Oct. 22, 1968 AKIRA OSE ET AL 3,407,054

METHOD OF MAKING BASELESS LAMP BULB

Original Filed April 16, 1963 2 Sheets-Sheet 1

Fig. 1a

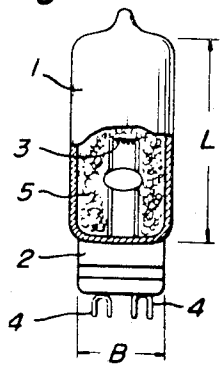

Fig. 1b

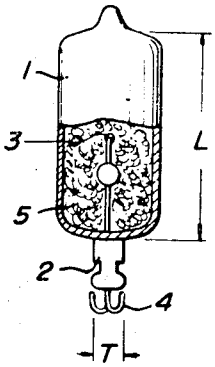

Fig. 2a

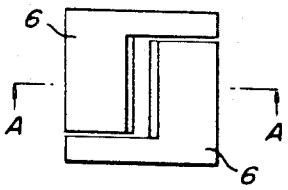

Fig. 2b

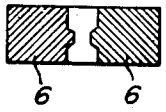

Fig. 3

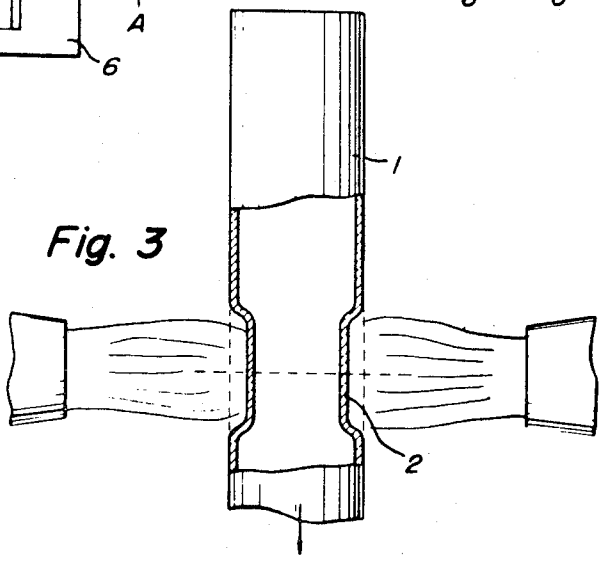

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Fig. 4

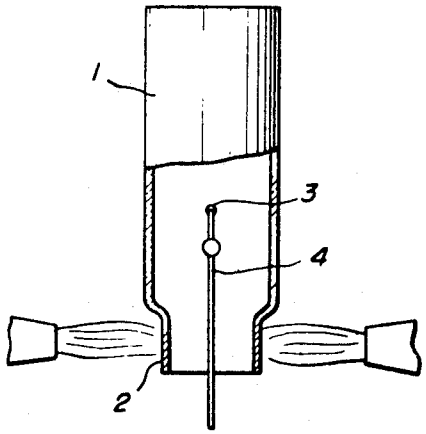


Fig. 5

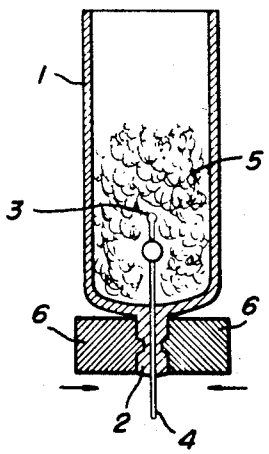
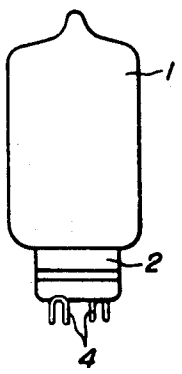


Fig. 6



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METHOD OF MAKING BASELESS LAMP BULB

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Continuation of application Ser. No. 273,375, Apr. 16, 1963. This application July 15, 1966, Ser. No. 565,657
Claims priority, application Japan, Apr. 21, 1962, 37/15,490
2 Claims. (Cl. 65—55)

ABSTRACT OF THE DISCLOSURE

A method of making baseless lamp bulbs comprising reducing the diameter and wall thickness of a straight glass tube by heating and elongating an end portion thereof, cutting the reduced end portion to a desired length, press molding the reduced end portion to seal and retain filament-carrying lead-in wires in the reduced end portion to form a socket end having truncated recesses therein, and fusing and sealing the other end portion of the glass tube to form a baseless lamp bulb having a greater inner volume than conventional baseless lamp bulbs.

This application is a continuation of application No. 273,375, filed Apr. 16, 1963, now abandoned.

The present invention relates to improvements in or relating to baseless lamp bulbs and methods of making the same.

In recent years, baseless lamp bulbs having an end portion press-formed for attachment to a socket without employing any separate base secured to the glass bulb have been increasingly used because of their lower cost of manufacture. This form of bulb structure has great economic advantages particularly with expendable lamps such as flash lamps for photographic use, which are expended in one burning.

According to the present invention, a method of making baseless lamp bulbs comprises reducing at least one of the dimensions of a straight glass tube to be formed into a baseless lamp bulb including the diameter and the wall thickness of one end portion of the tube by heating and elongating said glass tube and then pressforming said tube end portion to flatten the latter while sealing therein lead-in wires carrying a filament in a manner so that the flattened end portion may have external dimensions substantially the same as those of ordinary baseless lamp bulbs having the inner volume smaller than the inner volume of the bulb according to the present invention.

Also according to the present invention, a method of making baseless lamp bulbs comprises preparing a glass tube having dimensions including a diameter and a wall thickness substantially equal to those of a lamp bulb to be made, reducing the dimensions of a portion of said glass tube by heating and elongating the tube, cutting said glass tube portion to a suitable length, and then heating and flattening the cut end portion with filament-carrying lead-in wires inserted therethrough to seal the said lead-in wires in said end portion while forming the latter for engagement with a socket of a predetermined size.

According further to the present invention, a baseless lamp bulb comprises a filament, an elongated hollow glass bulb body circular in transverse cross section and enclosing said filament, an end formation on and integral with said bulb body and engageable with a socket of a predetermined size, and lead-in wires connected to said filament and sealed in said end formation, said bulb body having a diameter substantially different from the width of said end formation.

The present invention will now be described in detail

with reference to the accompanying drawings, in which:

FIG. 1*a* is a front elevation of a typical form of conventional baseless electric lamp, partly cutaway to show the inner structure thereof;

FIG. 1*b* is a side elevation of the same also partly cutaway to show the inner structure;

FIG. 2*a* is a plan view of a preferred form of press mold usable in the method of the invention;

FIG. 2*b* is a cross-sectional view of the same taken along the line A—A in FIG. 2*a*;

FIGS. 3 to 5 are partly cutaway elevations illustrating the respective stages of the inventive method; and

FIG. 6 is a front elevation of a lamp produced by the method.

Referring first to FIG. 1, the conventional baseless electric lamp illustrated includes a bulb **1** formed from a straight glass tube and enclosing a filament **3** joined to lead-in wires **4**. Customarily, the bottom portion of the glass bulb **1** is flattened by use of a press mold including a pair of mold sections, which are each of substantially L-shaped cross-sectional configuration, as shown in FIG. 2, and arranged in use on opposite sides of the bulb bottom portion to crush the latter into a flat shape having dimensions as required to engage with an appropriate socket while sealing in the lead-in wires. For example, baseless flash lamps of approximately 7,000 lumen-seconds, which are now in wide use, include a bulb **1** enclosing a luminous element **5** formed of approximately 23 milligrams of sliced zirconium foil and oxygen gas at a pressure of approximately 3,850 mm. Hg for aiding the burning of the luminous element. The bulb **1** is formed from a straight glass tube having an external diameter of approximately 11 millimeters and a wall thickness of approximately 0.7 millimeter and has an inner volume of approximately 1.2 cubic centimeters and a bulb length, L, of approximately 20 millimeters having a flattened bottom portion 2 externally dimensioned to have a width, B, of approximately 10 millimeters and a thickness, T, of approximately 3 millimeters. The flash lamp, being dimensioned as described above, has a maximized illuminating effect when fitted to an illuminator including a socket adapted to engage with the flattened end portion of the bulb and a reflector mirror designed to have a superb light-distributing characteristic in conformity with the bulb length.

In order to obtain an increased illuminating effect by increasing the luminous output of the flash bulb, for example, to approximately 10,000 lumen-seconds, it is required correspondingly to increase the amount of luminous material contained to approximately 33 grams while at the same time materially increasing the amount of gas filled in the bulb to allow the luminous material to be fully burned. This necessitates the increase of the inner volume of the bulb to approximately 2.2 cubic centimeters, which means an increase of the bulb length to approximately 28 millimeters as long as the bulb is formed from a glass tube of the same diameter. If such large and long lamp is used with an illuminator designed for use with conventional standard lamps of limited volume as described above, any satisfactory improvement in the illuminating effect cannot be expected as the light-distributing characteristic is necessarily impaired due to the excessive bulb length relative to the size of the reflector mirror of the illuminator. A remedy to avoid this difficulty is to employ an illuminator specially designed for use with such long lamps. This, however, involves on the user's side not only extra expenses but also a serious inconvenience in the actual picture-taking procedure particularly in case it is desired to interchange such long lamps with conventional ones as required. It has been found that such difficulties can be avoided by increasing

the diameter of the lamp bulb to increase the inner volume thereof without extending the bulb length.

In general, the external dimensions of the flattened bulb portion **2** are largely determined by the amount of glass embraced by the press mold during the forming process, that is, by the diameter and wall thickness of glass tube used. Lamp bulbs conventionally formed from a glass tube having a larger diameter thus have a larger flattened end portion, which cannot be fitted to the socket of an ordinary illuminator as described above.

According to the present invention, an improved method of making lamp bulbs is provided which is particularly suitable for the manufacture of lamp bulbs having a relatively large inner volume and adapted to be fitted to an ordinary illuminator designed for use with previous standard lamps of limited inner volume without adversely affecting the light-distributing characteristic of the illuminator.

An application of the method of the present invention to the manufacture of flash lamps having a rated luminous output of approximately 10,000 lumen-seconds will now be described with particular reference to FIGS. 3 to 6.

Referring first to FIG. 3, a portion of a glass tube **1** approximately 15 millimeters in external diameter is heated to soften and elongated to form a reduced-diameter portion **2** having an external diameter of approximately 11 millimeters and a wall thickness of approximately 0.7 millimeter, which is subsequently cut to a desired length.

Lead-in wires **4** carrying a filament **3** at one end thereof is then so inserted into the non-reduced portion of the glass tube through the remaining reduced-diameter portion thereof, the filament being disposed in the predetermined position in the bulb as illustrated in FIG. 4. Subsequently, the reduced-diameter portion is again heated to soften and flattened by use of a press mold **6** shaped similarly to one customarily used in the manufacture of standard lamps of limited inner volume thereby tightly to seal a portion of the lead-in wires in glass, as clearly seen in FIG. 5. Thereafter, approximately 33 milligrams of luminous material in the form of sliced zirconium foil **5**, to which if desired, an appropriate igniting agent is added and oxygen gas at a pressure of approximately 3,000 mm. Hg are filled in the tube through the top end thereof, which is open. The tube top is then fusion-sealed to obtain a bulb having a length of approximately 20 millimeters, as illustrated in FIG. 6. Finally, the end portions of the lead-in wires **4** extending downwardly from the bulb bottom are bent into a desired shape to complete the flash lamp.

The lamp bulb formed in this manner has a substantial inner volume of approximately 2.2 cubic centimeters and, enclosing a large amount of luminous material and a sufficient amount of gas fully effective to aid the burning of the luminous material, has a luminous output as large as approximately 10,000 lumen-seconds. In addition, the external dimensions of the flattened bulb portion are substantially the same as those of standard bulbs of limited inner volume since the amount of glass embraced in a press mold during the flattening procedure is substantially the same as that in the making of standard bulbs. Moreover, the bulb length is also substantially the same as that of previous standard bulbs. It is thus apparent that lamps made by the method of the present invention can be fitted to an illuminator designed for use with previous lamps of limited volume while obtaining a satisfactory light-distributing characteristic resulting in an increase of approximately 40 percent in the illuminating effect as compared with previous standard flash lamps.

Furthermore, it is to be noted that the method of the present invention is applicable not only to the manufacture of flash lamps as illustrated herein but also is extremely useful in the manufacture of baseless lamp bulbs for general illumination purpose having different volumes and also usable with luminaires of the same design.

It should be appreciated that the flattened bulb portion **2** includes truncated recesses shown in cross-section in FIG. 5 as formed by the press mold **6**. These truncated recesses assist the flattened bulb portion **2** in its function of retaining lead-in wires **4**.

Having fully described our invention, it is to be understood that we do not wish to be limited to the details set forth, but our invention is of the full scope of the appended claims.

It is claimed:

1. A method of making baseless lamp bulbs comprising initially reducing the diameter and the wall thickness of an end portion of a glass tube to be formed into a baseless lamp bulb by heating and elongating said end portion, pressing said reduced end portion from opposite directions to flatten said reduced end portion and seal lead-in wires within said glass tube so that the flattened portion has external dimensions substantially the same as those of conventional baseless lamp bulbs such that the largest dimension of the flattened portion is smaller than the diameter of said glass tube, and fusing and sealing the other end portion of said glass tube to form a baseless lamp bulb having a greater inner volume than conventional baseless lamp bulbs.

2. A method of making baseless lamp bulbs comprising preparing a straight glass tube having a diameter and wall thickness substantially equal to those of a lamp bulb to be made, reducing the diameter and the wall thickness of an end portion of said glass tube, severing said glass tube at said reduced end portion to provide a suitable length of said reduced end portion, heating and flattening said reduced end porion with filament-carrying lead-in wires in said reduced end portion to form a flat socket end having its largest dimension smaller than the diameter of said glass tube, and fusing and sealing the top portion opposite to the reduced end portion to form a baseless lamp bulb having a greater inner volume than conventional baseless lamp bulbs.

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