Oct. 12, 1965 J. SANDEN ETAL 3,211,941

FILAMENT SUPPORTS FOR TUBULAR INCANDESCENT LAMPS

Filed June 20, 1963

Fig. 1.

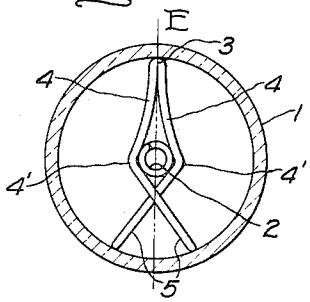


Fig. 2.

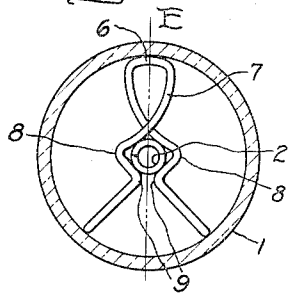


Fig. 4.

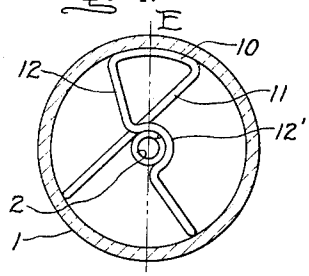


Fig. 3.

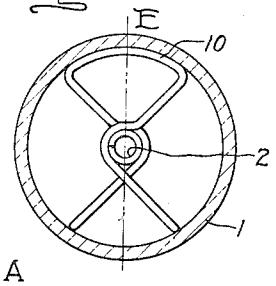


Fig. 5.

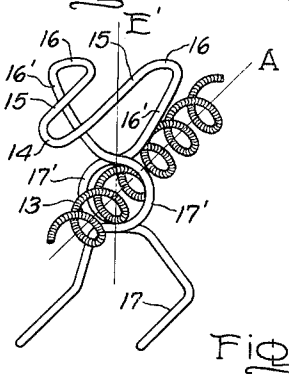


Fig. 6.

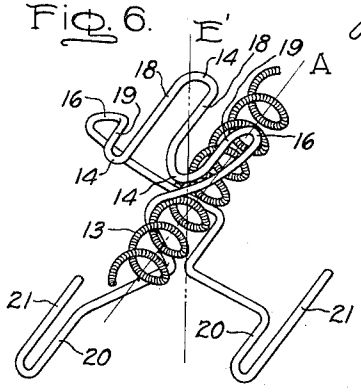
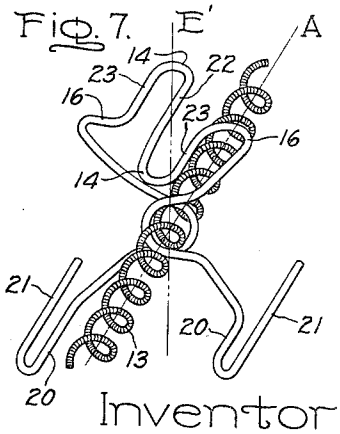


Fig. 7.



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FILAMENT SUPPORTS FOR TUBULAR INCANDESCENT LAMPS

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9 Claims. (Cl. 313—271)

This invention relates generally to incandescent electric lamps having tubular bulbs or envelopes containing a coiled filament the axis of which is substantially coincident with the envelope axis, and more particularly to improved support members for supporting the filament from the envelope wall.

Such support members consist generally of a spiral wire member located in a plane substantially normal to the envelope axis and having a center portion engaging the filament coil.

The improved support members comprising the present invention may be of simpler shape requiring substantially less material.

In accordance with the invention, a support member is formed from a single length of wire bent to form a retroverted mid-section which engages the envelope wall, and two clamping legs which cross over at least at one point adjacent the filament coil and which have clamping portions engaging the filament coil at least at three points around its periphery and which extend divergently therefrom into engagement with the wall of the tubular envelope.

Further features and advantages of the invention will appear from the following description and from the accompanying drawing wherein:

FIGS. 1 to 4 are cross sections of incandescent electric lamps with tubular envelopes and containing supports illustrating several species of the invention; and

FIGS. 5 to 7 are perspective views of further species of support members with a portion of the associated filament coil.

In FIG. 1 there is shown the tubular lamp envelope 1 and the filament coil 2. The wire support member consists of a retroverted mid-section 3 and two clamping legs each comprised of sections 4 and 5. The mid-section 3 is sharply curved and changes over into respective sections 4 of the clamping legs which are curved convexly to each other and to plane E passing through the coil axis and mid-section 3 of the support. Sections 5 of the clamping legs extend angularly from the curved sections 4 to provide intermediate clamping sections 4' which engage the filament coil 2 at four points around its periphery. The said free end sections 5 extend divergently into engagement with the envelope wall. Each section 5 traverses the plane E once so that the said sections cross over below the filament coil. The coil 2 is thus supported in a reliable manner from the envelope wall by means of the wire support member the total wire length of which is shorter than one single wire turn circumferentially engaging the envelope wall.

In FIG. 2 the tubular lamp envelope and the filament coil are again designated by the respective numerals 1 and 2. Plane E passing through the mid-section 6 of the support and through the coil axis is traversed once, at a point between the mid-section 6 and the coil 2, by each of the two clamping legs 7. That is, the said legs 7 cross over at the side of the filament coil 2 toward the mid-section 6. On both sides of coil 2 both the clamping legs are curved to provide clamping portions 8 engaging the coil 2 at four points. Between coil 2 and

the two free ends of the clamping legs the latter do not traverse plane E but have a second curvature 9 adjacent said plane. Between curvature 9 and the tips of its free ends the clamping legs diverge in a straight line into engagement with the envelope wall. The clamping legs are resiliently urged against each other in the vicinity of the filament coil and encircle it tightly.

As shown in FIG. 3 the retroverted mid-section 10 of the support conforms to the curvature of the tubular envelope 1 over a range up to about a right angle, i.e., over an angular span of 90°. Plane E passing through the axis of the filament coil 2 and the mid-section 10 is traversed twice by each clamping leg, once between the mid-section 10 and coil 2 and once between the coil 2 and the free ends of the support. That is, the said clamping legs cross over at each side of the coil 2. In proximity to coil 2 each clamping leg conforms to its curvature and encircles it tightly over nearly half its circumference. Between coil 2 and its free ends each clamping leg is straight and these straight sections engage the envelope wall at spaced points.

FIG. 4 shows an asymmetrically shaped support member by means of which the filament coil 2 is supported from the envelope 1. The retroverted mid-section 10 of this support conforms, as in FIG. 3, to the envelope curvature over a range up to about a right angle. Plane E passing through the mid-section 10 and the coil axis is crossed over by each clamping leg, at a point between the mid-section 10 and coil 2. Whereas the clamping leg 11 is straight throughout its length and engages coil 2 at only one point, the clamping leg 12 has a clamping portion 12' which conforms to the curvature of coil 2 and encircles it tightly over nearly half its circumference.

As shown in FIGS. 1 to 4 the wire of the support member is of nearly the same thickness as the filament wire. In the case of single coil filaments it is advantageous to make the wire of the support member of a diameter which is at least equal to the spacing between adjacent coil turns because the support member then clamps more securely on the coil and is secured against tilting much better than a support member of wire which is thinner than the spacing between coil turns. In FIGS. 5 to 7 the filament consists of a coiled coil and the support member wire diameter is smaller than the spacing between adjacent turns of the secondary coil. Plane E passing through the mid-section of the support and through the axis of the filament coil is represented in the cross sections of FIGS. 1 to 4 as a straight line. In the perspective views of FIGS. 5 to 7 there is shown for the sake of clarity no plane E but a straight line E' lying in this plane which stands vertically on the coil axis A.

The supports shown in FIGS. 5 to 7 have, besides the characteristic features of the supports shown in FIGS. 1 to 4, the further features that they are not limited to lying substantially only in a plane normal to the envelope and coil axis, but include sections extending parallel to the envelope axis and conforming to the tube wall by means of which it is assured that the supports will under no circumstances tilt from the aforesaid plane normal to the envelope axis in whch event the coil would not properly be supported but would tend to be distorted.

In the case of the above mentioned well known spiral supports, it has been suggested that tilting be prevented by making the outermost turn of a diameter which, when relaxed, was somewhat greater than the inner diameter of the envelope. It is, however, somewhat difficult to insert such supports into the envelope and the filament coil may thereby easily be distorted. It has also been proposed to provide spiral supports with two turns side by side engaging the envelope wall whereby any tilting of the support was prevented. As compared with the latter,

the support members shown in FIGS. 5 to 7 have the advantage of requiring much less material.

The supports shown in FIG. 5 to 7 have two clamping legs the free ends of which are provided with extensions bent to the same side and parallel to the envelope axis and abutting against the envelope wall. They may also be bent towards opposite sides. The mid-section of these supports has at least two straight wire sections extending parallel to the envelope axis and abutting against the envelope wall, and between adjacent straight wire sections a retroverted section also abutting against the envelope wall.

In FIG. 5 the coiled coil filament is shown at **13**. The mid-section of the support consists of a retroverted section **14** with straight wire sections **15** extending parallel to the envelope axis A. Sections **15** change over into two short transition pieces **16** at nearly right angles to the clamping legs. The clamping legs **16'** cross over at points both above and below the filament coil **13** with semi-circular clamping portions **17'** encircling the coil, similar to the FIG. 3 species. The free ends of the said clamping legs are provided with two straight extensions **17** abutting against the envelope wall parallel to the envelope axis A.

As shown in FIG. 6 the coiled coil filament **13** is supported by a member having at the middle thereof a retroverted section **14** with two straight sections **18**. Each section **18** is followed by a retroverted section **14** with a short straight section **19**. Sections **18** and **19** extend parallel to the envelope axis A and all straight sections **18** and **19** abut against the envelope wall. Between sections **19** and the two clamping legs there are provided the short transition pieces **16**. The ends of the clamping legs change over into the straight sections **20** which, in turn, change over into the straight sections **21**. Sections **20** as well as sections **21** extend parallel to the envelope axis A. At least the sections **21** engage the envelope wall. The clamping legs cross over above the filament coil, encircle the coil, and extend divergently away therefrom, similar to the FIG. 2 species.

The support for the coiled coil 13 shown in FIG. 7 has at its middle a longer straight section **22** and two shorter straight sections **23** which are connected with the straight section **22** by retroverted parts **14**. Short transition pieces **16** change over into the clamping legs. All the straight sections **22**, **23**, **20** and **21** extend parallel to the envelope axis A and at least sections **21** and **22** or **21** and **23** engage the envelope wall.

The tubular incandescent lamps, cross sections or part of which are shown in the several figures of the drawing, have an inert gas filling which may be below or above atmospheric pressure and to which is added a small quantity of iodine to provide a lamp of the type described and claimed in U.S. Patent 2,883,571 Fridrich and Wiley.

What we claim as new and desire to secure by Letters Patent of the United States is:

1. In an electric incandescent lamp comprising a tubular envelope having a filament coil extending axially of the envelope and at least one support member supporting the filament from the envelope wall, said support member formed from a single wire length bent to form a retroverted mid-section having its bight portion engageable with the envelope wall and two clamping legs extending from said mid-section, said legs having cooperating adjacent clamping portions thereof intermediate their lengths, at least one said clamping portion being curved so that between them they embrace the filament coil and engage it at least at three points around its periphery, said clamping legs having their free ends beyond said clamping portions extending divergently away from the filament into engagement with said envelope wall, said clamping legs

at their clamping portions crossing over at least at one side of the filament coil.

2. In an electric incandescent lamp having a filament support member as set forth in claim **1** wherein the crossing over of said clamping legs is at the side of the filament coil toward the said retroverted mid-section.

3. In an electric incandescent lamp having a filament support member as set forth in claim **1** wherein the crossing over of said clamping legs is at the side of the filament coil toward the said free ends of the clamping legs.

4. In an electric incandescent lamp having a filament support member as set forth in claim **2** wherein at least one of said clamping legs has its said clamping portion curved around nearly half the circumference of the filament coil.

5. In an electric incandescent lamp having a filament support member as set forth in claim **3** wherein the said retroverted mid-section is sharply bent back and the portions of the clamping legs between said mid-section and the filament coil are curved convexly toward each other.

6. In an electric incandescent lamp having a filament support member as set forth in claim **1** wherein the retroverted mid-section includes a portion conforming to the curvature of the tubular envelope up to an angular extent of about 90°.

7. In an electric incandescent lamp having a filament support member as set forth in claim **1** wherein at least one of said clamping legs has its said clamping portion curved around nearly half the circumference of the filament coil.

8. In an electric incandescent lamp comprising a tubular envelope having a filament coil extending axially of the envelope and at least one support member supporting the filament from the envelope wall, said support member formed from a single wire length bent to form a retroverted mid-section engageable with the envelope wall and two clamping legs, said legs having cooperating adjacent clamping portions thereof intermediate their lengths formed to engage the filament coil at least at three points around its periphery and having their free ends extending divergently away therefrom into engagement with said envelope wall, said clamping legs crossing over at least at one point adjacent the filament coil, wherein the free ends of said clamping legs terminate in extensions extending along the envelope wall parallel to the envelope axis.

9. In an electric incandescent lamp comprising a tubular envelope having a filament coil extending axially of the envelope and at least one support member supporting the filament from the envelope wall, said support member formed from a single wire length bent to form a retroverted mid-section engageable with the envelope wall and two clamping legs, said legs having cooperating adjacent clamping portions thereof intermediate their lengths formed to engage the filament coil at least at three points around its periphery and having their free ends extending divergently away therefrom into engagement with said envelope wall, said clamping legs crossing over at least at one point adjacent the filament coil, wherein the said retroverted mid-section includes a laterally retroverted portion extending along the envelope wall parallel to the envelope axis.

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