This invention relates to magnetrons and has more particular reference to the cathode structure thereof.

Magnetrons as heretofore manufactured have provided plates or discs at the ends of the cathode for both shielding and cathode-supporting purposes. At least one of these shields has to be electrically separated from the cathode, thus requiring a laval or other insulator therebetween. However, the cathode is supported from the shield and consequently there should be no movement permitted between the insulator and the shield in order to maintain the cathode rigidly secure. A filament passes out through the insulator and is attached to the shield, the prior art relying upon that connection to retain the shield in fixed relation upon the insulator. However, the filament is of such a small diameter, and so flexible and fragile, that the hole through the insulator has to provide a loose fit, as a result of which there is opportunity for lateral and longitudinal movement of the shield with respect to the insulator. Such movement is detrimental for at least two reasons, one being that the cathode will not retain its given and coaxial position within the anode, and secondly the cathode may vibrate with a finite amplitude. Such vibration materially affects the operation of the magnetron and is highly detrimental.

In its most general aspects, therefore, the present invention seeks to overcome the deficiencies of prior art mounting of cathodes in magnetrons. Also from a general aspect, the object of the invention is to provide means for more rigidly mounting the cathode in a magnetron.

More specifically, an object of the invention is to relieve the filament from former requirement of preventing movement between the supporting shield for the cathode, and the end insulator carried by the cathode.

A further object is to promote ease of assembly of filament and insulator and associated parts.

Still further objects of the invention will appear to those skilled in the art to which it appertains as the description progresses both by direct recitation thereof and by implication from the context.

Referring to the accompanying drawing in which like numerals of reference indicate similar parts throughout the several views:

Figure 1 is a vertical section of a magnetron showing the cathode and associated parts in elevation;

Figure 2 is a sectional view of the cathode and associated parts in section and on larger scale than in Fig. 1;

Figure 3 is a sectional elevation of the attaching means for filament and insulator applied to the shield which is shown in edge view; and

Figure 4 is a plan of Fig. 2.

In the specific embodiment of the invention illustrated in said drawing, the reference numeral 10 designates the usual magnetron body having end caps 11, end spaces 12 thereunder, and anode 13 between said end spaces. Said anode as usual is centrally hollow for passage therethrough of a cathode 14 which is a tube having an emissive outer surface. In the ends of the cathode tube are seated cylindrical insulators 15 and at the outer ends of the insulators are disc-shaped shields 16 transverse to the axis of said cathode and its insulators. The said shields are supported by the coaxial rod member 17 of co-axial lead-in structures 18 laterally disposed with respect to the magnetron with said rod members entering radially through the end spaces 12 and insulated from the body of the magnetron.

Within the cathode is a heater filament 19, the ends of which pass through central holes 20 in the insulators 15 and through a registering hole in the middle of each shield. While in the prior art attempt was made to utilize holes in the insulators and shields having as little clearance with the filament as practicable for fabrication purposes, the holes are, in the present invention, made considerably larger than the filament.

By preference, before application of the shield upon the insulator, an eyelet 21 is applied through the hole of the shield with the shank of the eyelet projecting through the shield and the flange 22 of the eyelet spot welded or otherwise secured flatwise on the shield next the margin of the hole and on the face of the shield away from the insulator. The protruding shank of the eyelet is inserted into the central hole 23 of the insulator with the face of the shield 16 proximate to the insulator juxtaposed to the end face of the insulator. The diameter of the hole in the insulator and that of the shank of the eyelet are made so nearly equal that the eyelet shank may be pressed into the hole with a tight frictional grip therein. Accordingly there is no lateral play between the eyelet and insulator and for all practical purposes the eyelet also keeps the shield from separating in an axial direction from the insulator.

On the outer face of the eyelet flange 22 of the inserted eyelet 21 another and outwardly directed eyelet 23 is secured by its flange 24, the
two flanges being spot welded or otherwise secured flatwise together, and the two eyelets, being on a common axis, provide a continuous passage therethrough. It is now a very simple operation to insert the end of the heater filament 18 in the passage through the eyelets especially since said passage may be larger than the filament. After the filament is thus inserted in place the shank of the outwardly projecting eyelet is cramped or pressed from opposite sides to grip the filament thereby and spot welded or otherwise permanently attached thereto.

By virtue of the construction above described, the cathode insulator is rigid with respect to the shield and cannot shift either laterally or longitudinally nor is any strain accomplishing this desideratum applied to the filament, the eyelets serving as both mounting means between shield and insulator and for the filament.

It may be called to attention that one of the shields is grounded with respect to the cathode, right angle strips 25 being shown for the purpose. However, the other shield cannot be grounded to the cathode since that would short circuit the filament. The present invention accordingly provides a structure usable at both ends of the cathode irrespective of which end of the cathode is grounded by the addition of strips 25.

We claim:

1. A hollow cathode having an insulator carried by the end thereof, a transverse shield at the outer end of said insulator, an eyelet on said shield, said eyelet having a shank in longitudinal engagement with said insulator and extending through said shield and retaining the shield and insulator from relative transverse movement, and a heater filament within said cathode and projecting through said insulator.

2. A hollow cathode having an insulator carried by the end thereof, a transverse shield at the outer end of said insulator, an eyelet on said shield in longitudinal engagement with said insulator and retaining the shield and insulator from relative transverse movement, and a heater filament within said cathode and projecting through said insulator, and another eyelet at the outside of said shield and secured to the portion of said filament projecting through the insulator.

3. A cathode mounting means comprising a pair of eyelets each having flanges and shanks, said flanges being juxtaposed and secured together and said shanks projecting in opposite directions from the juxtaposed flanges, an insulator having a hole therethrough, one of said eyelets projecting into said hole and in frictional engagement with the wall thereof, and a heater filament extending into said eyelets and secured to the one exterior of the hole.

4. A cathode assembly for a magnetron having lead-in wires and a cathode mounted therebetween, shields opposite the ends of said cathode secured to said lead-in wires, insulators interposed between said cathodes and shields, an eyelet projecting through each said shield and into the insulator, and each said eyelet having an outwardly projecting eyelet attached thereto and in axial alignment therewith, and a heater filament in said cathode said filament having its ends projecting into the outwardly projecting eyelets and secured thereby.

5. A cathode assembly for a magnetron having lead-in wires and a cathode mounted therebetween, shields opposite the ends of said cathode secured to said lead-in wires, insulators interposed between said cathodes and shields, an eyelet projecting through each said shield and into the insulator, and each said eyelet having an outwardly projecting eyelet attached thereto and in axial alignment therewith, and a heater filament in said cathode said filament having its ends projecting into the outwardly projecting eyelets, said outwardly projecting eyelets being in pressed engagement with said filament ends.

6. A cathode assembly for a magnetron having lead-in wires and a cathode mounted therebetween, shields opposite the ends of said cathode secured to said lead-in wires, insulators interposed between said cathodes and shields, an eyelet projecting through each said shield and into the insulator, and each said eyelet having an outwardly projecting eyelet attached thereto and in axial alignment therewith, and a heater filament in said cathode said filament having its ends projecting into the outwardly projecting eyelets, said filament end being welded to said eyelet.

7. A cathode assembly comprising a hollow cathode, an insulator in the end of said cathode, a shield overlying the end of said insulator, said cathode, insulator and shield being symmetrical on a common axis, and said insulator and shield having registering central holes therein, an eyelet having a flange and shank and said flange overlying the margin of the hole in the said shield and said shank being within the hole of both the shield and insulator, another and outwardly projecting eyelet aligned with the inwardly projecting eyelet, said eyelets being secured together endwise, and a heater filament projecting into the outwardly projecting eyelet, said outwardly projecting eyelet being in squeezed together gripping engagement with said filament.

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