Sept. 9, 1947. D. S. GUSTIN 2,427,096

ELECTRICAL DEVICE AND MOLDED STEM THEREFOR

Original Filed Dec. 1, 1938

Fig. 1.

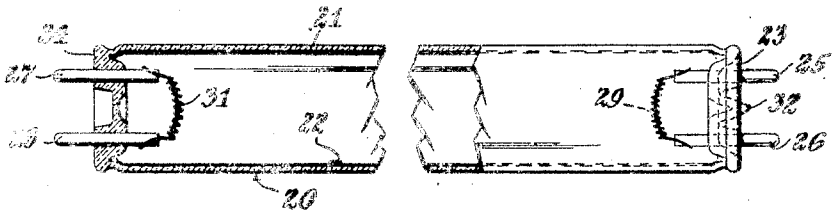


Fig. 2.

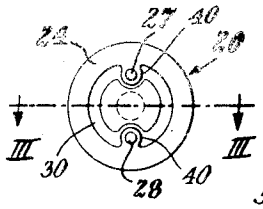


Fig. 3.

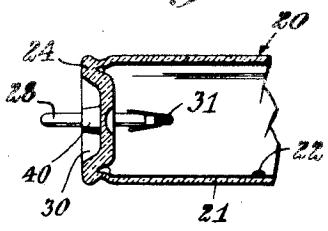


Fig. 6.

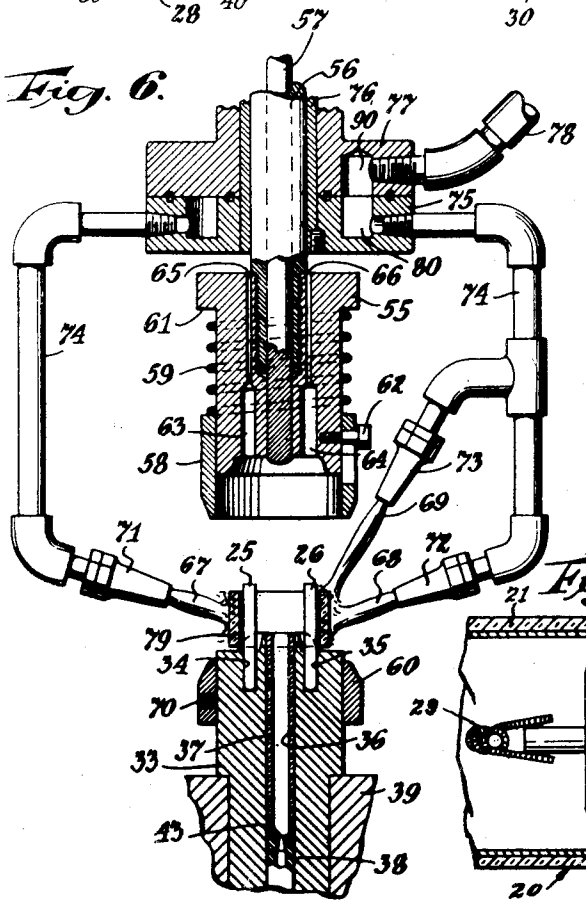


Fig. 4.

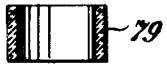


Fig. 5.



Fig. 7.

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ELECTRICAL DEVICE AND MOLDED STEM THEREFOR

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13 Claims. (Cl. 176—32)

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This application is a division of application Serial No. 243,356, filed December 1, 1938, now Patent No. 2,324,385, dated July 13, 1943, entitled Method and machine for making molded stems for electrical devices.

This invention relates to the manufacture of electrical devices, and more particularly to the molding of the flares, cups or base portions thereof.

The principal object of the invention, generally considered, is the manufacture of electrical devices such as discharge lamps, in which the lead-in conductors are made rigid enough to serve as outer contacts or posts in order to dispense with basing, the flares or cups being formed of glass molded therearound to form stems, either by softening and pressing glass blanks, or by pouring molten glass around the leads while held in place.

Another object of the invention is the manufacture of electric lamps, especially of the discharge type, in which the outer electrode leads are made so rigid that they are adapted to engage the sockets directly without basing, said leads being consolidated directly with glass cups or flares, electrodes mounted on the inner ends thereof, and the molded glass then sealed to the bulb proper.

Other objects and advantages of the invention, relating to the construction and arrangement of the various parts, will become apparent as the description proceeds.

Referring to the drawings:

Figure 1 is a fragmentary elevational view, partly in section, of an electrical discharge device embodying our invention.

Figure 2 is an end elevational view of the device of Figure 1.

Figure 3 is a fragmentary sectional view on the line III—III of Figure 2, in the direction of the arrows.

Figure 4 is an axial sectional view of one of the blanks used for making the glass base or flare which holds the heavy leads of a discharge or other electrical device, such as shown in Figure 1.

Figure 5 is an elevational view of one of the heavy leads used in making a base for a discharge or other electrical device, such as shown in Figure 1.

Figure 6 is a fragmentary vertical sectional view, with parts in elevation, showing one embodiment of a machine for manufacturing glass cups or bases for devices such as shown in Figure 1.

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Figure 7 is an axial sectional view of the right hand end portion of the device illustrated in Figure 1, with the end cup finished by placing wax-like material therein.

Referring to the drawings in detail, like parts being designated by like reference characters, and first considering Figures 1 to 5, inclusive, there is shown, as one embodiment of the invention, an electrical device 20 of the discharge type, comprising an envelope or bulb 21 in the form of an elongated hollow cylinder containing some mercury 22, the ends of said envelope being closed by glass discs, cups or bases 23 and 24. The cup 23 has incorporated therewith lead-in conductors 25 and 26, while the cup 24 has incorporated therewith lead-in conductors 27 and 28, to form stems, the conductors 25 to 28, inclusive, being so rigid that they are adapted to serve as outer contact posts and eliminate the necessity for the usual basing.

The inner ends of the leads 25 and 26 carry a filament 29, serving as one electrode, and the inner ends of the conductors 27 and 28 carry a similar filament 31, serving as the other electrode. The filaments may be formed of tungsten or other suitable material, with or without oxide coating to render them more efficient for the emission of electrons. The ends of the filaments 29 and 31 are connected to their lead-in conductors in any suitable manner, as by means of spot welding.

The conductors 25 to 28, inclusive, are formed of suitable material, tungsten and nickel alloys being mentioned as examples, and the glass sealed therearound is made of such a composition that it will not crack upon cooling around the lead-in conductors. For example, if soft glass is used for the base, then nickel iron, chrome iron, dumet or other alloys of the proper coefficient of expansion are desirably employed as the lead-in conductors. If (Corning code) No. 172 (or hard aluminum borosilicate) or No. 704 or 705 (both soft borosilicate) glass is employed, the lead-in conductors are formed of beaded molybdenum. Or if No. 704 or 705 glass is employed, such conductors may consist of "Kovar" (which is a patented cobalt-nickel-iron alloy), as for application in sodium and mercury vapor lamps. If No. 775 or 705 (both soft borosilicate) glass, or "Nonex" or No. 772 (or lead borosilicate) glass is used, then beaded tungsten leads are desirably employed to match the expansion of said glass.

It will be noted that the cup or base 23 has an exhaust tip 32 while the cup or base 24 is

without such a tip, as it is unnecessary to exhaust at more than one end. The tip 32 is protected by making the cup reentrant or concave outwardly, and the concave portion of both cups 23 and 24 may, if desired, be finished by filling with a material 50 like sealing wax as illustrated in Fig. 7.

From a consideration of Figs. 1, 2 and 3, it will be seen that by virtue of the bases or cups 23 and 24 being reentrant, an exterior recess 30 is formed in each, defined by the generally flat end or bottom wall portion, the outer peripheral rim or base edge extending at an angle to said bottom wall portion, and the reinforcing bosses 40, over or on less than half the bottom wall area, and through which the lead-in conductors 25 and 26, or 27 and 28, as the case may be, respectively extend, as shown in Fig. 3. On account of this recess the exhaust tube of the cup 23 may, if desired, be tipped off within its base, without danger of fusing or damaging the base, the thickening reinforcement or bosses 40, or injuring the lead-in conductors, if care is exercised and a small tipping off flame employed. If perchance, the extreme end of the tip 32 projects slightly, as illustrated in Fig. 1, after tipping-off and removal of the outer end of the exhaust tube, the projecting end portion may, before it hardens completely, readily be pushed or flattened so as to lie entirely within the recess 30, and not project beyond the plane of the peripheral edge portion of the cup 23. The bosses 40, which have flat outer surfaces parallel to the bottom wall portion, are formed by thickening parts of said bottom wall portion toward or to the outer surface or plane of the peripheral rim, flange, or base edge portion.

Referring now to Fig. 6, there are shown portions of one embodiment of a machine for forming such bases as just described and the manufacture of one, such as designated by the reference character 23, with an exhaust tube will be disclosed.

The machine, as shown in this figure, comprises a lower mold element 33 having pockets or cavities 34 in its upper face for receiving relatively rigid or thick one-piece lead-in conductors 25 and 26, such as those designated as forming parts of the cup or glass base 23. The lower mold element 33 also has a central aperture 36 receiving a glass exhaust tube 37, the lower end of which rests on the upper end of a tube 38, desirably formed of metal and adapted to carry compressed air to said exhaust tube. The lower mold element may be held in position in a support 39. Air may be conducted to the lower end of the tube by any desired means, such as a rubber tube from a suitable source of supply. The parent Patent No. 2,324,385, dated July 13, 1943, is referred to for a more complete description of the apparatus and method of manufacturing the bases or cups 23 and 24.

The air tube 38 desirably has the upper or exterior end of its passage constricted, as indicated at 43, so as to eliminate the possibility of glass flowing thereinto, as when employed without an exhaust tube.

Cooperating with the lower mold element 33 is an upper mold element 55 carried on and operated by a rod 56. Operable in the upper mold element 55 is a plunger 57. The upper mold element carries an annular supplemental mold portion 58, vertically slidable thereon and held in normal or lower position, as by means of coil spring 59, operating between its upper surface

and a shoulder 61 on the upper mold element 55. Undesired depression of the supplemental mold member 58 is prevented by means of a stop 62, connected to the upper mold element 55, and received in a corresponding slot in the supplemental member 58. When the upper mold element descends, the supplemental member telescopes with the lower mold member 33 and engages an annular member 60 connected thereto, as by means of a set screw 70.

The upper mold element 55 is provided with pockets or apertures 63 and 64, receiving the upper ends of the leads 25 and 26, and desirably having their upper ends vented to the atmosphere, as by means of small apertures 65 and 66, to relieve compression as the mold closes.

In order to heat the moldable material, such as the glass blank 79 and the upper end of the exhaust tube 37 during the process of forming the disc cup or base for the device of Figure 1, I provide suitable fires 67, 68 and 69, issuing from nozzles 71, 72 and 73, carried by piping 74, supplied with suitable combustible gas from manifold 75, carried by and rotatable with hollow shaft 76, driven by suitable means so that it rotates on the rod 56, and receiving a gaseous mixture through registering ports 80 and 90 from the hollow collar 77, held against rotation with the shaft 76, and receiving gas from pipe 78.

The manner of using the machine of Figure 6 for making glass cups or bases, such as designated by the reference character 23 is desirably as follows:

The first step in the operation, is desirably to place an exhaust tube 37 in the lower mold element, where it rests on the upper end of the air tube 38, as shown in Figure 6. The lead-in conductors 25 and 26 are then placed in their pockets 34 and 35, in the lower mold element, as shown in the same figure. A section 79 of large diameter glass tubing, corresponding in volume with that of the cup to be formed, is then placed on the lower mold element 33 so that it encircles the upper end of the exhaust tube 37 and the lead-in conductors 25 and 26, as shown in Figure 6.

The fires 67, 68 and 69 are then rotated, by turning the hollow shaft 76 by any suitable means, not shown, until the glass of the section 79 softens and draws around the leads 25 and 26. The action of the softened glass in wetting the leads 25 and 26 and drawing in around the upper end of the exhaust tube 37, is facilitated by the direction of flow of the fires 67, 68 and 69, and the surface tension of the nearly molten glass.

When the glass becomes sufficiently soft, the upper mold element 55 is brought down as by a downward movement of its supporting rod 56, causing the supplemental mold member 58 to telescope with the lower mold element 33, engage the annular member 60, and the glass to be pressed into the desired shape between the upper and lower mold elements 55 and 33. The glass, at the same time, is pressed into consolidating engagement with the upper end of the exhaust tube 37, the glass above the exhaust tube opening being thinned by the downward movement of the plunger 57, which also insures a good seal with the exhaust tube.

The next step in the process, is to raise the upper mold element 55, slightly, while leaving the plunger 57 in engagement with the formed cup or base 23, whereby said base is detached from the upper mold element and remains rest-

ing on the lower mold element 33. Both upper mold element 55 and plunger 57 are then raised out of the way. The diaphragm or thin section of glass closing the upper end of the exhaust tube 37, is now broken before the glass has had a chance to harden, by compressed air directed upwardly through the exhaust tube.

The completed base or cup 23, with the exhaust tube 37 sealed thereto, is then ejected or stripped from the lower mold element 33, by an upward movement of the air tube 38, as by means of the cam acting on a roller secured thereto, whereupon, an operator may remove the formed base or cup completely from the machine, preparatory to making another one.

It will, of course, be understood that in order to make the base or cup forming operation continuous, I desirably have a series of mold elements and associated parts, such as shown in the figure, and cause the same to move along to first receive the elements 37, 25, 25 and 79, heat and compress them to consolidate and form the base or cup, and then raise them for removal.

The parent Patent No. 2,324,385 may be referred to for further illustrations of the machine of Fig. 6 and other embodiments for making the cups or bases disclosed.

From the foregoing disclosure, it will be seen that I have devised a novel form of glass stem, base, or cup, particularly adapted for discharge devices. The cups, as formed have incorporated therewith, rigid prongs having the double function of lead-in conductors and outer contact members, thereby enabling me to dispense with a subsequent basing operation.

Although a preferred embodiment of my invention has been disclosed, it will be understood that modifications may be made within the spirit and scope of the appended claims.

I claim:

1. In an electrical device, a molded glass cup, said cup being concave outwardly forming a cavity within a peripheral rim, bosses disposed in said cavity and merging with said rim, lead-in conductors extending through said bosses, and an exhaust tube disposed between said bosses.

2. In an electrical device, a glass envelope, a glass base closing an opening of said envelope and attached thereto, said base having an outwardly opening recess, spaced bosses arranged within said recess and merging with said rim, an exhaust tube carried by the base, extending into said recess, and spaced from said bosses, and lead-in conductors passing through said bosses.

3. In an electrical device, a glass cup, said cup being concave outwardly forming a cavity within a peripheral rim, a boss disposed in said cavity, a lead-in conductor extending through said boss, and an exhaust tube disposed in said cavity adjacent said boss.

4. An electric device comprising an elongated glass envelope having an end closed by a pressed glass disc fused to the said end of said envelope, conductors extending through and fused directly to said glass disc and projecting outwardly therefrom to function as contact pins, a centrally arranged hollow re-entrant projection on said glass disc extending into said envelope and providing a recess in the outer surface of said disc, an exhaust tube depending from the inner end of said projection and sealed off within said recess, and means secured to said disc and covering at least the portion which is recessed.

5. An electric device, comprising a glass envelope, a glass base closing the opening of the envelope and attached thereto, said base having an exterior recess extending substantially to the marginal edge of the base, spaced reenforcing bosses arranged within the exterior recess and formed integral with the base, an exhaust tube carried by the base and extending into the recess and spaced from the reenforcing bosses, and terminal contact units embedded in the reenforcing bosses, the arrangement being such that access may be had to the exhaust tube through the exterior recess to fuse and tip off the same within the recess without liability of fusing the base or reenforcing bosses.

6. An electric device, comprising a glass envelope, a glass base closing the opening of the envelope and fused thereto, said base having an exterior recess extending substantially to the marginal edge of the base, spaced reenforcing bosses arranged within the exterior recess and formed integral with the base, an exhaust tube carried by the base and extending into the recess and spaced from the reenforcing bosses, the arrangement being such that access may be had to the exhaust tube through the exterior recess to fuse and tip off the same within the recess without liability of fusing the base or the reenforcing bosses, and a reenforcing filling for the exterior recess serving to reenforce the base and having the reenforcing bosses and parts of the terminal contact units embedded within such reenforcing filling.

7. In an electrical device, a base formed as a glass cup, said cup being concave outwardly forming a cavity within a peripheral rim, a part of said cup being thickened to form a boss within said cavity, and a lead-in conductor sealed through said boss.

8. In an electrical device, a base formed as a molded glass cup opening outwardly, the bottom portion of said base being thickened forming a boss, and a rigid lead passing through said thickened portion in order that its outer portion may function as a contact post.

9. In an electrical device, an envelope open at opposite ends, and a glass base at each end of said envelope, each base having a bottom wall portion, lying in a plane generally perpendicular to the axis of said envelope, and a peripheral rim portion comprising a flange offset from, and parallel to, the plane of said bottom wall and fused to the adjacent edge of said envelope, part of each bottom wall being thickened toward the plane of said flange and forming at least one flat-topped boss small in area compared to the bottom wall area, and a rigid lead-in conductor sealed through each boss to function as a contact terminal.

10. An electrical device comprising a molded base member having a bottom wall portion, a reinforcing boss thereon and small in area compared with said wall portion, a one-piece conductor secured in said boss and rigid to serve as an outer terminal or contact post, and a peripheral rim portion on said base extending at an angle to said bottom wall portion, said boss having a flat outer surface parallel to and offset from said bottom wall portion toward the plane of the edge of said rim portion.

11. In an electrical device, a molded base having a bottom wall portion, a part of said portion being thickened over only a relatively small portion of its area, a one-piece rigid conductor secured to and extending through said thickened part to serve as an outer terminal or contact post, and a peripheral rim portion on said base extending at an angle to said bottom wall portion, said thickened part having a flat outer surface parallel to

and offset from said bottom wall portion toward the plane of the edge of said rim portion.

12. In combination, a molded cup for an electrical device comprising a bottom wall portion, a part of which is thickened for reinforcing purposes over only a relatively small portion of its area, a peripheral rim encircling said thickened part, and one-piece rigid conductor means secured in said thickened part to serve as outer contact terminal means, said thickened part having a flat outer surface parallel to said bottom wall portion and offset therefrom toward the plane of the edge of said rim.

13. An electrical device comprising a molded base with an end wall, reinforcing boss means on less than one half of said end wall area, a peripheral rim encircling said boss means, and one-piece conductor means secured in said boss means to serve as outer contact terminal means, said boss means having a flat outer surface parallel to and offset from said end wall toward the plane of the edge of said rim.

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