

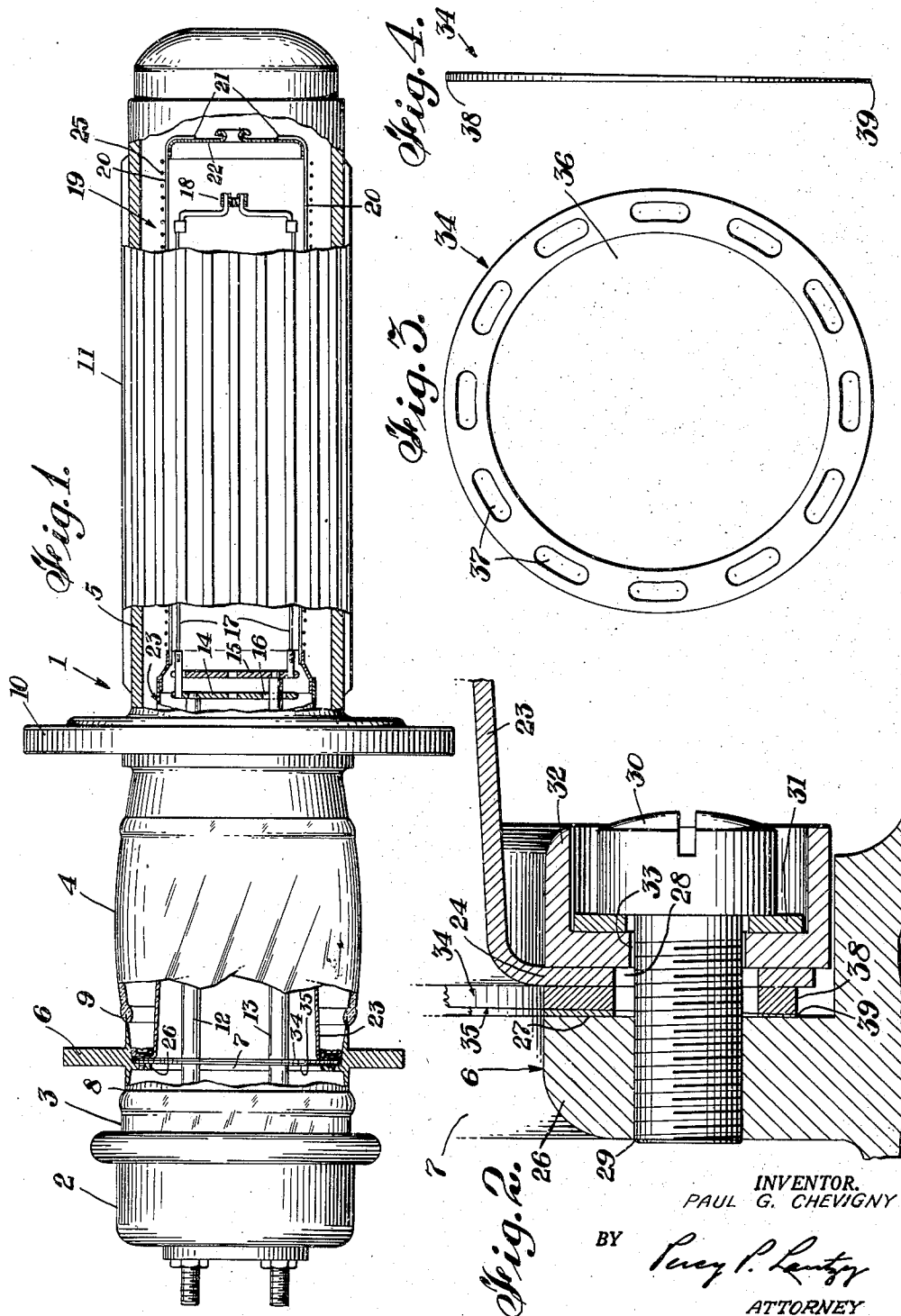
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TUBE CONSTRUCTION

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TUBE CONSTRUCTION

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This invention relates generally to a method and means of supporting elements, and particularly to the supporting of electrodes, such as for example, in electron discharge devices.

In many instances it is important that an element be supported in a given angular position or in a fixed spacial relationship with respect to another element. This is particularly true in electron discharge devices where it is essential that the spacing between electrodes be maintained within relatively narrow limits. Furthermore, it is usually important that this spacing be maintained not only at one point between said electrodes but throughout their entire lengths. Thus, a parallel relationship between the electrodes must be provided. The longer the electrodes are, the more difficult it becomes to maintain this parallel spacing throughout their lengths. This is particularly true when one of the electrodes is suspended from one portion of the tube envelope, and the other of the electrodes is suspended from a different portion of the envelope, with glass intervening between said portions, due to the fact that the glass usually distorts during the process of fusing it to complete the tube envelope.

An object of the present invention is the provision of an improved method and means for supporting elements, particularly electrodes, as for example, in electron discharge devices, whereby said elements may be supported in a fixed spacial relationship, and wherein adjusting means are provided for obtaining said relationship.

Another object of the present invention is the provision of an improved method and means for supporting electrodes in an electron discharge device.

Other and further objects of the present invention will become apparent and the invention will be best understood from the following description of an embodiment thereof, reference being had to the drawings, in which:

Fig. 1 is an elevational view, partly broken away, of an electron discharge device embodying my invention;

Fig. 2 is an enlarged sectional view of a detail of Fig. 1;

Fig. 3 is a plan view of a wedge employed in Fig. 1; and

Fig. 4 is a side elevational view of the wedge of Fig. 3.

Referring now to Fig. 1, the electron discharge device there illustrated is of the type adapted to handle high power, such as several hundred kilowatts, and is of large construction. Said device

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includes an envelope 1, generally cylindrical and elongated, comprising a metallic cap 2, glass portions 3 and 4 and a metallic portion 5, all being substantially cylindrical. Between glass portions 3 and 4, an annular hollow metallic member or ring 6 having a central opening 7 is arranged, and is sealed to said glass portions by means of feather edges 8 and 9 respectively. Ring 6 serves as a support and connector for the grid electrode. Another ring 10 is attached to the metallic portion 5 and serves as the anode external terminal, the inner surface of the metallic portion 5 serving as the anode. For dissipating heat, the anode is surrounded by a ridged member 11 whose ridges serve as air-cooling vanes.

Supported in the cap 2 are a pair of rods 12 and 13 which serve as the filamentary cathode supports and leads. At one end of rod 12 there is mounted a flat metallic disk 14 and at the corresponding end of rod 13, there is mounted a similar disk 15, which disks are circular, spaced apart, and extend parallel to each other transverse to the envelope 1 of the electron discharge device. Rod 13 passes through an opening 16 in disk 14 so that there is no electrical connection between rod 13 and said disk. A plurality of parallel spaced filaments 17 arranged in a circle are supported at one of their ends from disks 14 and 15 and are connected together at their other ends to a nut 18. Current flows from rod 12 to disk 14 and through the filaments connected to disk 14 down to nut 18 and up from nut 18 to the filaments connected to disk 15 and out through rod 13. The filaments suspended from each of the disks are in parallel and interleaved with each other.

The filaments 17 are sufficiently stiff so that while the nut 18 is not held rigid in position by any other means, the stiffness of the filament wires 17 and the rods 12 and 13 hold the filaments substantially fixed in position. Moreover, since the electron discharge device is normally positioned so that it extends vertically, that is with the cap 2 on top and the rest of the electron discharge device extending therebelow, the bottom portion of the filament, that is the portion at the nut 18, tends to remain in line with the upper portion. The cathode filaments 17, are elongated as will be seen from said figure, and are arranged so as to define a cylindrical configuration with each of the filaments circumferentially spaced from the other.

The grid electrode, generally designated by the numeral 19, likewise consists of a plurality of spaced parallel rods 20, arranged in a circle and

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surrounding the filaments 17, and are parallel to said filaments. The grid rods or grid wires 20 are bent over at one end, as indicated at 21, and welded or otherwise fastened to a bottom metallic cup-like member 22 while the upper end of said rods 20 are supported from a cylindrical member 23. Member 23 is bent outwardly at the upper end thereof to form an annular flange 24 (see Fig. 2). The annular flange 24 is mounted on ring 6 as will be described hereinafter. The grid 19 further includes a spiral wire 25 wound around the grid rods 20 and secured thereto as by being welded at the points where said spiral wire 25 touches said rods.

For the purpose of mounting the annular flange 24 on the ring 6, the inner end of said ring adjacent the opening 7 is thinned down to provide a thinned portion 26, having a face 27, which is adapted to register with the annular flange 24, said flange 24 having substantially the same diameter as said thin portion 26. The flange 24 is provided with a plurality of openings 28 circumferentially spaced around said flange and registering with threaded openings 29 in the thin portion 26 so as to allow threaded screws 30 to be inserted through openings 28 and to be screwed into the threaded openings 29. There are a plurality of screws 30, one for each opening 28.

Between the heads of screws 30 and the face 27 of the thinned portion 26 of ring 6, several elements are arranged. One of a plurality of small round lock washers 31 is inserted immediately adjacent the head of each screw 30. Next is a single annular channel member 32, having a plurality of openings 33, circumferentially spaced in the bottom of said channel, the openings 33 registering with the openings 28 in flange 24, said annular channel member 32 being substantially of the same diameter as the flange 24 and serving to keep equal pressure on the annular flange throughout its entire circumference. The last elements between the heads of screws 30 and face 27 are two circular metallic wedges 34 and 35.

The wedges 34 and 35 may be best seen in Figs. 3 and 4 which show one of said wedges 34, it being understood that both wedges are alike in construction. The diameter of each of said wedges is substantially the same as the diameter of the annular flange 24 and the thin portion 26 of ring 6. The central opening 36 in each of said wedges is preferably of the same shape and as large as the circular opening 7 in ring 6. Furthermore each of the wedges is provided with a plurality of slots 37 which register with the openings 28 in the annular flange 24 so that all of the screws 30 may pass through said flanges, but the slots 37 are substantially longer than the openings 28 and longer than the diameter of the threaded portion of screws 30 so as to allow for some measure of rotation of said members 34 and 35 even when the screws have been inserted and screwed part-way into the threaded openings 29 of ring 6. The wedges 34 and 35 taper from the thickest portion 38 at one point thereon to the thinnest portion 39 at a point diametrically opposite point 38.

The wedges 34 and 35 are adapted to be rotated before the screws 30 are inserted, and then rotated a slight amount for a final adjustment after those screws are inserted to adjust the position of the cylindrical support 23 and therefore the position of the grid 19. When the thickest portions 38 of wedges 34 and 35 are together at

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one point, the thinnest portion 39 of said wedges are together too, and the two thickest portions 38 tend to tilt the cylindrical support 23 and the grid 19 toward one side. When the thickest portion 38 of wedge 34 is immediately adjacent the thinnest portion 39 of wedge 35 as is for example, illustrated in the detail of Fig. 2, then the cylindrical support 23 will not be tilted with respect to the annular ring 6. Between these two rotative positions of the wedges, various amounts of tilt can be produced in any given transverse direction with respect to the tube envelope. Thus the tilt of the grid 19 can be adjusted so that the grid 19 is, throughout its length, parallel with and equally spaced from the filamentary cathode 17.

In actual practice in the construction of the electron discharge device of Fig. 1, the wedges are rotated before the screws are inserted and before the glass member 4 is joined to the rest of the tube envelope. The filaments of the cathode having been suspended from the disks 14 and 15 and the rods 12 and 13 having been fastened to said disks and to the cap or upper portion of the tube envelope, the grid and its cylindrical support 23 is placed with its annular flange 24 against the wedges 34 and 35 while the electron discharge device is upside-down, and the wedges are rotated until the grid assumes the proper position with respect to the filaments of the cathode. The screws are next inserted and after a final adjustment of the wedges 34 and 35, which is accomplished by a slight further rotation thereof, the screws are then tightened all the way to thereby secure the grid in predetermined fixed relationship to the filaments 17.

While I have described above the principles of my invention in connection with specific apparatus, it is to be clearly understood that this description is made only by way of example and not as a limitation on the scope of my invention as defined in the accompanying claims.

I claim:

1. Means for supporting one electrode in an electron discharge device in fixed relationship to another electrode comprising a common support, connecting means attached to said support mounting the one electrode on said support, connecting means attached to said support mounting the other electrode at a different location on said support, and a pair of wedge-shaped elements interposed between one of said connecting means and said support.

2. Supporting means as set forth in claim 1 in which said wedge-shaped elements comprise a pair of wedge-shaped annular washers.

3. Means for supporting two elements in fixed relationship to each other comprising a support member, connecting means attached to said support member mounting one of the elements at one place on said support member, connecting means attached to said support member mounting the other element at another place on said support member and relatively rotatable contiguous wedges interposed between one of said connecting means and said support member positioning said elements with respect to each other.

4. Supporting means according to claim 3 wherein said wedges are circular.

5. Means for supporting two elongated elements in fixed transversely spaced relationship to each other comprising a support member, connecting means attached to said support member mounting one of the elements at one place on said support member, connecting means attached to said

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support member mounting the other of the elements at another place on said support member, and relatively rotatable contiguous wedges interposed between said means for mounting the other element and said support member positioning the other element with respect to the one element.

6. Supporting means according to claim 5 wherein said wedges are circular.

7. Means for supporting two elongated elements in fixed transversely spaced relationship to each other, comprising a support member, connecting means attached to said support member mounting one of the elements at one place on said support member, connecting means attached to said support member mounting the other of the elements from a plurality of points at another place on said support member, and relatively rotatable contiguous wedges interposed between said means for mounting the other of the elements and said support member for positioning the other element with respect to the one element.

8. An electron discharge device comprising an envelope, a pair of electrodes within said envelope, means mounting one of said electrodes within said envelope, a support for another electrode having a circular portion, a mount, means attaching said circular portion to said mount at a plurality of points, and circular contiguous wedges adapted to be rotated about a common central axis interposed between said circular portion and said mount positioning said other electrode within said envelope.

9. An electron discharge device according to claim 8 wherein said one electrode is supported from one end of said envelope by means of a support passing through said mount, said mount is in the form of a hollow annular ring secured in said envelope, said attaching means consists of screw means attaching said circular portion

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to said mount and said wedges have openings therein through which said screw means pass, said wedges being adapted to be rotated in relation to each other around a central axis to position said other electrode within said envelope in relation to said one electrode.

10. An electron discharge device having an elongated envelope, supporting means extending from one end of said envelope, a first elongated electrode supported from said supporting means, an annular member sealed through said envelope at a distance from said one end thereof, said supporting means extending through the opening in said annular member, a second elongated electrode extending within said envelope in fixed transverse relationship to said first electrode, a support for said second electrode fixed thereto, said support having a circular portion, means mounting said circular portion on said annular member comprising fastening means positioned circumferentially around said circular portion and fastened to the inner periphery of said annular member, and a plurality of circular contiguous hollow wedges interposed between said circular portion and said annular member and having openings therein for the passage of the aforesaid fastening means therethrough, said wedges being adapted to be rotated for positioning said second electrode within said envelope with respect to said first electrode.

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