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LAMP SEALING METHOD

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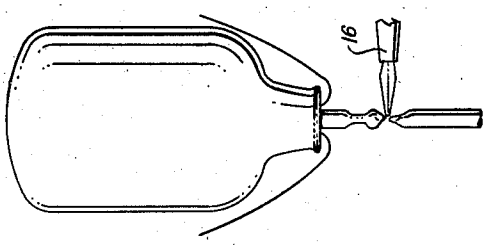


Fig. 4

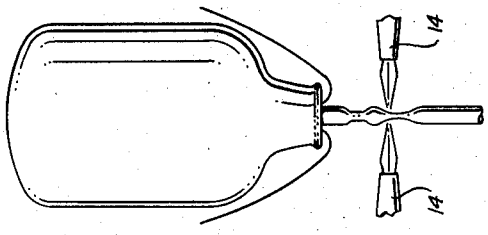


Fig. 3

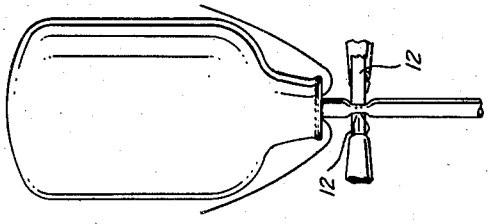


Fig. 2

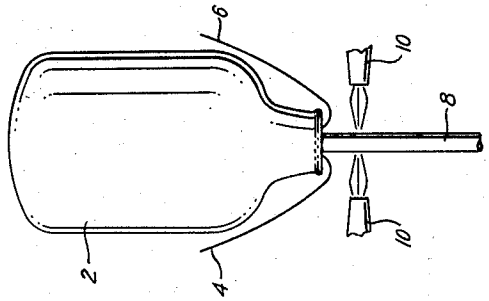


Fig. 1

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LAMP SEALING METHOD

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5 Claims. (Cl. 53—7)

This invention relates to the manufacture of electrical devices comprising a sealed envelope containing gas at a pressure above that of the surrounding atmosphere.

In the manufacture of gas-filled electric lamps, such as photoflash lamps for example, it is known that the light output of the lamp may be increased by increasing the size of the lamp envelope, the combustible and the oxygen in the lamp. It is also known that the size of the lamp envelope need not be increased if the gas pressure and quantity of combustible material is increased. However, the introduction into the lamp envelope of a gas at pressures above atmospheric poses a sealing problem which precludes the use of conventional sealing techniques normally employed in the manufacture of low pressure lamps on high speed machinery.

In the manufacture of low pressure lamps on high speed machinery, the glass exhaust tube is usually sealed by heating it to a temperature well above the softening point of the glass to make it flow into a gas-tight seal. In many cases the molten glass is stretched to facilitate the sealing operation. However, when gas at pressures above atmospheric is introduced into the lamp envelope, sealing of the exhaust tube cannot be effected by merely heating it to a temperature well above the softening point to make it flow because the molten glass is not strong enough to withstand the greater inside pressure and the wall of the exhaust tube ruptures.

Various means have been devised heretofore to effect this sealing operation, most of which usually involve a substantial amount of additional equipment and/or a substantial increase in the number of operational steps required. In most cases a substantial diminution in production speeds is necessitated.

In view thereof, an object of this invention is to provide a simple, efficient and effective method of tipping-off the exhaust tubes of electrical devices having a filling of gas at pressures above ambient.

Another object of this invention is to provide a tipping-off method which is readily adaptable to high speed lamp manufacturing equipment.

A further object is to provide a tipping-off method which may be employed without requiring a substantial reduction in production speeds.

These and other objects, advantages and features will be apparent from the following description of our method when read in conjunction with the accompanying drawing in which:

Figure 1 is a side elevational view of a lamp showing the exhaust tube thereof being heated.

Figure 2 is a side elevational view of a lamp showing the exhaust tube thereof being pinched closed.

Figure 3 is a side elevational view of a lamp showing the exhaust tube thereof being heated at a point below the pinched portion.

Figure 4 is a side elevational view of a lamp showing the exhaust tube thereof being tipped-off at a point below the pinched portion.

The lamp shown in the accompanying drawing comprises a sealed envelope 2 with a pair of lead-in wires 4 and 6 and an exhaust tube 8 extending therefrom.

In accordance with the principles of our invention, a filling of a gas above ambient pressure is introduced into the lamp envelope 2 through the exhaust tube 8. After the lamp envelope 2 has been provided with the desired gas fill, the exhaust tube 8 is heated by burners 10 (Fig. 1) until the exhaust tube 8 is workable but is not so soft that a rupture due to pressure differential will occur. The molten portion of the exhaust tube 8 is then pinched by jaws 12 (Fig. 2) to completely close the passage through the exhaust tube. After the exhaust tube has been pinched closed, that portion of the exhaust tube below the pinch is evacuated to bring the pressure therein below ambient and the exhaust tube is heated by burners 14, this time at a point below the pinch (Fig. 3), until the glass softens and becomes plastic. The exhaust tube is then stretched to provide a constriction therein. Finally, tipping-off at the constriction (Fig. 4) is effected by burner 16.

It will be apparent to those skilled in the art that this method represents a substantial improvement over methods heretofore employed because it is readily adaptable to conventional manufacturing equipment. It eliminates the need for a bell jar type of enclosure within which the sealing operation is performed in accordance with the teachings of some of the prior art methods. In accordance with other teachings of the prior art the exhaust tube is pinched closed and the exhaust tube stub is cracked off mechanically. In accordance with our method, the need for a device to perform the cracking off operation, and the attendant danger of fracturing the pinched portion, are avoided.

In accordance with the method of this invention, that portion of the exhaust tube below the pinched portion is evacuated to a pressure below atmospheric, thus making it possible to then heat the exhaust tube below the pinch to a molten state and effect the final tipping-off operation by the application of heat in combination with a stretching of the molten glass without the danger of rupturing the wall of the exhaust tube because of pressure differential conditions.

What we claim is:

1. The method of sealing and tipping-off an exhaust tube extending from and in communication with the interior of a sealed electrical device filled with gas at a pressure above ambient, which comprises: heating a portion of the exhaust tube, while exposed to ambient pressure, to a temperature sufficient to render it sufficiently plastic to be worked but not sufficiently plastic to be ruptured by the internal gas pressure; pinching the plastic portion of the exhaust tube completely closed; evacuating the exhaust tube below the pinched portion to a pressure below ambient; and heating the exhaust tube below the pinched portion to a temperature sufficient to effect a severance thereof.

2. The method of sealing and tipping-off an exhaust tube extending from and in communication with the interior of a sealed electrical device filled with gas at a pressure above ambient, which comprises: heating a portion of the exhaust tube, while exposed to ambient pressure, to a temperature sufficient to render it sufficiently plastic to be worked but not sufficiently plastic to be ruptured by the internal gas pressure; pinching the plastic portion of the exhaust tube completely closed; evacuating the exhaust tube below the pinched portion to a pressure below ambient; and heating the exhaust tube below the pinched portion to a temperature sufficient to cause it to flow into a gas-tight seal and effect a severance thereof.

3. The method of sealing and tipping-off an exhaust tube extending from and in communication with the interior of a sealed electric lamp filled with gas at a pressure

above atmospheric, which comprises: heating a portion of the exhaust tube, while exposed to atmospheric pressure, to a temperature sufficient to render it sufficiently plastic to be worked but not sufficiently plastic to be ruptured by the internal gas pressure; pinching the plastic portion of the exhaust tube completely closed; evacuating the exhaust tube below the pinched portion to a pressure below atmospheric; and heating the exhaust tube below the pinched portion to a temperature sufficient to effect a severance thereof.

4. The method of sealing and tipping-off an exhaust tube extending from and in communication with the interior of a sealed electrical device filled with gas at a pressure above ambient, which comprises: heating a portion of the exhaust tube, while exposed to ambient pressure, to a temperature sufficient to render it sufficiently plastic to be worked but not sufficiently plastic to be ruptured by the internal gas pressure; pinching the plastic portion of the exhaust tube completely closed; evacuating the exhaust tube below the pinched portion to a pressure below ambient; heating the exhaust tube below the pinched portion to a plastic state; stretching the plastic portion of the exhaust tube to provide a constriction therein; and heating the constricted portion to effect a severance of the exhaust tube.

5. The method of sealing and tipping-off an exhaust tube extending from and in communication with the interior of a sealed electric lamp filled with gas at a pressure above atmospheric, which comprises: heating a portion of the exhaust tube, while exposed to atmospheric pressure, to a temperature sufficient to render it sufficiently plastic to be worked but not sufficiently plastic to be ruptured by the internal gas pressure; pinching the plastic portion of the exhaust tube completely closed; evacuating the exhaust tube below the pinched portion to a pressure below atmospheric; heating the exhaust tube below the pinched portion to a plastic state; stretching the plastic portion of the exhaust tube to provide a constriction therein; and heating the constricted portion to effect a severance of the exhaust tube.

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