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B. C. GARDNER

2,473,793

GRID STRUCTURE

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FIG. 1.

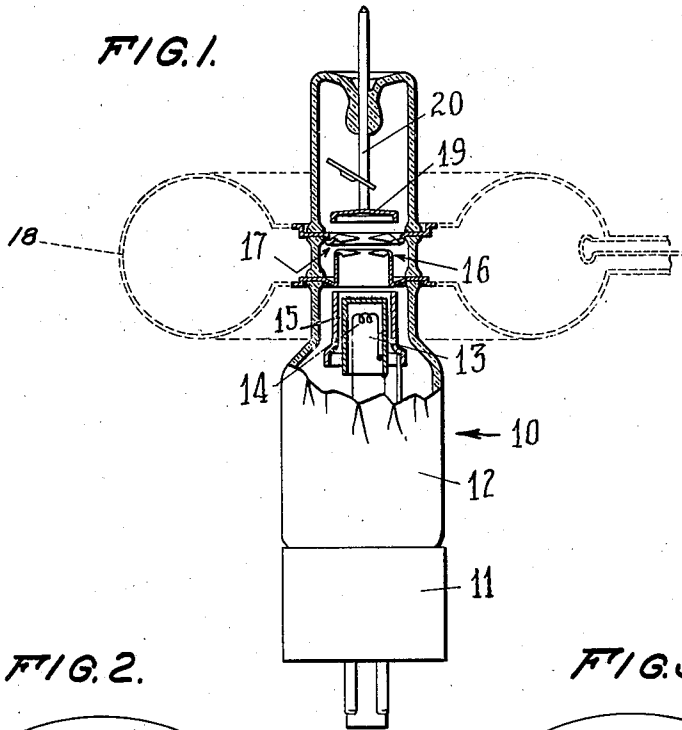


FIG. 2.

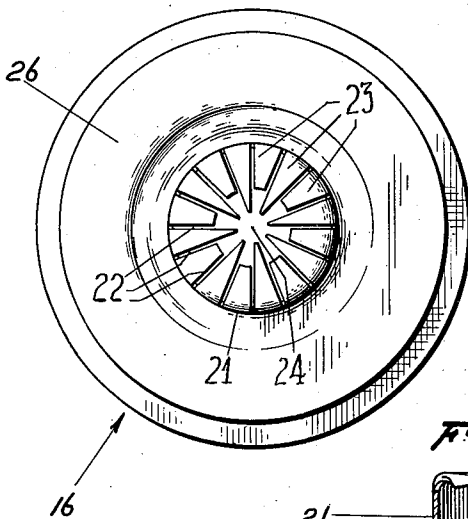


FIG. 3.

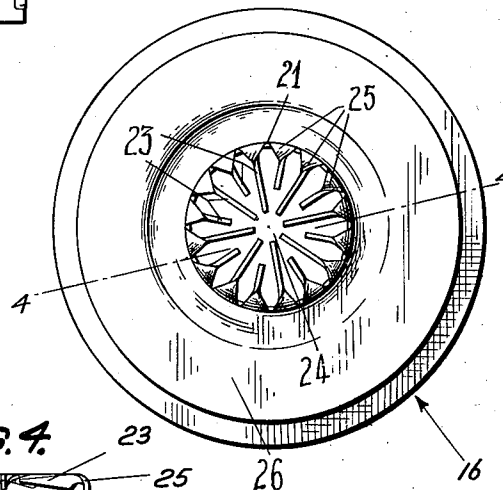
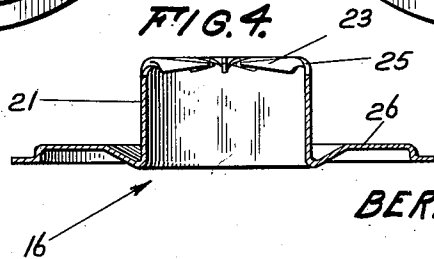


FIG. 4.



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GRID STRUCTURE

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2 Claims. (Cl. 250—27.5)

1

This invention relates to grid structures for electron-discharge devices, and while not limited thereto, it is especially suitable for use in electron-discharge devices of the type in which an electron beam is adapted to be velocity modulated.

During the operation of devices of the general character indicated, the grid structures thereof become quite hot. The resulting distortion of the shape of such grid structures alters the inter-electrode spacing of the device, and this, in turn, causes undesirable frequency drift. Grid structures heretofore made rigid in an effort to avoid this difficulty include a multiplicity of parts which require careful and, therefore, costly assembling.

Hence, it is among the objects of the present invention to provide a grid structure, suitable for use as aforesaid, which is of integral and, therefore, simple construction, which is easy and economical to fabricate, and which is more efficient in the performance of its intended function than the prior art structures.

These, and other objects of the present invention, which will become more apparent as the detailed description thereof progresses, are attained, briefly, in the following manner:

An annular member, for example, a tubular or cylindrical member, is closed at one end thereof, said closed end being provided with a plurality of radial slots dividing said closed end into a plurality of wedge-shaped fingers. These fingers are twisted at the bases thereof until they lie in planes parallel to the axis of the annular member. Alternate fingers are shortened so as to reduce the ratio of metal-to-space, when viewing the annular member endwise, and thus prevent too much interference with the electron beam intended to be acted upon. At the opposite end of the annular member, an outwardly-directed flange is provided by means of which the structure can be connected to an external circuit.

A structure such as that just described is rigid, and is made in one piece, thereby eliminating the disadvantages associated with the prior art.

In the accompanying specification there shall be described, and in the annexed drawings shown, an illustrative embodiment of the grid structures of the present invention. It is however, to be clearly understood that the present invention is not to be limited to the details herein shown and described for purposes of illustration only, inasmuch as changes therein may be made without the exercise of invention, and within the true

2

spirit and scope of the claims hereto appended.

In said drawings,

Fig. 1 is a longitudinal sectional view taken substantially through the center of a velocity-modulated electron-discharge device of the type known as a reflex Klystron, said device incorporating grid structures made in accordance with the principles of the present invention;

Fig. 2 is an end view of an annular member utilized in making the grid structures of the present invention, said member being shown at an intermediate stage in the manufacture thereof;

Fig. 3 is a similar view of the same member after completion; and

Fig. 4 is a transverse sectional view taken on line 4—4 of Fig. 3.

Referring now more in detail to the aforesaid illustrative embodiment of the present invention, with particular reference to the drawing illustrating the same, the numeral 10 generally designates a velocity-modulated electron-discharge device, commonly known as a Klystron, more especially, a reflex Klystron. It is to be understood that the present invention is not limited to this type of device.

Said device 10 includes a base 11 supporting an evacuated glass envelope 12. The envelope 12 may be provided with a re-entrant press (not shown) supporting a highly electron-emissive cathode 13 adapted to be heated to a temperature suitable to bring about copious emission by a filament 14. Said cathode 13 may be surrounded by an accelerating electrode 15.

A pair of appropriately spaced grid structures 16 and 17 is supported in advance of the cathode 13, for example, as by being sealed through the walls of the envelope 12, said grid structures, which will later be described in detail, being adapted to be connected, for example, to points of opposite potential on a cavity resonator 18, herein shown, in dotted lines, in the form of a toroid.

A repeller electrode 19 is supported beyond the grid structures 16 and 17 from a lead-in conductor 20 entering the envelope 12 through the end thereof opposite the base 11.

The grid structure 16 comprises a tubular member 21, made of highly conductive material, such as copper, one end of which is initially closed. As best seen in Fig. 2 of the drawing, said closed end is provided with a plurality of radial slots 22 to divide the same into a plurality of substantially wedge-shaped fingers 23. The central portions of the fingers 23 are punched out to provide the structure with a central opening 24, and alter-

nate fingers are further cut away to reduce the metal-to-space ratio in the central region of the structure and thereby prevent undue interference with the electron beam intended to be acted upon. As best seen in Figs. 3 and 4 of the drawing, the fingers 23 are twisted at the bases thereof, as at 25, until they lie in planes parallel to the axis of the tubular member 21.

The opposite open end of the tubular member 21 is provided with an outwardly-directed flange 26 by means of which the structure may be sealed through the tube envelope 12 and connected, as previously indicated, to, for example, the cavity resonator 18.

The grid structure 17 is substantially similar to the grid structure 16, except that the tubular body portion thereof may, if found desirable, be of shorter length.

This completes the description of the aforesaid illustrative embodiment of the grid structures of the present invention. It will be noted that said grid structures are of integral construction, are rigid, are easy and inexpensive to make, and enable the maintenance of constant interelectrode spacing, which, particularly in electron-discharge devices of the type to which reference has herein been made, is necessary to eliminate frequency drift.

Other objects and advantages of the present invention will readily occur to those skilled in the art to which the same relates.

What is claimed is:

1. A grid structure for an electron-discharge device comprising: a tubular member having integrally formed, at one end thereof, a plurality of inwardly-directed, radially-disposed fingers, and at the other end thereof, an annular flange for connecting the same to an external circuit.

2. A grid structure for an electron-discharge device comprising: a tubular member having integrally formed, at one end thereof, a plurality of inwardly-directed, radially-disposed, wedge-shaped fingers, and at the other end thereof, an annular flange for connecting the same to an external circuit; said fingers lying in planes parallel to the axis of said tubular member.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,549,253	Houskeeper	Aug. 11, 1925
1,612,835	Schottky	Jan. 4, 1927
2,261,154	Hansen et al.	Nov. 4, 1941
2,394,396	Mouromtseff et al.	Feb. 5, 1946
2,400,743	Clifford	May 21, 1946
2,414,785	Harrison et al.	Jan. 21, 1947