July 18, 1961 H. PIETZSCH ET AL 2,993,191

BASE FOR ELECTRIC DISCHARGE LAMP

Filed March 25, 1957

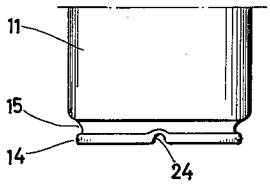



Fig. 1

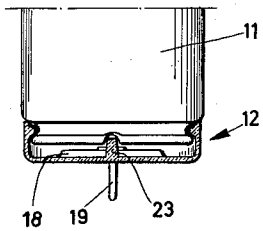
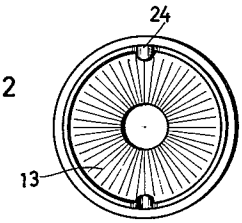



Fig. 7

Fig. 2



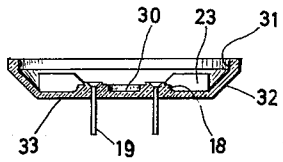
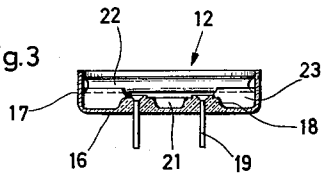




Fig. 5

Fig. 3



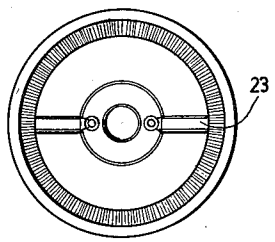




Fig. 6

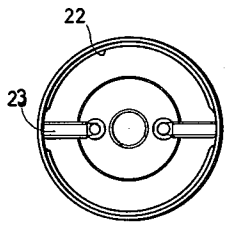



Fig. 4

INVENTORS

HERBERT PIETZSCH

OTTOKAR SORGE

BY Howard R. King

ATTORNEY

United States Patent Office

2,993,191

Patented July 18, 1961



2,993,191

# BASE FOR ELECTRIC DISCHARGE LAMP

Herbert Pietzsch, Berlin-Haselhorst, and Ottokar Sorge, Berlin-Frohnau, Germany, assignors to Patent-Treuhand-Gesellschaft für elektrische Gluhlampen m.b.H., Munich, Germany

Filed Mar. 25, 1957, Ser. No. 648,135
Claims priority, application Germany Mar. 28, 1956
6 Claims. (Cl. 339—145)

This invention relates to a base for electric discharge lamps and relates more particularly to a transparent or translucent base for lamps having tubular glass bulbs, the ends of which are closed by what is termed a lamp stem including a glass tubular member having a flared end which is fused to the end wall of the tubular lamp bulb. Lead wires are sealed through the stem and are electrically connected to the contact pins of a base when the base is secured to an end of a bulb by a suitable cement.

In common practice the bases used for discharge lamps vary in form, composition and structure and are of opaque material out of harmony with the light transmitting area of the bulb. The advantage of being able to provide a light transmitting base will be readily understood. Certain difficulties arise, however, in the use of a transparent material which involves not only the provision of a satisfactory material but in the means for securing the base to the bulb which brings in the need for a transparent cement. Cements for this purpose have not only been found impractical in not being suitable to meet temperature conditions, but, in the increase in the thickness of the material through which the light must pass.

It has been found, however, that a transparent or translucent base, meeting the requirements essential to manufacture of a practical and commercial article, may be had by the use of an artificial resin which, as will be explained, surmounts the difficulties heretofore encountered.

The resin selected has a modulus of elasticity of as low as about 5,000 kg./cm.$^2$ and as high as about 19,000 kg./cm.$^2$ with a breaking dilation of more than 50% and as high as about 230% and which has an initial softening temperature of as low as about 150° C. and as high as about 210° C. A modulus of elasticity which is greater than 5,000 kg./cm.$^2$ or a breaking dilation which is greater than 50% as disclosed in the present invention is required because otherwise it is not possible to pull the base over the tube end at room temperature and without heating. Also, during operation of the lamp in a closed envelope there is a temperature of about 130° C. in the surroundings of the base. In order to prevent with certainty any deformation of the base by heat in use, the base material must have a sufficiently high softening temperature or a sufficient constancy of form or shape at the temperatures occurring in operation. These characteristics are found in certain dicarboxylic acid polyamides and obtainable on the market under the trade name "Ultramid S." The breaking dilation is a percentage of increase of length to original length at moment of breakage, at room temperature and may be expressed by the formula

$$\frac{L}{L_0} \times 100 = \text{percent breaking dilation}$$

wherein L means the increase of length in mm. on drawing of a test piece at the instant of breaking, and $L_0$ means the original length in mm. of the test piece.

When a lamp base in accordance with the present invention is formed of the above material, it has been found that, not only may the base be readily formed or molded about the bulb neck, but the material of the base, after being heated until it softens, will after cooling adhere to the glass bulb, making the use of a cement unnecessary. It was also found that the union between the glass bulb and the base was so effective as to meet prescribed torsion tests.



In practice it was ascertained that the high heat spread coefficient of expansion, of the order of magnitude of the base material selected, also results in a speedy adherence of the base to the bulb if the base is applied to the bulb end when the bulb is heated above the softening point of the base material, and if the base is cooled down quickly below the softening point of the base material. Furthermore, by reason of its higher coefficient of expansion, the base contracts faster and becomes firmly attached to the bulb, and because of the high breaking dilation of the base material, no cracking or distortion occurs due to the shrinkage of the base after cooling.

As stated, a base of the material set forth is elastic to such degree that in certain cases the use of heat may be dispensed with and the base may be attached to the bulb by the application of pressure. In this case the base wall or rim may be provided with an annular rib extending inwardly. The base may then be applied to the bulb neck and the rib forced over the bead and groove which is formed on the bulb as a result of the sealing operation. The rib is moved into the groove between this bead and the bulb proper. This operation may be performed when the base is at a temperature below the softening point as, for example, at room temperature. It has been found that the base when so applied is securely attached to the bulb. If necessary to prevent rotary movement of base relative to the bulb, the base may be formed with ribs to be disposed into grooves provided in the bulb neck.

The material employed for the base may be clear, translucent or diffusing. Its transparency at a thickness of 1 mm. amounts to at least 30% which is satisfactory. It may be desirable to obtain light radiation emitted through the glass lamp wall and through the base of not only the same intensity but also of the same color. The base material may, therefore, be the same color or luminescent material may be added.

The present base composed of the material above set forth is of particular advantage when the lamps are put to use in tropical countries, since the base material absorbs very little moisture. If the base is immersed in water for 24 hours, its weight is increased by less than 1% and its weight after complete saturation about 3% to 4% or less than 5%.

The present invention is primarily directed to the provision of a lamp base of a light transmitting material.

It is also an object of the invention to provide a base of transparent material for use with an electrical discharge lamp.

Another object of the invention is to provide a lamp base of a transparent material capable of deformation to engage and secure the base to the bulb end.

Another object of the invention is to provide a base composed of a material capable of being reformed when subjected to heat to tightly embrace a bulb surface to secure the base thereto.

Another object of the invention is to provide a base composed of a material which when subjected to heat may be reformed to make firm contact with a bulb neck and which contacting base surface adheres to the surface of the bulb.

Another object of the invention is to provide a light transmitting base composed of a material having an annular portion deformable to make firm contact with the surface of a lamp bulb and which will cement the base to the bulb surface to secure the base in fixed relation to the bulb.

The invention will be more clearly understood by reference to the following description together with the accompanying drawing, in which:

FIGURE 1 is an elevation of an end portion of a tubular lamp bulb with an annular trough and rim and with diametric notches in accordance with the present invention;

FIGURE 2 is a bottom view of the bulb shown in FIG. 1;

FIGURE 3 is a cross-section of a base to be attached to the bulb of FIG. 1;

FIGURE 4 is a plan of the base shown in FIG. 3;

FIGURE 5 is a cross-sectional view of a modified form of base;

FIGURE 6 is a plan of the base shown in FIG. 5; and

FIGURE 7 is a cross-sectional view of a base of the type of FIG. 3 assembled on a bulb of the showing of FIG. 1.

In the selected embodiment of the invention, as illustrated in the drawing, an end portion of a tubular bulb **11** is shown in FIG. 7 with a base member or cap **12** secured thereto, the bulb being shown separately in FIG. 1 and the cap separately in FIG. 3. The end of the tubular bulb **11** is closed by what is termed a lamp-stem or lamp-seal, which includes a flare tube **13** including a tubular and flared portion surrounding an exhaust tube. When the flared portion of the stem is sealed to the tubular buld end, a thickened portion in the form of an annular rim or bead **14** is formed of less diameter than the outside diameter of the tube and spaced therefrom by an annular recess or trough **15**.

In accordance with the present invention the base member **12** is in the form of a cap having a bottom wall or disk **16** surrounded by a side wall **17**. The central portion of the bottom wall is thickened at **18** to receive and secure contact pins **19** which extend from the outer surface of the base and are tubular to receive lead wires (not shown) of the lamp. Centrally located on the inner surface of the thickened wall or land **18** is a depression **21** to accommodate the end of an exhaust tube when the cap is secured to the bulb. This depression or reduced thickness of the land **18** permits slight distortion of the base of about 1 to 2 mm. in the event of impact as in the event that the lamp is mishandled or subjected to a fall.

When the base or cap is positioned with the annular wall **17** adjacent to the trough of a bulb end which has been heated to about 300° to 350° C., preferably to about 330° C., the base material melts and occupies the trough or channel **15** and by reason of the character of the material of which the base is composed, adheres to the surface of the glass bulb.

The base is quickly cooled in about ten to fifteen seconds to below its softening temperature, which is less than 210° C., causing the base material to shrink or contact about the bulb neck. This is due to the higher coefficient of expansion compared to that of the glass by reason of the particular material of which the base is composed and employed in accordance with the present invention to provide a lamp base. The coefficient of longitudinal extension of the material used amounts to 14 to $16.10^{-5}$° C. but that of glass amounts to only 0.7 to $0.9–10.5^{-5}$° C.

A base of the type shown in FIGS. 3, 4 and 7 and provided with transverse or radial ribs may in some cases be applied to the bulb neck without heating of the bulb neck. It has been found in practice that owing to the high modulus of elasticity (19,000 kg./cm.$^2$ of the material employed for the base, the base may be pressed against the bulb end to cause the annular rib or reinforcement **22** to snap over the bead or rim **14** and into trough or channel **15** of the bulb to thus secure the base against relative endwise movement with respect to the bulb and to position the radial ribs **23** in the notches **24** to prevent rotary movement of the base relative to the bulb.



As shown in FIGS. 6 and 7, the base may be in the form of a disk **25** which requires less material than when in the form of a cap or cup. The outside diameter of the disk-base **25** may be about the same as that of the rim or bead **14** of the bulb. The base **25** is pressed against the bulb end and heated by contact with the hot bulb, or otherwise, above the melting point of the base material and quickly cooled. Where contact is made between the surface **26** and bulb the material of the base adheres firmly to the glass. Since, in the bulb sealing operation variations may occur in the diameter or tapering of the flare tube of the stem, the contact surface **26** of the base may be conical, receding from the center to provide surface **27** for effective contact with the flare tube of the stem. This disk-base may also be provided with radial ribs **28** to engage notches in the rim of the bulb to prevent relative rotary movement and has a cavity **29** to accommodate the end of an exhaust tube.

FIGURES 5 and 6 show what may be termed a conical reinforced base which is of advantage from a production standpoint, since it may be readily die cast. When applied, it is pressed against the heated bulb neck and secured by virtue of heat from the bulb, or otherwise, softening the material of the base and effecting a contraction radially inwardly to thereby form an arcuate rib seating in trough **15** and adhering to the glass of the bulb thereat. As shown, this base is provided with an end wall or disk **33** and an annular reinforcement **31** and has an inclined wall **32** and a depression **30** to receive an end of an exhaust tube and may be provided with radial ribs **23**.

As will be evident from the foregoing, the present invention not only provides a more desirable type of base from the light-transmitting standpoint, but makes use of a material capable of being deformed or molded into fixed relation with a bulb neck and provides the added important feature of being rendered adherent to cement the parts together. By reason of the properties and workability of the material employed, it not only is found desirable for use to provide a base but may be employed to provide a transparent or translucent socket.

Although a preferred embodiment of the invention is shown and described herein, it will be understood that modifications may be made therein without departing from the spirit and scope of the invention, as set forth in the appended claims.

What is claimed is:

1. In combination, a tubular discharge lamp bulb having an end closed by a stem seal and providing thereat an annular rim and an annular trough between the body of said bulb and said rim, said rim having two diametrically opposed notches, and a base dimensioned for making direct physical contact with at least a part of the exterior of said bulb end, said base comprising light-passing material and being in the form of a cap comprising a disk and an annular wall, said disk having two radial ribs diametrically opposed for engaging in said notches to retain the base against rotary movement relative to said bulb, said disk having base pins therein and projecting therefrom in a direction away from the bulb body, and said annular wall having an inturned rib adjacent to the annular edge of said wall remote from the disk, said rib engaging said trough and fastening the base to the bulb.

2. A combination in accordance with claim 1 wherein said disk is provided with a reinforcement extending coaxially inwardly therefrom and into which said base pins are sealed.

3. A combination in accordance with claim 2, wherein said reinforcement provides a central depression toward the bulb and of less diametric dimension than the diametric spacing between said base pins to receive an end of an exhaust tube.

4. A combination in accordance with claim 1, wherein said cap is frusto-conical with its smaller end constituting said disk and its annular wall being inclined outwardly

therefrom at the periphery thereof with the maximum diameter of the inclined wall remote from said disk and providing said inwardly directed annular rib thereat around said end of the bulb in said trough thereof.

5. A combination in accordance with claim 4, wherein a reinforcement is provided extending in the same direction as the axis of and within said cap toward the bulb, and said base pins being sealed in said reinforcement.

6. A combination in accordance with claim 5, wherein said reinforcement provides a central depression in its end toward the bulb to receive an end of an exhaust tube.

**References Cited** in the file of this patent

UNITED STATES PATENTS

| | | |
|---|---|---|
| 2,009,220 | Bols | July 23, 1935 |
| 2,094,648 | Fritze et al. | Oct. 5, 1937 |
| 2,134,472 | Criger et al. | Oct. 25, 1938 |
| 2,154,550 | White et al. | Apr. 18, 1939 |
| 2,191,367 | Carothers | Feb. 20, 1940 |
| 2,268,700 | Criger et al. | Jan. 6, 1942 |
| 2,309,729 | Gordon | Feb. 2, 1943 |
| 2,339,166 | Harrison | Jan. 11, 1944 |
| 2,385,340 | Baxter | Sept. 25, 1945 |
| 2,392,785 | Thomas | Jan. 8, 1946 |
| 2,535,773 | Yoder | Dec. 26, 1950 |
| 2,590,221 | Stevens | Mar. 25, 1952 |
| 2,644,198 | Crawford | July 7, 1953 |
| 2,733,420 | Marz | Jan. 31, 1956 |
| 2,859,483 | High et al. | Nov. 11, 1958 |

OTHER REFERENCES

British Plastics—Nylon the Latest Synthetic Material—April 1940, pp. 408–409.

Modern Plastics—The News About the Nylons, vol. 32, No. 12, August 1955.