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E. W. B. GILL ET AL

VACUUM TUBE SHIELD

Filed Oct. 31, 1925

Fig. 1

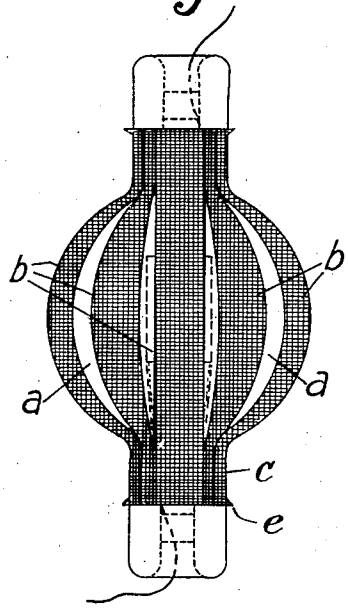
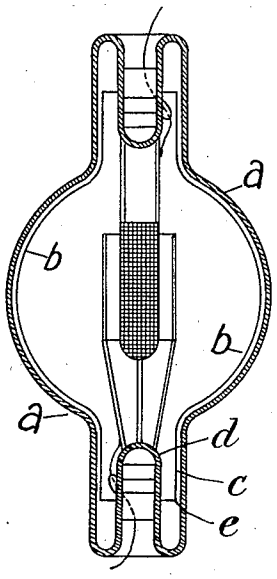


Fig. 2



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ERNEST WALTER BRUDENELL GILL, OF MERTON COLLEGE, OXFORD, AND ERNEST GREEN, OF HENDON, LONDON, ENGLAND.

VACUUM-TUBE SHIELD.

Application filed October 31, 1925. Serial No. 65,933.

To all whom it may concern:

Be it known that we, ERNEST WALTER BRUDENELL GILL, a subject of the King of Great Britain, residing at Merton College, Oxford, England, and ERNEST GREEN, a subject of the King of Great Britain, residing at 24 Church Road, Hendon, London, England, have invented new and useful Improvements in Vacuum-Tube Shields (for which we have filed an application in Great Britain April 9, 1924), of which the following is a specification.

Our invention relates to vacuum tubes and particularly to tubes adapted to generation of large powers of high frequency energy.

An object of our invention is to provide in a vacuum tube device a shield adapted to control the distribution of electric fields therein.

Another object of our invention is to provide a vacuum tube device having a shield for enhancing the durability of the seals therein.

Another object of our invention is to provide in a vacuum tube device a shield adapted to control the electron charge distribution.

In the prior art of the manufacture and operation of vacuum tubes it has been found that the electric field stresses in the device tend to concentrate themselves at the seals through which the conductor members are passed. The concentration of the fields results in high stresses which tend to overheat the glass at the seal and to produce electrolysis in the heated glass resulting in an early failure of the tube.

In the copending application of Ernest Green, Serial No. 622,415, filed March 2, 1923 and assigned to the Radio Corporation of America there is described the addition to a thermionic generating valve of a conducting ring or strip so disposed as to modify the distribution of the electric field produced between the anode, grid and filament, with the object of reducing any conduction currents which may be produced in the film deposited on the interior of the glass.

It has now been found that improved results are obtained by providing a conducting shield over practically the whole of either the outside or the inside of the glass.

According to this invention, which is an improvement in or modification of the invention claimed in the previously mentioned specification, a valve is provided with a conducting shield which covers practically the whole of either the exterior or the interior surface of the glass. By this means the newly invented shield prevents conduction in a film on the glass surface and also serves to control the distribution of the electrostatic stresses at the seal by removing the point of maximum field intensity to a distance from the seal.

Other objects and structural details of our invention will be apparent from the following description when read in connection with the accompanying drawings, wherein:

Fig. 1 is a view in elevation of an embodiment of our invention and

Fig. 2 is a section of an alternative embodiment of our invention.

Referring to Figure 1, *a* is a thermionic valve of the type described in the previously mentioned specification but provided with an outer conducting shield *b* formed of strips of copper; it is desirable in practically all cases that any film deposited on the inside of the glass should not extend to the upper portion of the neck of the valve.

The shield *b* may or may not be in contact with the glass. Also it is not ordinarily necessary to make connection between the shield and any interior deposited film.

When the grid lead is brought out through a side neck the shield should cover this in part also.

The shield has the effect of short circuiting the deposit, which is of very high resistance, and so of eliminating the losses, due to induced currents in the deposit.

The point of maximum stress in an electric field is at a sharp edge, and the point of next highest stress is that at which a conductor emerges from a substance having a given dielectric constant to one having a different dielectric constant. If these two points coincide a very high electric field stress may be produced. The shield of our invention provides a separate edge which is positioned a substantial distance away from the seal and thereby separates the two points of maximum stress. By so doing it much reduces the intensity, and thereby the destructive effect of the electric field upon the seal.

In some cases the shield may be kept at

a potential negative to the filament, which will prevent any bombardment of the glass by electrons.

Referring to Figure 2, *a* is a similar valve and *b* a shield similar to the shield shown in Figure 1 but arranged inside the valve. It may be a metallic coating deposited on the inner surface of the bulb.

This is shown in the drawing where a portion *c* of the shield is extended toward the extreme end of the device and surrounding the seal member *d*. The edge *e* of the extended portion *c* of the shield is brought to a point beyond the seal from the electrodes as indicated and it serves thereby to concentrate the maximum point of the electrostatic field at its edge *e*, thereby removing the strong field stresses from the seal *d*. This is best shown in Figure 2 where the shield is indicated as inside of the tube but it applies equally to the modification shown in Figure 1.

By this means we are enabled to reduce markedly the conduction currents in a poorly conducting film on the interior of a vacuum tube and simultaneously therewith to control the distribution of the electrostatic field within the tube in such way as to reduce the stresses imposed upon the seal member thereby reducing energy losses within the tube and greatly increasing its durability.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. A shield for a vacuum tube having a press and electrodes comprising a metallic member adapted to be placed contiguous to the surface of said tube and surrounding said electrodes and press but out of contact with said press.

2. In a vacuum tube having a press, electrodes, and a film on the interior of the tube, a shield, adapted to reduce the magnitude of conduction current in said film, comprising a metallic body contiguous to said film but out of contact with said press.

3. A shield for a vacuum tube having a press and electrodes, comprising a metallic member adapted to be placed contiguous to the surface of said tube, a portion thereof being adapted to surround said electrodes, another integral portion being adapted to surround said press, the edge thereof being extended beyond said press from said electrodes.

4. A shield for a vacuum tube having a press, electrodes, and a film on the inner surface thereof, comprising a metallic member contiguous thereto, a portion thereof cooperating with said film to reduce conduction currents therein and another portion cooperating with said press, extending therebeyond from said electrodes, but out of contact therewith.

5. A shield for a vacuum tube having a press, electrodes, and a conducting substance in contact with the tube surface, comprising a metallic body contiguous thereto, surrounding said electrodes and interposed between said electrodes and said tube surface.

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