Aug. 23, 1938. A. J. WHITE 2,128,173

METHOD OF MAKING STEMS FOR SEALED ELECTRICAL DEVICES

Filed Nov. 27, 1937

Fig. 1.

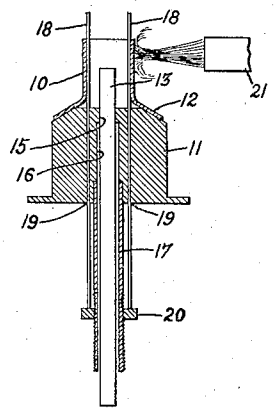


Fig. 2.

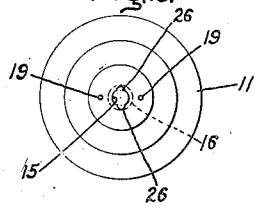


Fig. 3.

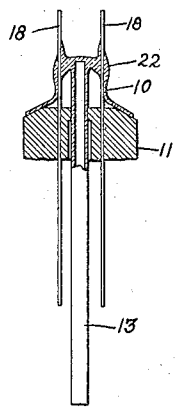


Fig. 5.

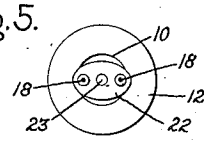


Fig. 4.

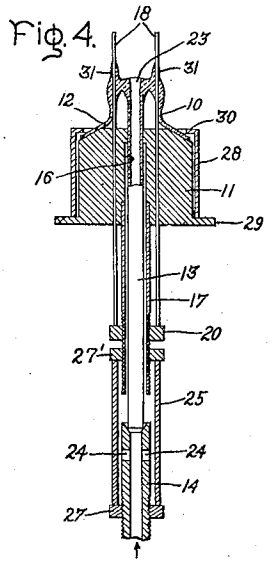
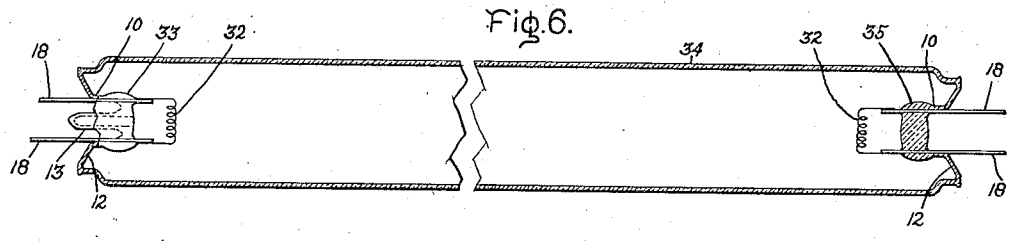


Fig. 6.



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2,128,173

METHOD OF MAKING STEMS FOR SEALED ELECTRICAL DEVICES

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Application November 27, 1937, Serial No. 176,909

3 Claims. (Cl. 176—7)

My invention relates to stems for sealed electrical devices such as electric lamps and discharge devices, and to methods of manufacturing the same.

The standard practice in making the stems which carry the exhaust tube and the lead-in wires upon which the energy translation elements such as the filaments or electrodes of electric lamps or similar devices are mounted, is to assemble a stem tube, an exhaust tube and the lead-in wires with the inner ends of the stem and exhaust tubes lowermost and substantially in line. The expression "inner end" is used herein with reference to the stem tube to indicate that end of the said tube which extends into the envelope or bulb and in which the lead-in wires are sealed, while the expression "outer end" indicates the end which is united to the bulb. The corresponding ends of the exhaust tube are similarly designated. The stem is gripped by a pair of jaws at a point adjacent to its upper or outer end while the exhaust tube is gripped by another pair of jaws. The lower or inner ends of the exhaust and stem tubes are fused together at a point below the stem tube holding jaws and then compressed by clamping the fused glass around the lead-in wires with another pair of jaws. This results in a "press" portion consisting of a flat solid mass of glass at the inner end of the stem tube with the lead-in wires extending therethrough. Air pressure is then applied through the exhaust tube to blow a passage through the molten glass at an angle to the flat surface of the press portion. The exhaust tube communicates through this passage with the interior of the envelope when the stem is sealed thereto. This process is described in Patent No. 1,423,956, Mitchell and White.

In some instances it is very desirable to make the stem as short as possible and in those cases the stem cannot be made short enough by the above-described process. The stem tube jaws cover a substantial length of the stem tube and are spaced from the inner or lower end of the stem a substantial distance to prevent the molten glass from sticking thereto. Moreover, the flat press portion extends longitudinally of the stem tube a substantial distance and thus further adds to the length of the finished stem. It is therefore not feasible to make the stem shorter than about 26 mm. according to standard practice, and this is too long for many purposes.

One of the objects of the present invention, therefore, is to provide a method for making a shorter stem than can be made according to prior standard practice. Another object is to provide a method of making stems which is very simple and economical and which will produce stems which are gas tight and substantially free from strains. Other objects and advantages of my invention will appear from the following description and from the drawing.

In the drawing, Fig. 1 is an elevation, in section, showing the assembly of the parts of a stem on a suitable holder or head in accordance with my invention; Fig. 2 is a plan view of the holder or head; Figs. 3 and 4 are views similar to Fig. 1 illustrating further steps in the manufacture of a stem; Fig. 5 is a plan view of the stem shown in Fig. 4; and Fig. 6 is a longitudinal sectional view of an electric discharge lamp having stems therein made in accordance with my invention.

Referring to Fig. 1, the stem tube 10 is disposed on the upper end of the holder 11 of a head in an upright position, that is, with the flanged end 12 thereof lowermost, contrary to the usual present practice. The exhaust tube 13 is disposed concentrically within the said stem tube, being gauged at its lower end by the upper end of a tube 14 (Fig. 4). The said exhaust tube 13 extends through a closely fitting opening 15 and an enlarged opening 16 in the holder 11 and through a tube 17 which supports the holder 11. The exhaust tube 13 is preferably located so that its upper end is below the upper end of the stem tube 10, as shown in Fig. 1, although it may be at the same level as the upper end of the stem tube. The lead-in wires 18—18 extend through openings 19—19 in the holder 11 and are gauged at their lower ends by a nut 20 screwed on the threaded lower end of the tube 17.

With the parts of the stem properly disposed, the head comprising the holder 11 is rotated and the upper end of the stem tube 10 is heated by a gas flame from a burner 21, causing it to collapse about the lead-in wires 18—18 and form a solid mass of plastic glass 22 (Fig. 3) which forms a comparatively thin layer over the upper end of the exhaust tube 13 and closes it off. While the glass mass 22 is still plastic, compressed air is blown through the exhaust tube 13 to form an opening or aperture 23 (Fig. 4) through said mass in axial alignment with the exhaust tube. Air is also blown into the space between the exhaust tube 13 and stem tube 10 to round out the joint therebetween. The stem is then preferably further heated by a soft flame in order to anneal the glass and prevent cracking thereof upon cooling.

The air for blowing out the opening 23 and for

rounding out the joint between the exhaust tube 13 and stem tube 10 is introduced through the tube 14 (Fig. 4), some of the air going straight up through the exhaust tube 13. Some of the air also passes through lateral openings 24 in the tube 14, into a sleeve 25 surrounding the ends of tubes 14 and 17, thence into the said tube 17 around the exhaust tube 13, through opening 16 and through openings 26—26 (Fig. 2) at the sides of opening 15 into the space between the exhaust tube 13 and stem tube 10. The sleeve 25 is held between nuts 27' and 27 threaded on the tubes 17 and 14 respectively. In order to prevent the stem from being blown upward off the holder 11, it is weighted down, for example, by a cylindrical member 28 which rests on a flange 29 on holder 11 and has its upper end inwardly flanged at 30. The flange 30 extends over and just above the flanged end 12 of the stem 10, thereby preventing it from being blown upward.

It will be noted that in the process described above the glass mass 22 is not compressed by clamping as is the usual practice. By fusing the upper end of the stem tube and permitting the glass to flow downward freely, the stem may be made quite short, for example 12 mm. in length or even a little shorter if desired.

During the collapse of the upper end of the stem tube 10, a thin coating of glass 31—31 adheres to the lead-in wires 18—18. For mounting an electrode 32 (Fig. 6) on the said leads 18—18, the said glass coating 31—31 may be removed, by pinching for example, thereby exposing the portions of the said leads covered thereby which are clean and free from oxide so that the ends of the electrode 32 may be readily welded thereto, the ends of said leads being trimmed off if desired. The electrode 32 preferably consists of a coiled coil of tungsten wire coated with an electron emissive material such as barium and/or strontium oxide.

For making a tubular electric discharge lamp as shown in Fig. 6, the stem 33 made by the process described above, is sealed to one end of a tubular glass envelope 34. The sealing-in is preferably performed by the method described and claimed in my co-pending application Serial No. 176,910, of even date, wherein the adjacent end of the flange 12 of the stem and the end of the envelope 34 are held in abutting relation with a disc of carbon, for example, which is heated by induction so that the said ends of the flange and envelope are fused and sealed together by heat conducted from the said disc. The opposite end of the envelope 34 has sealed thereto a stem 35 which is made in the same manner as stem 33 except that the exhaust tube 13 is omitted. To complete the lamp shown in Fig. 6, it is exhausted through the tube 13 and is then filled with a gaseous atmosphere comprising, for example, a filling of argon at a pressure of about 4 mm. and a small quantity of mercury, after which the exhaust tube is sealed. The inner surface of the envelope may be coated with a luminescent material such, for example, as zinc silicate, cadmium silicate, calcium tungstate, cadmium borate or zinc beryllium silicate.

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

1. The method of making a stem for an electric lamp or similar device which comprises assembling a stem tube, lead-in wires, and an exhaust tube in a vertical position with the exhaust tube inside of the stem tube and the lead-in wires extending longitudinally of said tubes, fusing the upper end of said stem tube to cause it to flow freely downward and form a solid mass of glass inclosing a portion of said lead-in wires and forming a comparatively thin layer over the end of said exhaust tube to close it off, and delivering gas pressure through said exhaust tube to blow an aperture axially through said mass of glass.

2. The method of making a stem for an electric lamp or similar device which comprises assembling a stem tube, lead-in wires, and an exhaust tube in a vertical position with the exhaust tube inside of the stem tube, the upper end of said exhaust tube being located below the upper end of said stem tube and the lead-in wires extending longitudinally of said tubes, fusing the upper end of said stem tube to cause it to flow freely downward and form a solid mass of glass inclosing a portion of said lead-in wires and forming a comparatively thin layer over the end of said exhaust tube to close it off, and delivering gas pressure through said exhaust tube to blow an aperture axially through said mass of glass.

3. The method of making a stem for an electric lamp or similar device which comprises assembling a stem tube, lead-in wires, and an exhaust tube in a vertical position with the exhaust tube inside of the stem tube and the lead-in wires extending longitudinally of said tubes, fusing the upper end of said stem tube to cause it to flow freely downward along said lead-in wires and form a solid mass of glass inclosing a portion of said lead-in wires and forming a comparatively thin layer over the end of said exhaust tube to close it off, and delivering gas pressure through said exhaust tube to blow an aperture axially through said mass of glass, removing the thin coatings of glass on said lead-in wires above said mass of glass and welding the ends of an electric energy translation element to the thus exposed portions of said lead-in wires.

ARTHUR J. WHITE.