Oct. 3, 1944. A. J. WHITE 2,359,500

SEALING-IN METHOD

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Fig. 1.

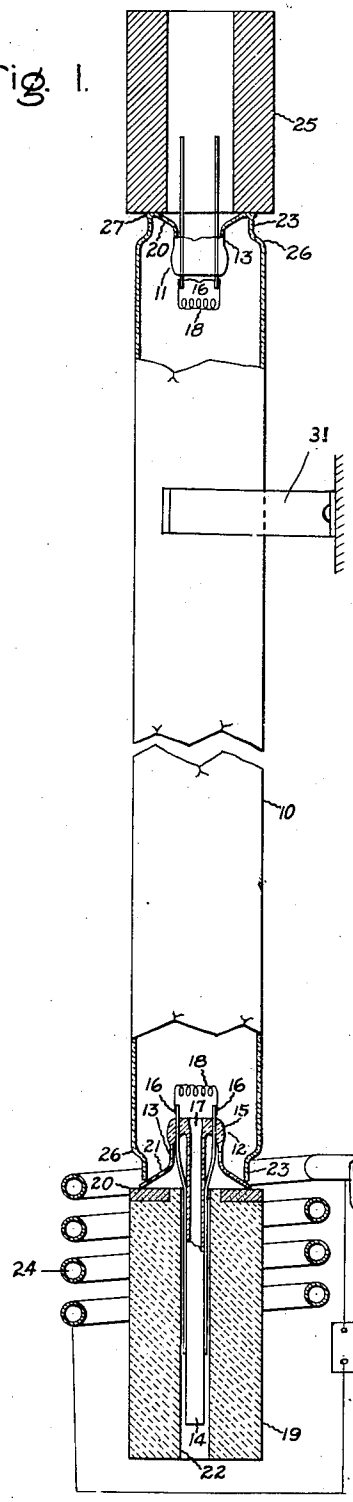
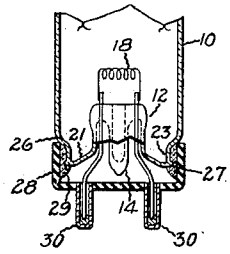


Fig. 2.



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SEALING-IN METHOD

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Renewed January 11, 1940

7 Claims. (Cl. 49—78)

My invention relates to an improved method of sealing together the ends of tubular glass members, and more particularly to a method of sealing glass stems in the bulbs or envelopes of electric lamps or similar devices.

Stems for electric lamps and similar devices generally comprise a glass stem tube having one end fused around a portion of one or more lead-in wires extending through the tube, the other end of said tube being flared or flanged outward. The stem is sealed in a bulb or envelope by inserting it therein and then applying gas flames to fuse the open end or neck portion of said bulb or envelope and the flange on said stem to seal them together.

The above method has the disadvantage in some instances that the gas flames distort a considerable portion of the bulb or envelope adjacent to the seal. This may be objectionable for several reasons, one of which is that the subsequently attached base may not be properly seated on the bulb. Moreover, the gas flames may, in some instances, adversely affect the lead-in wires extending from the stem.

One of the objects of the present invention is to provide a new and improved method of sealing a stem in an envelope which will obviate the above-mentioned disadvantages and will seal a stem in an envelope without distortion of the portion of the envelope adjacent to the sealed joint. Another object is to provide a method by which the stem is quickly and efficiently sealed in the envelope to produce a hermetical seal free from cracks. Other objects and advantages of my invention will appear from the following description and from the accompanying drawing.

In the drawing, Fig. 1 is an elevation, mostly in section, of a tubular electric discharge lamp and a portion of an apparatus for sealing stems in the ends of the tubular envelope of the lamp in accordance with my invention, and Fig. 2 is an elevation, mostly in section, showing one end of the lamp with a base attached thereto.

According to my invention, the method of sealing consists generally in placing a stem with its flanged end resting on a disc or ring of a material which is capable of being heated by induction and will not adhere to the fused glass, such as carbon. The envelope is then placed over the stem with its open end or neck portion resting on the flange or adjacent thereto. The said disc or ring is then heated to a high degree by induction to cause the adjacent ends of the stem and envelope to be fused and sealed together by conduction and radiation of heat from the said disc or ring. Pressure may be applied at the opposite end of the envelope, if desired, to press the fused ends of the envelope and stem thereagainst.

Referring to Fig. 1, the lamp illustrated therein in process of assembly comprises a tubular glass envelope 10 having a stem 11 at its upper end (shown as already sealed in), and another stem 12 at its lower end about to be sealed in. The said stem 12 is of the so-called tipless variety and comprises a glass stem tube 13 and an exhaust tube 14 which are fused at their upper ends to form a mass of glass 15 enclosing portions of lead-in wires 16—16, there being an axial opening 17 through the said mass of glass formed by blowing through the said exhaust tube 14. An electrode 18, consisting preferably of a coiled-coil of tungsten wire coated with an electron emissive material such as barium and/or strontium oxide, is secured at its ends to the inner ends of the lead-in wires 16—16. It is very desirable that the stems be as short as possible in order that the electrodes 18—18 may be close to the ends of the envelope 10. Therefore, in making the stem 12 it is held in an upright position and the upper ends of the stem tube 13 and exhaust tube 14 are heated to fusion by gas flames, causing them to collapse and flow down along the lead-in wires 16—16 to form the solid mass of glass 15. While the glass mass 15 is still plastic, air pressure is applied to the exhaust tube 14 to blow the opening 17, there being no compression or pressing of the glass mass 15 by a pair of jaws at any time as is the usual present practice. Air is also blown into the space between the exhaust tube 14 and stem tube 13 to round out the joint therebetween, thereby eliminating sharp corners which may lead to cracks. During the flowing of the glass downward along the lead-in wires 16—16, the said wires are coated with a layer of glass, and breaking off this coating leaves a clean surface, free from oxide, to which the ends of the electrode 18 may be readily welded. The stem 11 is made in the same manner except, of course, that the exhaust tube 14 is omitted. This method of making the stems is described and claimed in my application No. 176,909, of even date, now Patent 2,128,173. Of course, stems made according to standard practice may be used if desired.

For sealing in the stem 12, I have illustrated in Fig. 1 an apparatus comprising a support rod or block 19 of refractory insulating material, such as sillimanite, having a disc or ring 20 of material which is capable of being heated by induction and will not adhere to glass, preferably

carbon, placed on its upper end. The stem 12 is placed with its flanged end 21 resting on the disc 20 in abutting relation therewith, the exhaust tube 14 and lead-in wires 16—16 extending into an axial opening 22 in the support rod 19. The envelope 10 is then clamped in the jaws of a holder 31 and it is lowered until the reduced open end or neck portion 23 thereof rests on the flange 21. A coil 24, which is connected to a suitable source 32 of high frequency current, is then slowly raised by a lever 33, for example, so as to surround the disc 20, thereby heating the said disc by induction to a very high degree and causing the envelope neck 23 and flange 21 to be fused and sealed together. Pressure is preferably applied to the envelope 10 during the sealing operation, for example, by a suitable weight 25. By this method of sealing the neck 23 of the envelope is not distorted, nor is the shoulder 26 distorted, nor is any portion of the short stem 12 distorted. The envelope 10 and stem 12 are permitted to remain on the disc 20 for a short period after the current flow to coil 24 has been interrupted so that the sealed joint is annealed.

By making the flange 21 large enough to extend a short distance beyond the neck 23 of the bulb, as shown in Fig. 1, a small bead 27 may be formed at the sealed joint which may be desirable for preventing the base from being pulled off the envelope. In Fig. 2, I have illustrated one form of base comprising a shell 28 of insulating material which is butted against the shoulder 26 and is attached to the neck 23 of the envelope by cement 29, the bead 27 being embedded in said cement. Since the shoulder 26 is undistorted, the bases 28 of different lamps are always uniformly mounted and the overall lengths of the lamps are held within close limits. Each of the bases 28 is in this instance provided with a pair of pins 30—30 to which are connected the lead-in wires 16—16.

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

1. The method of sealing a glass stem tube to the glass envelope of an electric lamp or similar device which comprises placing adjacent ends of said stem tube and envelope against a disc of material which is capable of being heated by induction and will not adhere to glass and then heating said disc by induction to cause a portion of the generated heat to flow by conduction to the abutting ends of said stem tube and envelope to fuse them together.

2. The method of sealing a glass stem tube to the glass envelope of an electric lamp or similar device which comprises placing adjacent ends of said stem tube and envelope against a disc of carbon and then heating said disc by induction to cause a portion of the generated heat to flow by conduction to the abutting ends of said stem tube and envelope to fuse them together.

3. The method of sealing a glass stem tube having a flanged end to the end of the glass envelope of an electric lamp or similar device which comprises positioning said stem tube with its flanged end in abutting relation with a disc of material which is capable of being heated by induction and will not adhere to glass, placing said envelope over said stem tube with its end pressing against the said flanged end of said stem tube, and then heating said disc by induction to cause a portion of the generated heat to flow by conduction to the abutting ends of said stem tube and envelope to fuse them together.

4. The method of sealing adjacent ends of glass tubes together which comprises arranging said tubes one within another with their adjacent ends against a disc of material which is capable of being heated by induction and will not adhere to glass and then heating said disc by induction to cause a portion of the generated heat to flow by conduction to the abutting ends of said tubes to fuse them together.

5. The method of sealing adjacent ends of glass tubes together which comprises arranging said tubes one within another with their adjacent ends in contact and at least one of them abutting against a disc of material which will not adhere to glass and then heating said disc to cause a portion of the generated heat to flow by conduction to the said ends of said tubes to fuse them together.

6. The method of sealing adjacent ends of glass tubes together which comprises arranging said tubes one within another with their adjacent ends in contact and at least one of them abutting against a disc of material which will not adhere to glass and then heating said disc electrically to cause a portion of the generated heat to flow by conduction to the said ends of said tubes to fuse them together.

7. The method of sealing a glass stem tube to the glass envelope of an electric lamp or similar device which comprises placing adjacent ends of said stem tube and envelope in contact with each other and the end of one of them against a disc of material which will not adhere to glass and then heating said disc to cause a portion of the generated heat to flow by conduction to the said ends of said stem tube and envelope to fuse them together.

ARTHUR J. WHITE.