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F. H. R. ALMER ET AL
ELECTRIC DISCHARGE TUBE HAVING HEAT FLOW
CATHODE CENTERING MEMBER
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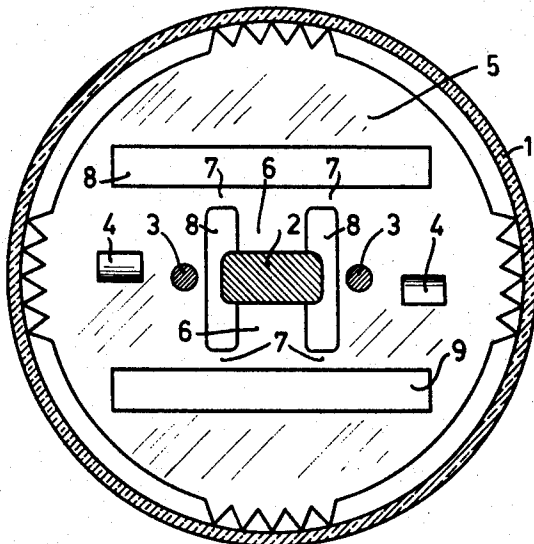


FIG. 1

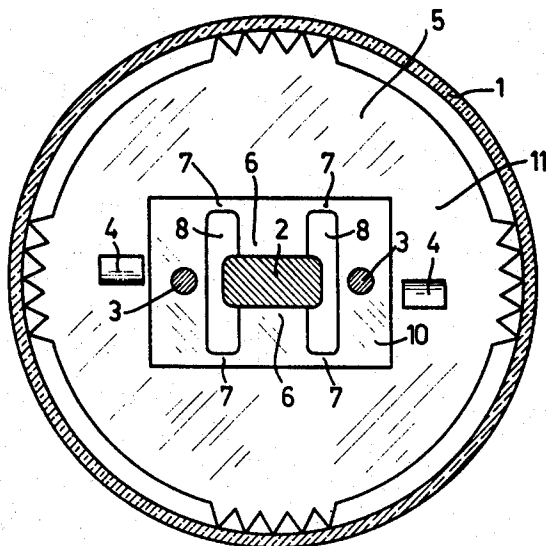


FIG. 2

INVENTOR

FRIEDRICH H. R. ALMER
JAN FENNEMA
ADRIANUS KUIPER
HENDRIK SANTING
JAN A. VAN VELDHUIZEN

BY

Frank R. Seifert
AGENT

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ELECTRIC DISCHARGE TUBE HAVING HEAT FLOW CATHODE CENTERING MEMBER

Friedrich Hermann Raymund Almer, Jan Fennema, Adrianus Kuiper, Hendrik Santing, and Jan Anton van Veldhuizen, all of Eindhoven, Netherlands, assignors to North American Philips Company, Inc., New York, N.Y., a corporation of Delaware

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2 Claims. (Cl. 313-47)

This invention relates to electric discharge tubes having thermionic cathodes which are centered and supported in the tube by means of at least one preferably plate-shaped insulating member.

It is common knowledge that comparatively large temperature differences can occur between the ends and the center of thermionic cathodes and that furthermore the temperature of the cathodes of a number of tubes of one and the same type can be widely different.

Many attempts have been made to reduce the above-mentioned disadvantage by decreasing the heat dissipation of the ends of the cathode by taking steps for reducing the transfer of heat from the cathode to the insulating members as far as possible. However, it has been found that these steps mitigate the first-mentioned disadvantage, but that the difference in the cathode temperatures of a number of tubes of one and the same type could be reduced only in a comparatively small degree.

It has now been found that especially the second disadvantage can be considerably reduced if, in accordance with the invention, steps are taken in such tubes to ensure that the heat transfer of the cathode to the part of the insulator which is in contact with the cathode exceeds the heat dissipation from this part of the insulator to the remaining part. The part of the preferably plate-shaped insulator which engages the cathode is connected to the remaining part of the insulator by parts which poorly conduct heat, so that the heat dissipation through these members is reduced to a minimum. In any case, the temperature gradient along these connecting parts must exceed the temperature gradient between the part of the cathode engaging the insulator and this adjacent part of the insulator. As a result, the temperature difference between this latter part of the insulator and the cathode becomes comparatively slight.

The present invention is based on the recognition that the large differences in heat dissipation are due to the fact that there is a highly variable thermal contact between the cathode and the insulator engaging it so that large variations in the heat dissipation are produced. By the step in accordance with the present invention, the temperature of the part of the insulator engaging the cathode becomes comparatively high so that there is only a comparatively slight difference between the cathode temperature and the insulator temperature at the points of contact. Differences in the heat transfer at these points consequently have a relatively smaller influence upon the heat dissipation of the cathode.

The heat dissipation of the hot parts of the insulator to the remaining part of this insulator can be accurately determined and hence kept constant for the various specimens owing to the fact that this transfer is effected through stationary parts of the insulator. These stationary parts may comprise connecting strips produced by aperturing a plate-shaped insulator. It is desirable for the heat dissipation through these strips to be reduced to a minimum, however, in any case, this heat dissipation always is substantially equal for equal insulating members. Furthermore it is desirable for the cathode to be in highly heat-conducting connection with the insulator so that at this

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point the abrupt thermal variation is small and hence variations in this connection exert a lesser influence upon the cathode temperature.

It has been found that the value of the temperature differences in the various tubes of one and the same type can be reduced by half or even by two-thirds by the use of the invention.

The invention will now be described more fully with reference to a drawing, in which

FIG. 1 is a plan view of an electrode system of a tube in accordance with the invention, and

FIG. 2 shows an alternative embodiment.

In FIG. 1, reference numeral 1 denotes a tube envelope and 2 a cathode; grid stay rods are designated 3 and bent-over lugs securing the anode to a mica member 5 are designated 4. Parts 6 of the mica centering member 5 are in good thermal contact with the cathode, but are connected to the remaining part of the plate 5 by narrow strips 7 only. Since the heat dissipation through the parts 7 can be much smaller than that from the cathode to the parts 6, the parts 6 will assume a high temperature and differences in heat dissipation from the cathode 2 to the parts 6 will have a smaller influence on the total heat dissipation, since this is determined by the parts 7 and can be accurately equal for all the mica members. The thermal contact between the cathode and the mica member, however, can fluctuate widely since the cathode must not be gripped in the aperture of the mica plate too firmly. Small variations of the sizes of the cathode cross-section and of the mica aperture can give rise to large differences in the thermal contact.

Due to the very slight heat dissipation through these parts 7, the temperature drop across the cathode from the center to the ends is also decreased while the mean cathode temperature is increased.

In FIG. 2, use is made of a separate mica plate 10 which serves in particular for centering the cathode 2 and the grid stay rod 3. Here again the parts 6 of the mica plate can assume a high temperature. The grid is centered with respect to the anode 4 and the tube wall 1 by means of a mica member 5 which, however, does not engage the cathode.

It will be appreciated that the invention can be carried into effect in alternative manners also. However, a heat accumulation must always be possible in the part of the mica member engaging the cathode so that always the heat transfer from the cathode to the mica must be better than the heat dissipation from this part of the mica member to the remaining parts of this member.

What is claimed is:

1. An electric discharge tube comprising at least one electrode including a thermionic cathode, an electrode centering member of insulating material having a first portion engaging the cathode and a second portion in contact with a cooler portion of the tube, said centering member having a portion intermediate the first and second portions thereof which has a smaller sectional area than that of the first and second portions whereby the transfer of heat from the first portion to the second portion is retarded and the temperature difference between said first portion and the cathode is minimized.

2. An electric discharge tube as claimed in claim 1, in which the centering member is a mica plate of which the first portion engaging the cathode is connected to the remainder of the mica plate by narrow strips only.

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