Dec. 24, 1946. R. B. HOFFMAN 2,412,987

VACUUM TUBE CONNECTION

Filed April 4, 1942

Fig. 1.

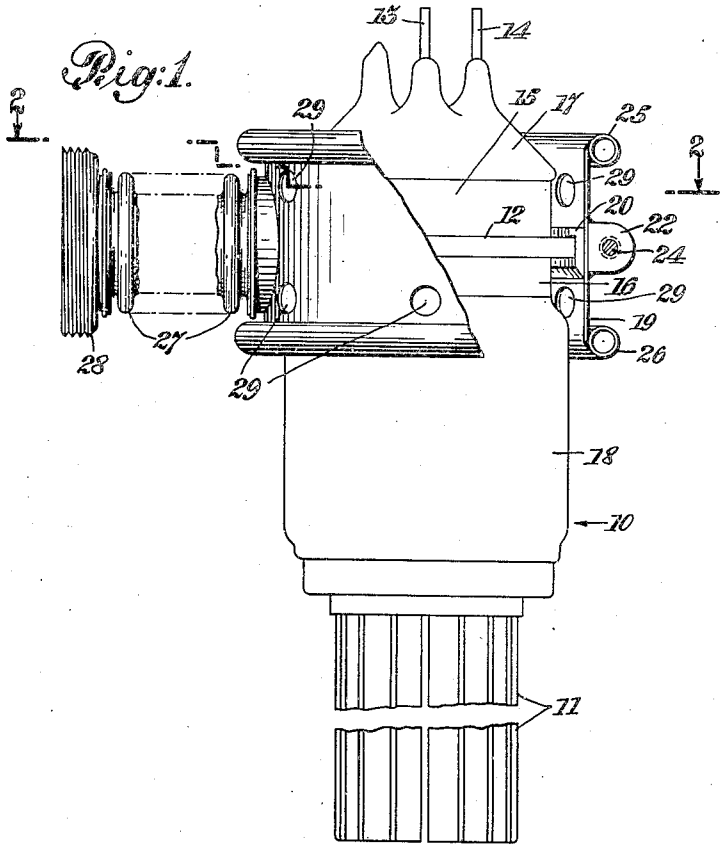
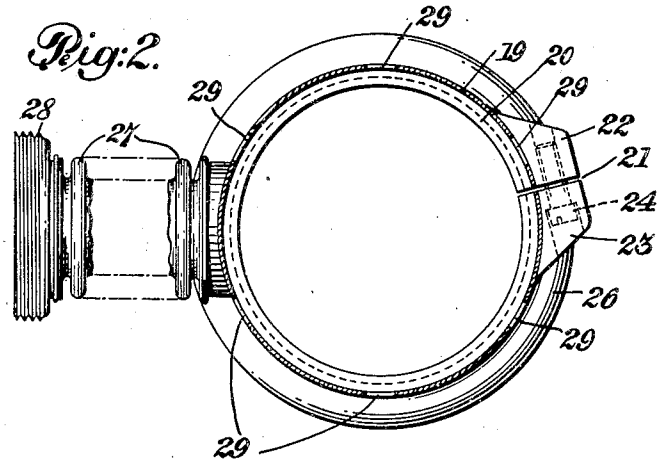


Fig. 2.



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VACUUM TUBE CONNECTION

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10 Claims. (Cl. 250—27.5)

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This invention relates to improvements in vacuum tube arrangements, and more particularly to improved ways of mounting and making connection to such devices for operation at ultra-high frequencies.

It is an object of the invention to provide an improved means for making connection to vacuum tubes for operation at ultra-high frequencies.

Another object is to provide an improved low inductance asymmetrical connection to an annular electrode terminal in such devices.

A more specific object is to provide an asymmetric connection of the above nature that will have good heat radiating properties, be relatively easy to connect, and at the same time relieve voltage stress conditions that would otherwise appear on the envelope of the tube.

Other objects and various further features of novelty and invention will hereinafter be pointed out or will become apparent to those skilled in the art from a reading of the following specification in connection with the drawing included herewith. In said drawing—

Fig. 1 is a partly sectionalized elevation of a connecting means in accordance with the invention shown mounted on a suitable electron discharge device, and

Fig. 2 is a section of the connecting means shown in Fig. 1 taken substantially in the plane 2—2.

It is known that in electron discharge tube construction for operation at ultra-high frequencies, it is of the utmost importance to reduce the length of lead-in connections to a minimum. Many of these devices are accordingly, so designed as to fit directly into co-axial line structures which may be used as resonating means for maintaining the tube in oscillation, or for other purposes. Devices of this nature have been shown for example in the copending applications for patent of G. Chevigny and E. Labin, Serial No. 427,728 filed January 22, 1942; G. Chevigny and E. Labin, Serial No. 431,134 filed February 14, 1942; and G. Chevigny, Serial No. 434,914 filed March 16, 1942. These devices are generally of the external anode type whereby the anode may be better cooled to increase operating efficiency. Connection to the grid electrode as well as support thereof is by means of an annular terminal member passing through the envelope, whereby a concentric transmission line connection may be made directly thereto when desired.

However, in certain applications of these devices, it is desirable that asymmetric connection

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be made to an electrode terminal of this latter type. It is clear that such connection could be effected merely by a solid or stranded wire connector soldered or otherwise tied to a portion of the periphery of the annular grid terminal. In accordance with my invention however such a connection is arranged to make contact with substantially the whole periphery of the annular terminal in spite of the fact that the connection is to extend to a single point at one side of the tube. A highly efficient connection of the asymmetric type forms a feature of this invention and will be particularly described with reference to the drawing.

Fig. 1 shows in outline form an electron discharge device 10 of the above-indicated nature. Device 10 includes an anode of the re-entrant type having a substantial portion 11 thereof extending externally of the device for cooling purposes. The anode is of generally cup shaped form, and disposed concentrically therein are the grid and cathode electrodes. The grid electrode is physically supported by an annular terminal 12 which extends outside the envelope of the tube. Filament connections 13, 14 are provided at the end of the tube remote from the anode. When the discharge device is used in conjunction with a section of cylindrical transmission line co-axial therewith, a clamping or other connection is made to terminal 12. In the form shown, terminal 12 is formed with two axially extending annular flanges 15, 16 tapering down for purposes of effecting a sealing relation with insulating portions 17, 18 of device 10.

In accordance with the invention, an adapter for making connection to terminal 12 comprises a generally cylindrical member 19 having a seating portion 20 formed on the inner surface thereof for seating member 19 in co-axially spaced relation with respect to the envelope of device 10. As shown more clearly in Fig. 2, member 19 is longitudinally split as at 21. At this cleavage point lugs 22, 23 are provided so that a clamping, and hence secure, fit of the adapter to terminal 12 may be made, as by tightening a bolt 24. Member 19 is preferably more extensive in its axial dimension than are flanges 15, 16, and terminal 12 combined, and at its edges a pair of so-called corona shields 25, 26 are provided. Shields 25 and 26 are of such radial dimension that the inner surface of member 19 is tangential to them.

Asymmetric connection to tubular member 19 is made by fixing a Sylphon bellows 27 of good conducting material to a portion of the outer

surface thereof. An adapter 28 at the free end of bellows 27 permits ready connection thereof to a tubular-type transmission line forming a further portion of the circuit for tube 10.

For purposes of better cooling of terminal 12 and flanges 15, 16, and particularly to improve cooling of the glass portions of the tube which are adjacent the grid terminal and are surrounded by tubular member 19, the latter is provided with a number of apertures 29 in its surface so that either convection currents of air may circulate more freely or forced ventilation will be aided, as will be clear.

It will be seen that the device described permits a highly efficient asymmetric connection to be made to a terminal of the above-mentioned type. Bellows 27 permits the utmost in flexibility by permitting fast and ready connection of an electron discharge tube in its circuit with little danger of jarring its metal-to-glass seals and electrode elements. At the same time no substantial inductance is introduced by this connection as compared, for example, to a solid or stranded wire or braid or other conventional type of connecting lead. The fact that the corona shield 26 extends further toward anode 11 than does the sealing edge of flange 16, serves to relieve voltage stresses at this edge of flange 16 and, furthermore, assures that maximum voltage stresses will not occur at sharp edges. This disposition of shield 26 has the further desirable effect of reducing danger of surface conductivity along insulating portion 18 by virtue of its spaced relation with respect thereto. The substantial axial dimension of member 19 provides a large heat radiating surface and thus forms together with apertures 29 a highly efficient cooling arrangement for the grid electrode.

While the invention has been described in detail in particular connection with the preferred forms illustrated, it is to be understood that many modifications, additions, and omissions may be made within its scope as defined by the appended claims.

What is claimed is:

1. A device for use at ultra-high frequencies for making connection to an annular electrode terminal on an electron discharge tube, comprising a generally cylindrical member frictionally engageable with the periphery of said terminal, and axially flexible tubular means galvanically engaged with the outer surface of said cylindrical member and extending generally radially outward therefrom.

2. A device according to claim 1, wherein said tubular means comprises a Sylphon bellows of conducting material.

3. A device for use at ultra-high frequencies for making connection to an annular electrode terminal on an electron discharge tube, comprising a generally cylindrical member conductively engageable with the periphery of said terminal,

said cylindrical member extending axially an amount greater than said terminal and having at each edge thereof an annular rounded portion, and flexible tubular means galvanically engaged with the outer surface of said cylindrical member and extending generally radially outward therefrom.

4. A device according to claim 3, wherein the surface of said cylindrical member has a plurality of apertures, whereby better circulation of air between said tube and said cylindrical member is permitted.

5. A device according to claim 3 further, comprising adapter means at the free end of said flexible tubular means for connection to a tubular transmission line.

6. A device according to claim 3 wherein, said annular rounded portions are substantially tangent to the inner portion of said cylindrical member.

7. A device according to claim 3 further, comprising clamping means on the inner surface of said cylindrical member engaging said annular electrode terminal for ensuring good frictional engagement thereof with said annular electrode terminal.

8. An adapter device for use at ultra-high frequencies and for making connection to an annular electrode terminal of an electron discharge device, said terminal adapted to support an electrode within the discharge device and having a pair of opposite axially extending annular, inwardly positioned flanged portions for sealing connection with the insulating envelope of the discharge device, said adapter comprising a generally cylindrical member having its axial dimension greater than that of said terminal and flanged portions combined, so that it overlaps the insulating envelope of the discharge device, said cylindrical member having at each edge thereof an annular rounded portion, and flexible tubular means galvanically engaged with the outer surface of said cylindrical member and extending generally radially outward therefrom.

9. An adapter device according to claim 8, wherein said cylindrical member includes an annular, radially inwardly extending portion formed on the inner surface thereof for seating said adapter on said annular electrode terminal.

10. An adapter device according to claim 8, wherein said cylindrical member includes an annular, radially inwardly extending portion formed on the inner surface thereof for seating said adapter on said annular electrode terminal, said inwardly extending portion being so disposed axially of said cylindrical member that when said adapter is mounted on said terminal, said annular rounded portions are symmetrically positioned with respect to the outer circumference of said terminal.

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