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VACUUM TUBE STRUCTURE

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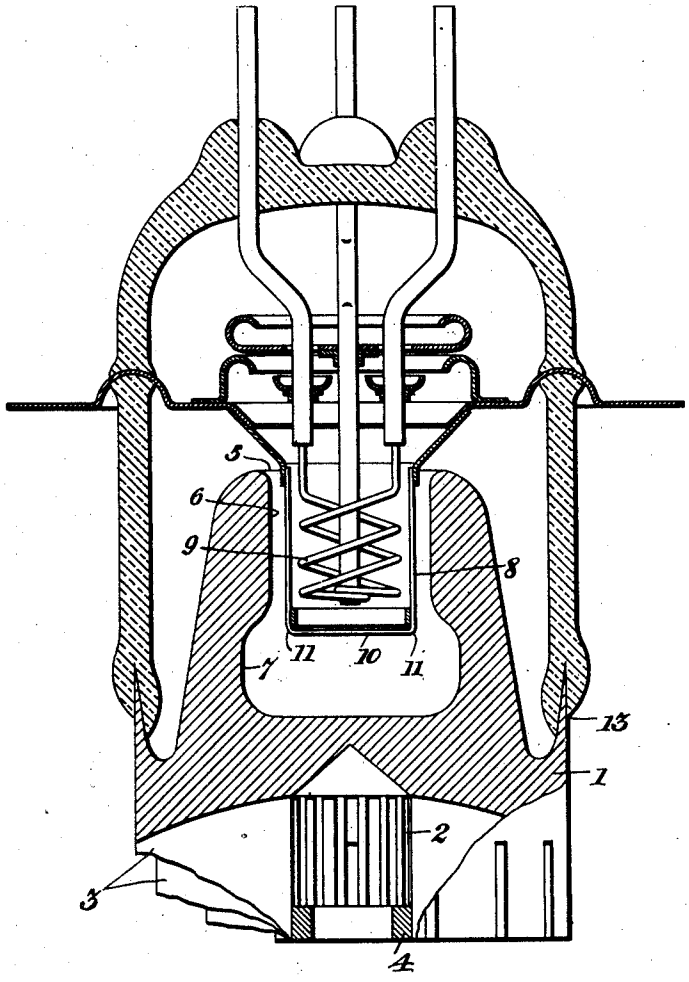

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VACUUM TUBE STRUCTURE

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3 Claims. (Cl. 250—27.5)

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This invention relates to vacuum tube structures and more particularly to power tubes used in high-frequency installations.

I have discovered that when power tubes are reduced in respect to their interelectrode spacing, the influence of the parasite capacities of the inactive parts of the anode and grid become of increasingly greater importance. This is particularly true of the cylindrical recess type of anode into which the grid and filament extend. For instance, the capacity between the inner end and corner portions of the grid which extend beyond the filament, and the inner end portions of the anode recess becomes very large compared to the capacity between active portions of the grid and the anode. The influence of the electrostatic capacity of these inactive parts of the grid and the anode is not only increased when the interelectrode dimensions are reduced in size but also increase when higher frequencies are used on the tube. The reactance of the inactive zones vary inversely as the frequency and, therefore, for higher frequencies, the electrostatic capacities of these inactive portions become increasingly important parts of the whole capacity between the grid and anode.

One of the objects of the invention, therefore, is to produce a low-capacity grid-anode construction for vacuum tubes.

Another object of the invention is to so construct the anode for vacuum tubes as to reduce the parasite capacities between the inactive portions of the grid and anode.

Still another object of the invention is to so construct the anode of a vacuum tube structure as to reduce the capacitance effect between the inner end portions of the grid and the inner end portions of the anode recess into which the grid extends without reducing the heat-conducting and radiating capacity of the anode.

I accomplish the above and other objects of the invention by making the inner end portion of the recess larger than the adjacent active portion of the recess into which the grid and filament extend so that the distance between the inactive portions of the grid and the anode is substantially greater than the distance between the active portions thereof. This new relationship of the inactive parts reduces greatly the parasite capacities between the grid and anode resulting in an appreciable decrease in the whole capacity between the grid and anode as compared with existing structures. The larger inner portion of the recess is made without reducing the heat-radiating capacity of the anode. This is accomplished by

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making large the portion of the anode containing the large inner end portion of the recess. More specifically, the outer surface of the anode is tapered gradually from adjacent the outer surface of the heat radiating base portion thereof toward the recessed end so that the large inner end portion of the recess is disposed in the larger half of the tapered portion. Thus, an ample amount of wall thickness is provided alongside the large inner end of the recess for heat conduction to the heat radiating base.

For a better understanding of the invention, reference may be had to the accompanying drawing in which the sole figure is a vertical sectional view of the tube structure embodying the invention.

Referring to the drawing, the anode 1 comprises a base structure having an axially extending opening 2 in the bottom thereof surrounded by a plurality of radially extending heat radiating fins 3. The opening 2 is provided with a ring 4 into which the connection of any suitable gas or liquid circulating device may be inserted. The upper end of the anode is provided with an axially extending recess 5, the upper portion 6 of which is cylindrical and the lower or inner portion 7 of which, while also cylindrical is of considerably greater diameter than the diameter of the cylindrical portion 6. The grid 8, the parts of which are arranged in a generally cylindrical order, extends into the recess 5 with the active portion thereof disposed concentrically with respect to the cylindrical portion 6.

Since the active portions of the grid and anode surfaces are determined by the location of the filament 9 which, as shown in the drawing, is disposed within the grid 8, the end portion 10 and also the inner corner portions 11 of the grid element are for practical purposes inactive. These portions in existing tube constructions, however, provide electrostatic capacitance between the grid and the anode and this parasite capacitance is found to be of very great importance to the whole capacitance of the grid and anode. The larger portion 7 of the recess 5 increases considerably the distance between these inactive portions of the grid and anode as compared with the distance between the active portions thereof thereby greatly minimizing the parasite capacitance occurring between the end and corner portions of the grid and the adjacent portions of the anode. This improved structural relationship of the inactive and active portions of the grid and anode results in a low-capacity grid-anode vacuum tube structure which is espe-

cially desirable in power circuits using high frequencies.

The large inner portion 7 of the recess does not interfere with the heat radiating capacity of the anode structure because the anode is correspondingly increased in cross-sectional area along the zone of the larger portion of the recess. This is effected by tapering gradually the anode from closely adjacent the glass connecting edge 13 of the base toward the upper recessed end thereof. This outer shape of the anode provides an ample amount of heat-conducting wall thickness about the portion 7 of the recess to maintain the active surfaces of the anode at a satisfactory temperature.

From the foregoing, it will be readily apparent that I have improved the anode construction of power tubes and have reduced greatly the parasite capacity of the inactive portions of the grid and anode thereby making possible a small-sized, low-capacity tube that can be used in high-frequency installations.

While I have shown but one embodiment of the invention, it is recognized that many variations and applications of the anode-grid relationship are possible without departing from the invention. It will be understood, therefore, that the embodiment shown and described is intended to be illustrative of the invention only and not as restricting the appended claims.

What I claim is:

1. A vacuum tube having a recessed anode into which the filament and grid extend and a heat-radiating base, the portion of the recess in said anode extending beyond the active portion of the grid being of larger dimensions than the portion of the recess adjacent which the active portion of the grid is disposed, and the outer surface of the anode being tapered from adjacent the outer surface of the base portion thereof toward the recessed end, the cross-sectional area of the anode in the zone of the larger portion of the recess being adequate to provide satisfactory conduction of heat to the heat radiating base portion thereof.

2. An anode construction for vacuum tubes comprising a portion adapted to be disposed within the tube, the end of said portion having a recess therein, the outer portion of the recess comprising the active surfaces adjacent which a grid element of substantially uniform lateral dimensions is adapted to be disposed, and the inner portion of the recess having lateral dimensions larger than said outer portion thereby disposing the surfaces of said inner portion at a greater distance from the inactive end portion of the grid than the active surfaces of said outer portion are from the active portion of the grid.

3. An anode construction as described in claim 2 wherein the anode has a heat radiating base adapted to be disposed outwardly of the tube, the portion of the anode adapted to be disposed within the tube being tapered from adjacent the outer surface of the base portion to the recessed end thereof, and the large inner portion of the recess being located in the tapered portion adjacent the base.

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