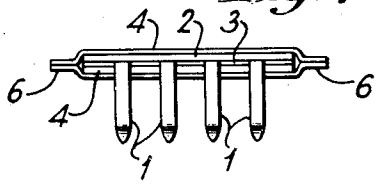


Fig. 8

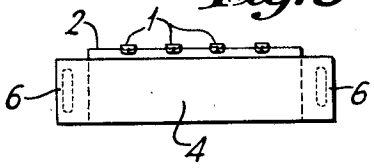


Fig. 10

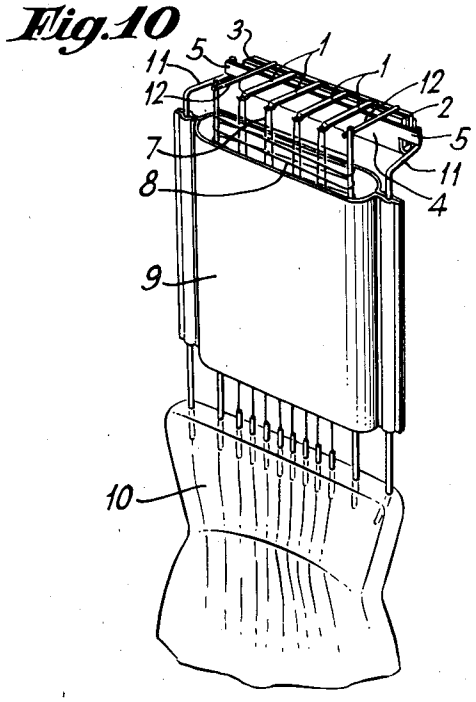
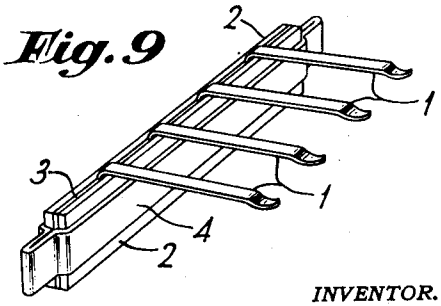


Fig. 9



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ELECTRODE SPACER

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Application January 25, 1939, Serial No. 252,756
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4 Claims. (Cl. 250—27.5)

This invention relates to electric discharge devices of the type comprising at least one cantilever spring supported at its fixed end from an insulating member. Such springs are used, for example, in tensioning the filamentary cathodes of thermionic valves and for spacing electrodes.

It has been proposed to use glass as the insulating material, and to insert the fixed end of the spring into the glass softened by heat. Since the fixed end is softened, by heat during its insertion into the glass, it has then been proposed to wrap the spring round the glass for some distance from the point at which it is fixed. With this method, however, it is difficult to ensure that the effective length of the cantilever will be the same for different springs, in view of accidental variations, for example, in the shape and dimensions of the glass supporting member. Since the load necessary to produce a given deflection of the cantilever is proportional to the cube of the effective length, large variations in the tension applied to the filament occur in practice.

The object of the present invention is to provide an improved method of supporting a cantilever spring from an insulating member, which is easy to perform and uniform in results.

According to the invention the cantilever spring is clamped at the fixed end between strips of flexible insulating material, such as mica, by means of a metal clamp which does not make electrical contact with the spring. Several springs insulated from one another may be clamped between the same strips of mica or the like.

The characteristic features of this invention are defined with particularity in the appended claims and preferred embodiments are described in the following specification and shown in the accompanying drawing in which Figures 1 and 4 are perspective views of electrode supports and spacers constructed according to this invention, Figure 2 is a view of a section through the device of Figure 1, Figure 3 shows one of the insulating pieces employed in the support member of Figure 1, Figures 5 and 6 are respectively top and side views of another support member constructed according to this invention, Figures 7 and 8 are respectively top and side views of a support member constructed according to this invention, Figure 9 is a perspective view of a modified support member constructed according to this invention and Figure 10 shows in perspective an electrode assembly with the improved electrode spacer of this invention.

Figure 6 shows in perspective the electrode system of a thermionic valve, comprising a cathode 7 in the form of four V-shaped filaments, a grid 8 and an anode 9, all supported from a glass pinch 10, and cantilever springs 1, whose ends are clamped according to the invention, supported from the anode of the valve by means of the wires 11 welded to the metal clamp 4. The upper end of the grid 8 is located by means of wires 12 which are clamped between the mica strips 2 between which the fixed ends of the springs are clamped.

In all the figures, the spring 1 are in the form of strips of metal, such as molybdenum, and are bent at right angles at or near their fixed ends which are clamped between two rectangular strips of mica 2, by means of a metal clamp 4. The clamp 4 of Figures 1 and 2 is made of sheet metal, such as nickel, bent so as to have a U-shaped cross section; the mica sheets are pressed between the limbs of the U. A strip of mica 3, Figure 3, in which slots are cut to receive the ends of the springs and whose thickness is slightly less than that of the springs, is placed between the two micas 2, and serves to locate the springs in fixed positions.

In Figure 4 the separating mica 3 is absent. But the tool used to press the limbs of the U together is recessed opposite the fixed ends of the spring, so that the mica strips 2, and metal clamps 4, are shaped round the springs as shown.

As shown in Figures 5 and 6 projections 5 are provided at the ends of the metal clamp 4. These extensions may be welded to side rods of the mount to support the clamps, and therefore the springs, from an electrode of the valve.

Figure 8 is an elevation and Figure 7 is a plan of another modification of the embodiment shown in Figure 1. Here the metal clamp 4 projects beyond the ends of the mica sheets 2, and the projecting ends are welded together at 6.

In Figure 9, which is a perspective view, the metal clamp 4 has the form of a flattened ring of metal clamped round the mica strips; the resulting structure is then very similar to that of Figure 7.

In any of these embodiments, additional wires or strips may be clamped between the mica strips, electrically insulated from the metal clamp; these wires or strips may act as support wires for an electrode or electrodes of the discharge device. The electrode spacer of this invention is easier to make than the usual glass bead and is less expensive to manufacture.

I claim:

1. An electron discharge device comprising an

electrode assembly with a filamentary cathode extending longitudinally through the electrodes, means for engaging one end of the filament at one end of assembly comprising a strip of metal U-shaped in cross section joined at its ends to said assembly, strips of yieldable insulating material within said metal strip, a hook held at one end between said insulating strips and engaging the filament at the other end.

2. An electrode assembly for an electron discharge device comprising a filamentary cathode, means for tensioning said cathode comprising a cantilever spring, a metal trough supported at its ends on the electrode assembly, layers of insulating material in said trough, one end of said spring being gripped in said trough between two layers of the insulating material, and the other end of the spring engaging said cathode.

3. An electrode assembly for an electron discharge device comprising a plurality of coaxial electrodes, means for insulatingly spacing the electrodes at one end of the assembly comprising metal pieces joined to said ends of the electrodes, the opposite ends of said pieces being gripped between strips of insulating material, and means for mechanically pressing said insulating strips into firm engagement with said opposite ends of said pieces.

4. An electrode assembly comprising a plurality of coaxial electrodes, means for insulatingly spacing the electrodes at one end of the assembly comprising an elongated metal clamp, a plurality of metal pieces each joined at one end to one electrode and gripped at the other end in said metal clamp, and means for insulatingly separating the gripped ends of the pieces from said clamp.

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