July 6, 1948. A. K. WING, JR 2,444,483

FILAMENT SUPPORT

Filed May 23, 1946

Fig. 1

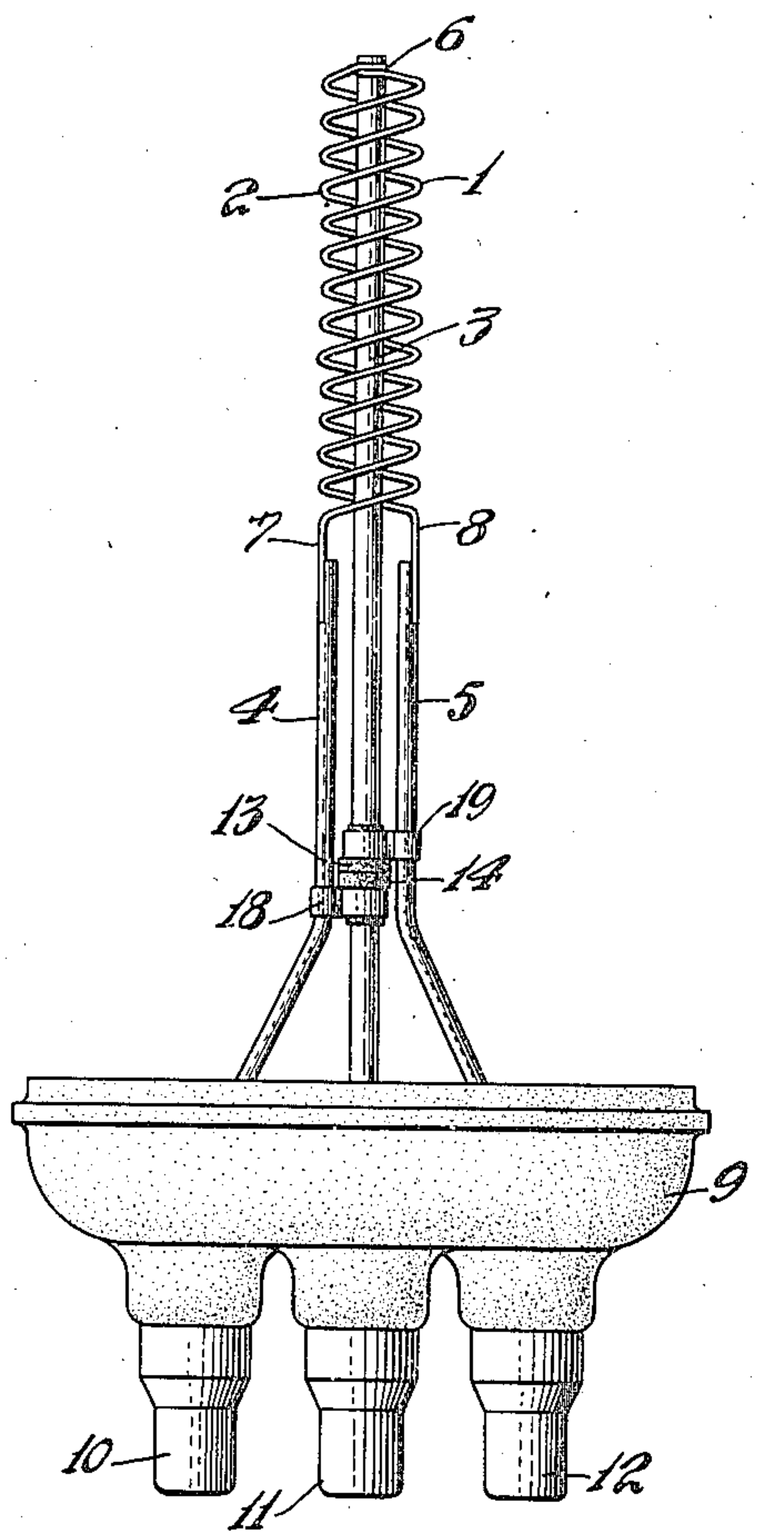


Fig. 2

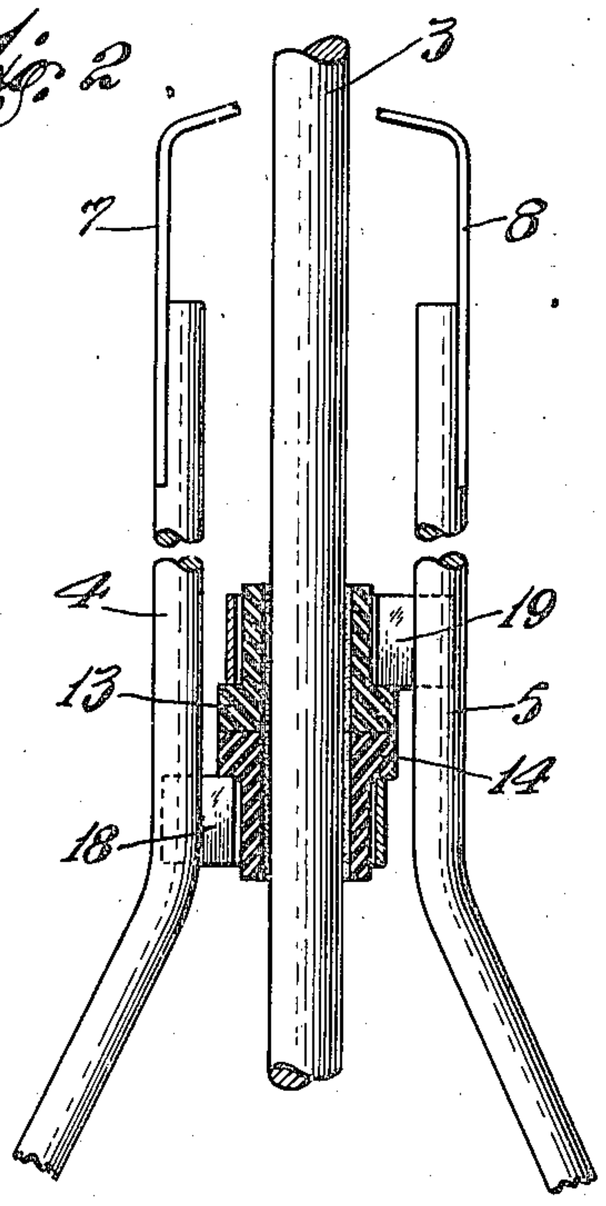


Fig. 3

Fig. 5

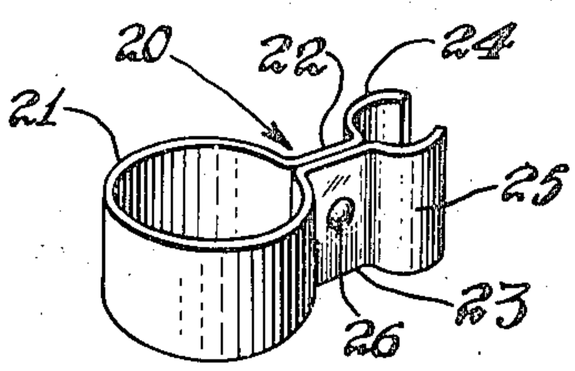


Fig. 6

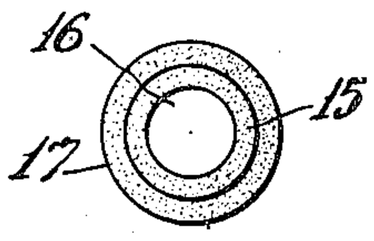
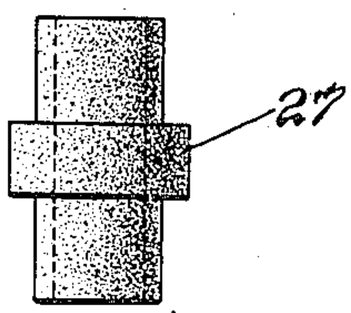
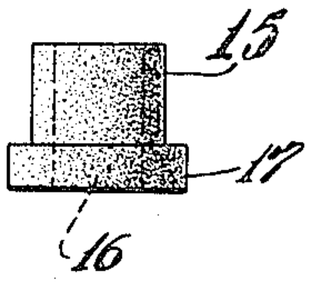


Fig. 4





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FILAMENT SUPPORT

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5 Claims. (Cl. 250—27.5)

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This invention relates to vacuum tubes and particularly to electrode constructions and supporting arrangements in such tubes.

The principal object of the invention is to provide an electrode supporting structure which will maintain the proper desired alignment and spacings of the electrode elements, while allowing for unequal thermal expansion of the supports.

In vacuum tubes adapted for handling substantial amounts of power, it is often the practice to provide a filament of a type having a central support and a pair of side supports. A typical filament of this type is a double helical filament in which the two ends of the double helices are attached to respective filament terminal supports acting as connecting leads, and the central point of the double filament is attached to a central support between the two side supports. In the operation of such tubes heat is developed, resulting in thermal expansion of the supporting rods; and the expansions of the rods may not be equal. Unless precaution is taken, this will tend to warp the alignment of the supporting rods, and produce misalignment of the electrode.

To guard against such misalignments, I provide means in accordance with my invention for allowing the supporting members to undergo unequal thermal expansion while still maintaining the desired relative positions of the supporting members and consequently maintaining the electrode structure in its desired position.

I carry out my invention by the provision of a collar means on one of the supports and a spacing member attached to the collar and to the other supports. The support having the collar is adapted to slide longitudinally within its collar so that even though the support expands at a different rate than the other supports, the desired spacing between the supports will be maintained and the spacer will not be warped out of position.

The foregoing and other features of my invention will be better understood from the following detailed description and the accompanying drawing of which:

Fig. 1 is an elevation view showing a filament assembly arrangement constructed according to my invention;

Fig. 2 is an elevation view partly in cross-section showing a detail of the construction used in Fig. 1;

Fig. 3 is a top view of a shoulder bead used in the arrangement of Fig. 1;

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Fig. 4 is a side view of the shoulder bead of Fig. 3;

Fig. 5 is a perspective view of a spacing clip used in Fig. 1; and

Fig. 6 is an alternative form of shoulder bead which may be used in place of that used in Fig. 3 and Fig. 4.

Referring to the drawings, there is shown a filament assembly arrangement useful in vacuum tubes of the power type. The filament is of the double helical type, comprising one helix 1, wound in one direction, and another helix 2, wound in the other direction. To support the filament there is provided a central support rod 3 and a pair of side supports or rods 4 and 5. The upper ends of the helical filaments 1 and 2 are both supported at 6, near the top of the central rod 3, to which the filament may be fastened, for example by welding. The opposite ends 7 and 8 of the filament wires are attached, for example by welding, to the respective side supports 4 and 5. The three supporting rods 3, 4 and 5 are sealed through a suitable insulating member 9, which is ordinarily of glass, in a well known manner; and the member 9 is adapted to be sealed to the envelope of the vacuum tube in a well known manner which need not be described here. At the outside of the glass mounting member 9, suitable terminal members 10, 11 and 12 may be fastened to the respective supporting rods 4, 3 and 5.

For the purpose of maintaining the central location of center rod 3 midway between side legs 4 and 5, there is provided a spacing means. This comprises a pair of shoulder beads 13 and 14, one of which is shown in greater detail in Figs. 3 and 4. It is an insulating member which may be made of ceramic or the like comprising a cylindrical portion 15 with a central hole 16 passing centrally through it. At one end, the cylindrical portion is provided with an outer flange or collar 17. Two such beads are placed over the central rod 3 with the rod slidably fitted through their holes 16, the beads preferably being placed so that the shoulders 17 abut each other as shown in cross-section in Fig. 2.

A pair of spacing strips 18 and 19, preferably of metal, are attached to the cylindrical portions 15 of the respective shoulder beads 14 and 13, and extend in opposite directions to the respective side legs 4 and 5. As shown in Fig. 5, each of the clips comprises a strip 20 shaped to form a cylindrical portion 21, for fitting around one of the cylinders 15, of the shoulder bead, and formed into two straight portions 22 and 23 arranged side

by side. The straight portions terminate in partial cylindrical portions 24 and 25 for gripping one of the side rods 4 or 5. When the clip is assembled with cylindrical portion 21 around its respective shoulder bead, and portions 24 and 25 around the respective rod 4 or 5, the two straight portions 22 and 23 are fastened together, for example by welding at 26. The portions 24 and 25 are welded or otherwise securely fastened to the side legs against motion, either up or down or in a rotary direction. The central rod 3 is free to move lengthwise relative to the shoulder beads through which it passes; although the shoulder beads fit snugly enough so that the central rod 3 is not permitted to move laterally with reference to the side legs.

An alternative form of shoulder bead is shown in Fig. 6, wherein a single bead is provided having a single flange or collar 27 centrally located around the cylindrical portion of the bead. This provides two cylindrical portions, one on either side of the collar 27, around which the respective clips 18 and 19 are fastened, to provide the structural relationship shown in Figs. 1 and 2.

It will be recognized that by my invention, I have provided an electrode mounting and supporting arrangement which is simple in construction and can quickly be assembled, and does not require the use of stop wires or the like for maintaining the spacing. The arrangement permits movement lengthwise of the central supporting rod relative to the other legs, while securely maintaining the desired spaced relationship between the supports. The welding or fastening of the clips to the side rods prevents undesired swinging of these clips around the slide rods as centers, thereby preventing skewing of the structure.

The structure is particularly applicable to filaments provided with a mid-point lead and two side leads, and especially to filaments of the double helical type. The structure may, however, be used for other kinds of electrodes having a number of supports, where it is desired to keep the supports properly spaced while allowing for their expansion or elongation.

I claim:

1. A structure supporting a double helical filament, said structure comprising a central supporting rod and a pair of side rods, the midpoint of the filament being attached to the central rod, and the ends of the filament being attached to respective ones of the side rods, an insulating member having a hole in it and slidably placed over the central supporting rod, and a pair of spacing members attached to the insulating member and extending to and attached to a respective one of the side rods.

2. Apparatus according to claim 1 in which the insulating member comprises a pair of shoulder beads each of which has a central hole through which the central rod is passed, each shoulder bead having an enlarged shoulder and a cylindrical portion of smaller diameter than the shoulder, the two shoulders being placed against each other, and one of the spacing members being placed around the cylindrical portion of one bead and the other spacing member being placed around the cylindrical portion of the other bead.

3. A filament supporting structure comprising a central supporting lead, two side supporting leads for the filament, located on either side of the central supporting lead, an insulating bead having a hole through it and an enlarged shoulder, slidably placed over the central support, a spacing clip fastened to the bead and to one of the side supports, a second insulating bead also having a hole through it and an enlarged shoulder, slidably placed over the central support with its shoulder abutting the shoulder of the first-mentioned bead, and a second spacing clip attached to the second bead and rigidly attached to the other side support, whereby upon elongation or expansion of the supports, the central support may slide through the beads without distorting the structure.

4. A filament supporting structure comprising a central support and two side supports for the filament spaced on either side of the central support, a pair of insulating beads placed over the central support, and a clip member attached to each bead, said clip member comprising a metallic strip having a portion which passes around and grasps the bead, and two portions placed side by side which extend to one of the side supports and is fastened thereto, the two straight portions being attached together.

5. A filament supporting structure comprising a central supporting rod, two side supporting rods located on either side of the central rod, an insulating bead in the form of a cylindrical member having a hole centrally through it, through which the central rod is slidably passed, and an enlarged shoulder at an intermediate position of the cylindrical bead, a spacing clip fastened to the clip at one side of the shoulder and having a portion extending to and fastened to one of the side rods, and a second spacing clip fastened to the bead at the other side of the shoulder and having a portion extending to and fastened to the other side rod, whereby upon elongation or expansion of the supporting rods, the central rod may slide relative to the bead without distorting the structure.

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

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