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SEALED ENVELOPE AND METHOD OF MANUFACTURE

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Fig. 1.

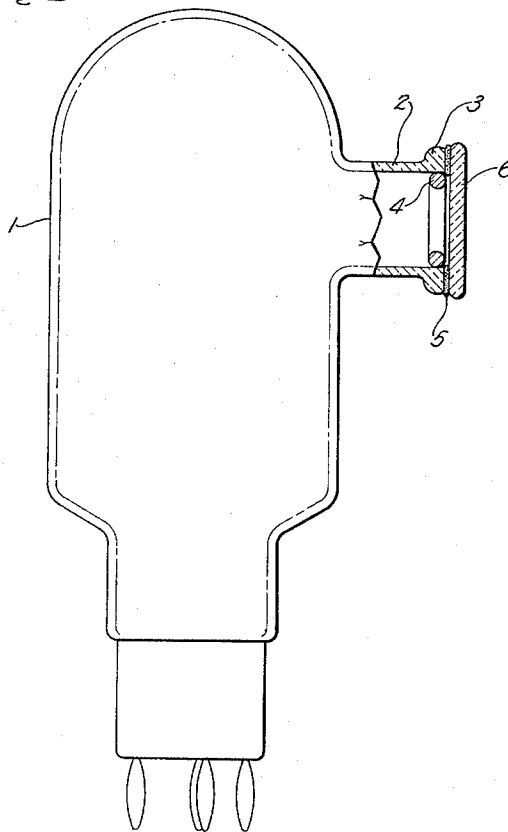
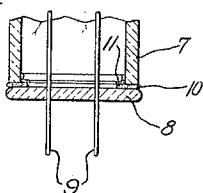


Fig. 2.



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SEALED ENVELOPE AND METHOD
OF MANUFACTUREBasil Noel Clack, Wembley Park, England, as-
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3 Claims. (Cl. 154—116)

1

This invention relates to the manufacture of sealed envelopes of the type comprising at least one vitreous closure member sealed across the aperture of a hole in a part of the envelope by means of a thermoplastic adhesive which is heated to effect the sealing and becomes liquid during the heating. Such envelopes may be used, for example, in the manufacture of electric devices such as lamps, photocells or Geiger counters which do not attain high temperatures in operation. The closure member may, for example, be a transparent window, or it may be a stem carrying one or more lead-in conductors.

In such manufactures it is sometimes found that during the sealing of the closure member to the main part of the envelope the inner surface of the member, when it is to serve as a window, becomes partly obscured by the adhesive running over it when liquefied during the heating, and since it is often impossible after the sealing to get at the inner surface of the window so as to clean it, the possibility of such obscuration occurring is a considerable disadvantage.

It is an object of this invention to provide a simple method and structure for reducing this disadvantage, as well as to provide generally a novel method and structure for effecting seals of the aforesaid type.

Further objects and advantages of my invention will appear from the following description and from the drawing wherein Fig. 1 is an elevation, partly in section, of an electric device having a window sealed to the envelope of the device in accordance with my invention, and Fig. 2 is an elevation, in section, of an electric device having a stem sealed thereto in accordance with my invention.

According to this invention, a method of manufacturing a sealed envelope of the type specified comprises the steps of fitting a solid annulus closely within the hole in the envelope so that the outer surface of the annulus lies almost flush with or projects slightly from the aperture, applying a thermoplastic adhesive to the outer surface of the envelope around the aperture and/or a perimeter band of the surface of the closure member, placing the closure member across the aperture, liquefying the adhesive by heating and pressing the closure member onto part of the envelope around the aperture to effect the seal.

In this method, in accordance with the invention, the liquefied adhesive is drawn to the solid annulus by surface tension to form a fillet between the annulus, the window, or other closure member, and the edge of the aperture, and this

2

greatly reduces the possibility of any of the liquefied adhesive running across the center part of the window.

A preferred form for the solid annulus is a metal ring spring clip made, for example, from a length of wire bent to the desired shape, the ends of which are unjoined and may be separated by a small gap.

Another suitable form which the solid annulus may take is that of a narrow thin-walled collar or cylinder which is adapted to fit closely within the wall of the aperture. This collar may be provided with a narrow inwardly flanged rim such that the flange is adapted to rest near to or against the inner surface of the closure member during the sealing operation.

The nature of the thermoplastic adhesive used for sealing the closure member to the aperture depends mainly on the nature of the surfaces to be joined and the temperature which the seal will be required to withstand in operation of the device of which the envelope forms part. Wax is commonly used for sealing vitreous windows to vitreous envelopes and is suitable for use in the method in accordance with this invention.

Some thermoplastic cements are also suitable for use in accordance with the invention; in particular, polyvinyl acetate may be used for seals which are to be subjected to temperatures up to about 150° C. in operation of the device of which they form part.

The embodiments shown in the drawing will now be described by way of example.

In Fig. 1 the glass envelope 1 has formed at one part of it a short outwardly projecting neck 2 about 22 mm. in internal diameter whose main wall thickness is substantially the same as that of the glass envelope but whose rim is formed with an outwardly directed flange 3 about 4 mm. wide which is slightly thicker than the rest of the neck. Into the end of this neck is inserted a spring clip 4 so that part of the surface of the clip lies coplanar with or projects slightly from the inner rim of the neck flange 3. This spring clip 4 consists of a length of about 68 mm. of 1 mm. diameter nickel wire which has been bent into a 22 mm. diameter ring with a small gap in its circumference.

The surface of the flange 3 which has, if necessary, been previously ground flat is then coated with warmed wax 5 and a circular quartz window 6 of 30 mm. diameter is then placed over the end of the tube or neck 2 so that it lies against the wax-coated flange 3.

The wax 5 is then liquefied by heating while

3

the window 6 is pressed against the flanged end 3 of the tube; liquefied wax is then drawn to the annulus 4 by surface tension and the wax is thereby prevented from running over the central part of the window. The whole is then allowed to cool and the annulus is cemented firmly in position by the wax.

The device shown in Fig. 2 may, for example, be a photoflash lamp of the type comprising a sealed glass bulb filled with oxygen and containing a combustible material such as a loose mass of thin metallic foil or wire and a suitable electric ignition means. In this case, the bulb neck 7 is closed by a closure member or stem in the form of a glass disc 8 through which is sealed a pair of lead-in wires 9 which support, within the bulb 7, the usual filament and associated fulminating material constituting the ignition means. The disc 8 is sealed to the bulb neck 7 by a thermoplastic adhesive 10 in the manner described in connection with Fig. 1. Although an annulus like that at 4 in Fig. 1 may be used, in this case I have shown an annulus 11 of modified form and consisting of a thin-walled collar which fits closely in the bulb neck 7 and is provided with an inwardly flanged rim which rests near to or against the inner surface of the stem 8.

When employing polyvinyl acetate, this material is dissolved in acetone and is preferably applied to the ground glass portion of the seal in the Fig. 1 construction. The quartz window is then applied, pressed into position by means of a clamp, and baked at 180° C. for 30 minutes. Preferably, the glass component is pre-baked to 100° C. after coating, but before applying the quartz window, to remove the solvent and air bubbles.

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

1. The method of sealing a vitreous envelope having an opening therein which comprises fitting a solid annulus closely within said opening so that the outer surface of the annulus lies approximately flush with the outer marginal surface of the envelope around said opening, applying a thermoplastic, non-vitreous, organic adhesive to the said marginal surface, placing

4

a vitreous disc-like closure member across said opening, liquefying the adhesive by heating and pressing the closure member against said marginal surface of the envelope so that the adhesive is drawn to the said annulus by surface tension to form a fillet thereat and to hermetically seal the closure member to the envelope.

2. The method of forming a seal between a marginal outer surface of an opening in a vitreous envelope and a marginal surface of a vitreous disc-like closure member which comprises fitting a solid annulus closely within said opening so that the outer surface of the annulus lies approximately flush with the said marginal surface of said opening, applying a thermoplastic, non-vitreous, organic adhesive to at least one of the aforesaid marginal surfaces of said envelope and closure member, placing the closure member across said opening, liquefying the adhesive by heating and pressing the envelope and closure member together so that the adhesive is drawn to said annulus by surface tension to form a fillet thereat and to hermetically seal the closure member to the envelope.

3. A device of the class described comprising a vitreous envelope having therein an opening which is closed by a vitreous disc-like closure member hermetically sealed to the marginal surface of the envelope around said opening by a thermoplastic, non-vitreous, organic adhesive, and a solid annulus in said opening at the joint between said envelope and said closure member, said adhesive forming a fillet between said annulus and the adjacent surfaces of said closure member and envelope.

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