

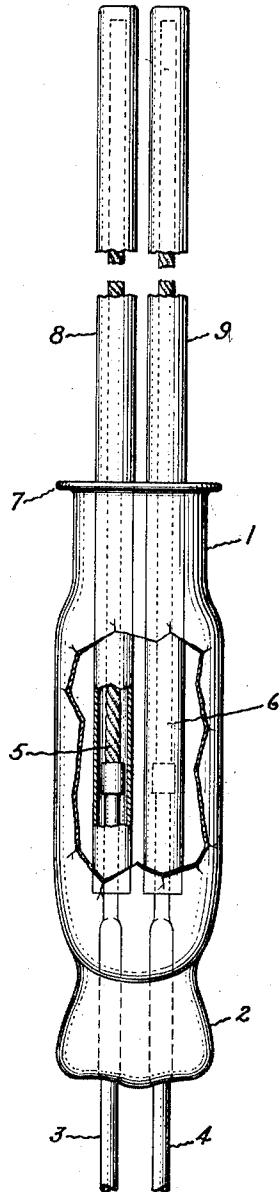
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METHOD OF TREATING COPPER LEADING-IN WIRES

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UNITED STATES PATENT OFFICE.

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METHOD OF TREATING COPPER LEADING-IN WIRES.

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The present invention relates to leading-in wires employed in electric lamps and electric discharge tubes, and more particularly to a method of treating, during the construction of such devices, the usual stranded copper leading-in wires which supply current to the incandescent filament.

In the manufacture of relatively large vacuum tubes, it is customary to employ a seal assembly including a glass stem portion provided at one end with a press seal through which heavy tungsten wires pass. These wires are usually secured within the stem portion to stranded copper conductors and the upper portion of the glass stem is sealed or joined to the body portion of the tube. It is customary to anneal the glass stems to remove strains from the glass and when the so-called hard glass, which is a borosilicate, is employed the annealing temperature is approximately 600° C. At such a temperature the stranded copper wires often become so brittle, due to oxidation, that they break in two when bent. Copper is also deposited on the inner walls of the glass stem, this deposit leading frequently to a subsequent puncture of the tube.

According to the present invention, I have provided an arrangement whereby embrittlement of the copper leads and deposition of copper on the glass stem during annealing is prevented and the copper wire at the same time is provided with a bright, clean surface.

The novel features which I believe to be characteristic of my invention are set forth with particularity in the appended claims. My invention itself, however, will best be understood from reference to the following specification when considered in connection with the accompanying drawing in which the single figure shows a view broken away and partly in section and partly in elevation of a portion of an electron discharge device embodying the features of my invention.

Referring to the drawing, I have indicated at 1 a stem portion of an electron discharge device, the stem portion being made of hard glass and having the usual press seal 2 at one end thereof through which tungsten wires 3 and 4 extend. A pair of copper conductors 5 and 6, made up of a series of wires of small diameter, are secured in any suitable manner to the tungsten wires and are adapted to supply current to a filamentary electrode, not shown, when connected to a source of energy. The upper end of stem 1 is provided with a flanged portion 7 whereby the stem may be joined or secured to a suitable glass receptacle.

To remove strains from the glass stem 1 and press seal 2, they are usually heated at an elevated temperature in an electric furnace. Before insertion in the furnace, leads 5 and 6 are surrounded with elongated copper jackets 8 and 9, closed or fused at their upper ends. These jackets have an inner diameter only slightly greater than the diameter of the stranded copper conductors at the point where the latter are joined to the tungsten wires so that there is a small space between the copper conductors and their surrounding jackets. When the copper jackets have been adjusted, the stem and conductors are heated in the electric furnace, and in a non-reducing atmosphere, to a temperature of approximately 600° C. When removed from the furnace the copper strands are entirely free from brittleness, there is no deposition of copper on the inner walls of the stem and the strands have a clean, bright appearance, the leads being cleaner after, than before annealing. Although a small amount of air is enclosed by the jackets 8 and 9; it is so small that it has no deleterious effect on the stranded copper leads.

While I have illustrated my invention mainly as applied to electron discharge devices, it is not limited to that use but may also be employed in connection with electric lamps having large seals which require flexible leads.

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

1. The method of treating a copper conductor extending through a glass stem, while annealing the glass stem, which comprises surrounding said conductor during the annealing process with a shielding tube slightly larger in diameter than the diameter of the conductor and thereafter removing said tube.

2. The method of treating stranded copper conductors extending through a glass stem, during the anneal of the glass stem, which comprises surrounding each of said conductors during the annealing process with a copper tube and thereafter removing said tube.

3. The method of treating stranded cop-

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per conductors extending through a glass stem, during the anneal of the glass stem, which comprises surrounding each of said conductors with a copper jacket closed at one end and slightly larger in diameter than its copper conductor.

4. The steps in the fabrication of a seal assembly for containers comprising juxtaposed glass and a copper member, which con-

sists in surrounding said copper member with a loosely fitting envelope and heating said assembly in a non-reducing atmosphere to a temperature at which strains are removed from said glass member.

In witness whereof, I have hereunto set my hand this 29th day of June, 1927.

CHARLES T. DE GROAT.