

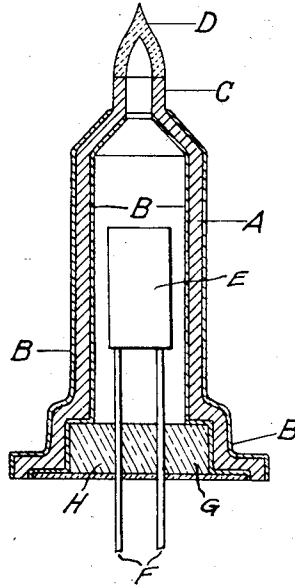
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ELECTRON TUBE

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ELECTRON TUBE

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Discharge vessels are known whose wall is made of a ferromagnetic material. Materials of this kind have the advantage that they are easy to unite with glass and have a relatively small heat conductivity so that the sealing spot at which glass is sealed to the ferromagnetic material is not so highly heated as the middle of the discharge vessel. This use of ferromagnetic materials, however, also involves a drawback in case the discharge vessel is operated at high frequencies. In fact, great hysteresis losses due to reversals of the magnetic field can arise in this case, whereby the output of the discharge vessel will be reduced to a considerable extent. Such problems arise particularly in the case of discharge vessels of the external-anode type.

These losses may be avoided by means of the invention described hereafter.

The accompanying drawing is a sectional view showing a vacuum vessel for electron tubes which is intended also to constitute the anode thereof in well known manner.

According to the invention the ferromagnetic material A of which the discharge device is made is coated inside and outside with a non-ferromagnetic material B except for a tubular end portion C to which a glass head D is sealed. The coating B preferably consists of copper, silver, chromium or rhodium. The coating within the vessel must have a vapor pressure small enough not to affect the vacuum to an appreciable degree under operating temperature conditions. Any of the well known methods may be employed for producing the coating B. For instance, this may be produced by electrolysis or by plating.

In the case of tube not dealing with high temperatures it has been found desirable to employ a coating of copper. For higher temperatures a coating of chromium or preferably of rhodium will be suitable.

The precaution of arranging such coating on all sides has for its object to prevent the electromagnetic field from entering the ferromagnetic material. The layer affixed to this material must hence be of a thickness greater than the penetration depth of the electromagnetic field. The penetration depth depends on frequency. Since, however, in the case of low frequencies the arising losses are of little consequence these considerations are only concerned with relatively high frequencies, such as 10^8 cycles per second. In this regard the penetration depth is in the order of magnitude of 2 millimeters or less. Penetration depth less than 0.1 millimeter need

not be considered here. The coating should hence be 0.1 to 2 millimeters in thickness.

The coating itself need not be vacuum-tight and may therefore be a coarse-grained electrolytic precipitate.

It is important that the ferromagnetic body should be provided on all sides with a well conducting coating of non-ferromagnetic material. Within the discharge vessel there is the field between the body so coated, which may be the anode, and the other electrodes, while outside a field between this anode and adjacent grounded parts is effective.

As stated before, the tubular end portion C of the vessel is not coated with material B. By suitable constructional arrangement it will be possible to withhold field lines from the uncoated part of the vessel.

The metallic coating may be affixed either before arranging the head D or may be affixed thereafter. The latter method will be suitable if the coating is liable to be affected by the sealing process.

What is claimed is:

1. An external-anode type discharge device having a wall portion made at least in part of a material having ferromagnetic properties, said wall portion being provided inside and outside with a coating of electrically good conducting non-ferromagnetic material, said coating extending over substantially all the surface of said ferromagnetic material.
2. A discharge device according to claim 1, wherein the said coating is 0.1 to 2 millimeters in thickness.
3. A discharge device according to claim 1, in which one end of said wall portion is uncoated, and further comprising a glass head sealed to this uncoated end.
4. The method of manufacturing the bulb portion of an electron discharge device, which method includes the steps of forming a generally cylindrical envelope of a material having ferromagnetic properties, sealing a glass head to one end of said envelope, and then applying a coating of non-ferromagnetic material having good electric conductivity to substantially all of the inner surface of said envelope.
5. The method of claim 4, in which said coating of good conductive material is applied to all the inner surface of said envelope except in the immediate vicinity of said glass head seal.
6. The method of claim 4, which includes the additional step of applying a coating of said non-ferromagnetic material having good electric

conductivity to substantially all of the outer surface of said envelope.

7. An electron discharge device including a generally cylindrical wall portion of ferromagnetic material having high electric conductivity on substantially all the inner surface of said wall portion, a glass head sealed to one end of said wall portion, and an electrode-supporting member of insulating material sealed to the other end of said wall portion.

8. An electron discharge device according to claim 7, further comprising a coating of non-

ferromagnetic material having high electric conductivity on substantially all the outer surface of said wall portion.

9. An electron discharge device according to claim 7, further comprising a coating of non-ferromagnetic material having high electrical conductivity on substantially all the outer surface of said wall portion, in which said coating of said non-ferromagnetic material extends over all of the surface of said ferromagnetic material except to the immediate vicinity of said glass head.

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