METHOD OF FABRICATING AN INCANDESCENT LAMP AND ITS CONSTRUCTION

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FIG. 1

FIG. 2

FIG. 3

FIG. 4

FIG. 5

FIG. 6

FIG. 7

FIG. 8

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METHOD OF FABRICATING AN INCANDESCENT LAMP AND ITS CONSTRUCTION
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ABSTRACT OF THE DISCLOSURE
The method of fabricating a miniature lamp is described. A pair of support wires and a pair of filament lead wires are positioned on the end of an exhaust tube. The support wires are first inserted into the end of the tube. Below the point of insertion, a loosely fitting annular glass ring is positioned allowing enough space for the pair of filament lead wires. The glass ring is fused to the filament wires and the exhaust tube. After bending of the ends of the wires, a filament is fitted thereto, the ends of which are secured to the lead wires and looped and supported in axial arrangement by the support wires.

BACKGROUND OF THE INVENTION
This invention relates to the method of fabricating incandescent lamps. More particularly the invention concerns a method of producing an improved lamp stem construction whereby uniform axial alignment of the filament is achieved from lamp to lamp in production.

Specifically, the invention is directed to the fabrication of lamps of miniature and sub-miniature classifications where space is at a premium and long life an essential requirement.

These lamps have a variety of uses such as in readout devices, scanning devices, illuminated panels and similar components requiring reliability and sustained light output.

DESCRIPTION OF PRIOR ART
Present lamps of the miniature and sub-miniature class have many design and assembly problems. In the construction of these types of lamps, the fabrication steps are fairly similar for each. Basically, the filament lead-in wires and suitable filament support wires are supported and spaced apart by a ceramic button. The button is located a distance below the supporting end of the lead-in wires where a filament is disposed. The lead-in wires extend below the ceramic button and are bent at right angles. These lower portions of the lead-in wires are then coated with a sodium tetraboronate solution prior to a metal-to-glass sealing operation. A glass envelope is slipped over the filament and a seal is made with the wires extending outwardly. In making the seal, a concentrated amount of heat is applied to the juncture of the envelope and tube. Overheating at this point leads to oxidation of the ends of the lead-in wires, making the rejection rate very high.

With this technique, commonly called butt-sealing, the filament alignment is not uniform from lamp to lamp. After completion of the lamps, the filament may be centered to a point where the filament will touch the inner wall of the envelope. When this occurs, it produces an alloying effect between the glass and the tungsten filament, causing gradual blackening of the lamp and a steady breakdown of the cross-section of the tungsten filament.

With the breakdown of the filament, the life of the lamp is shortened considerably. This is a decided disadvantage for long life and obviating this problem is an essential feature of the present invention.

SUMMARY OF THE INVENTION
In our method of fabrication, we overcome the above-mentioned disadvantages by utilizing a glass exhaust tube as a central mounting post. To the top end of this exhaust tube we soften and insert a pair of filament support wires, and then fuse a pair of filament lead-in wires below and adjacent to the end of the exhaust tube. The filament lead-in wires are first positioned between a glass annular ring that is loosely fitted over the exhaust tube. The annular glass ring and lead-in wires are then fused to the exhaust tube leaving a predetermined amount of lead-in wires extending above and below. The ring is now defined as a glass node which has become an integral part of the exhaust tube. The top ends of the wires are then bent to a desired shape. The support wires are provided with loops and the lead-in wires formed with V-shape ends. Each end of a suitable wire filament is then crimped to the V-shaped ends of the filament lead-in wires. The remaining center portion of the filament is looped and fitted through the formed portions of the support wires. This completed stem assembly provides a rigid construction that can be inserted into a glass envelope. The neck of the envelope is then sealed to the exhaust tube at the juncture of the glass node area. It may be noted that the length of the exhaust tube extending below the node can be utilized as an adjustable centering rod during the sealing operation to insure axial alignment of the filament. This alignment of the filament and ruggedized stem arrangement is an important feature of our invention and can prevent the deleterious effects of shock and vibration.

BRIEF DESCRIPTION OF THE DRAWINGS
FIGURE 1 is an elevational view of a glass exhaust tube.

FIGURE 2 is an elevational view of the glass exhaust tube after the insertion of a pair of support wires.

FIGURE 3 is an elevational view of the exhaust tube having a pair of filament lead wires positioned between an annular glass sleeve.

FIGURE 4 is an elevational view of the exhaust tube after heat is applied to the glass annular ring thereby fusing the lead wires in place. Also both pairs of wires are formed at their upper ends.

FIGURE 5 is an elevational view of the exhaust tube after a filament is positioned on the wires.

FIGURE 6 is an elevational view of the exhaust tube with a lamp envelope covering the filament and sealed to the glass node and the exhaust tube.

FIGURE 7 shows an elevational view of the completed lamp construction, partly in cross-section to show the tip of the exhaust tube and the electrical arrangement of the lead-in wires.

FIGURE 8 shows an elevational view of a completed lamp structure.

DESCRIPTION OF PREFERRED EMBODIMENT
In reference to the drawings in which the various steps taken in the fabrication of our invention are shown, FIGURE 1 illustrates a hollow glass tube 10 that is used as a central mounting post. A pair of support wires 12, are heat-inserted to the upper end of the exhaust tube 10 as viewed in FIGURE 2. The wires are preferably made from molybdenum or equivalent refractory material. Thereafter, an annular glass ring 14 is positioned directly below where wires 12 are inserted into the tube. As viewed in FIGURE 3, the annular glass ring 14 is slightly larger in diameter than the exhaust tube 10 to provide space to hold a pair of filament lead-in wires 16. A portion of the wires 16 extend about the annular ring 14 and a slightly
FIGURE 4 demonstrates the next step when the annular ring 14 is fused to the exhaust tube 10 changing the annular ring 14 from that of a separate ring to an enlarged integral node 18. The fused node 18 rigidly holds the lead-in wires 16 in fixed relationship to the support wires and the exhaust tube 10. Also in this particular step of manufacture, the upper ends of the wires 12 and 16 are suitably formed. The support wires upper ends 12 are made with loops 20 and the ends of the lead-in wires are provided with a V-shaped 22. This stem arrangement is now ready to receive a filament. As viewed in FIGURE 5, a conventional filament wire 24 is attached to the top ends of the wires 12 and 16. The end of the filament wire 24 is fitted into the V-notches 22 of the lead wires 16 and crimped in place. The central portion of the filament wire 24 is then passed over the loops of the support wires 12 thus supporting the filament 24 in a hoop shape.

At this point in the fabrication of the lamp, the stem of the lamp is completed. In reference to FIGURE 5, it can be seen that the filament, support wires 12 and lead-in wires 16 are rigidly positioned on exhaust tube 10. The tube 10 is also utilized as an adjustable centering post to insure axial alignment of the filament during the critical step of sealing a suitable envelope over the stem. As viewed in FIGURE 6 a lamp envelope 26 is shown sealed over the completed stems where the neck of the envelope 26 is joined to the glass node 18. A further step of exhausting the lamp envelope through the exhaust tube 10 and final tipping of the tube is accomplished directly below the node 18 at a point 27.

As viewed in FIGURE 6 the lead-in wires 16 extend below the semi-completed lamp but are formed as a final step of bazing, the lamp can be viewed in FIGURE 7. A standard base 30 filled with bazing cement 32 is placed over the base of the lamp 26. One of the lead wires 16 is fitted and soldered into a hole 33 in the side of the metal base 30. The other lead wire 16 is directed to a hole 34 in the bottom of the base and soldered to a contact button 36. Button 36, as viewed in FIGURE 7, is insulated from the metal base 30 by a wafer insulator 40 for a proper electrical circuit.

FIGURE 8 shows a completed lamp structure of our invention where the filament 24 is shown in axial alignment within the glass envelope 26. In our invention the alignment of filament 24 in relation to the walls of the envelope 26 and the base 30 is an important feature. It is apparent that other variations and modifications may be made by those skilled in the art, it is our intent however, to be limited only by the scope of the appended claims.

We claim:
1. In a process of fabricating incandescent lamps, the steps which comprise: inserting support wires into the end of an exhaust tube; positioning a glass annular ring about said exhaust tube and below the point of insertion of said support wires; placing a pair of filament lead-in wires between said annular ring and said tube; fusing said annular ring and said filament lead-in wires to said exhaust tube thereby forming a glass node that rigidly fixes said filament lead-in wires to said exhaust tube; affixing a wire filament to the upper ends of said filament lead-in wires; looping and supporting the center portion of said filament over the ends of said support wires, thereby forming a stem structure; placing a glass envelope over said stem structure and sealing said envelope to said node and said exhaust tube; evacuating said envelope and tipping said exhaust tube.
2. The process according to claim 1 including the steps of slipping a glass annular ring about said exhaust tube and said wires and fusing said ring to said exhaust tube.
3. The process according to claim 2 including the step of sealing said envelope over said filament, the neck of said envelope being sealed to said fused annular ring.

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