Dec. 13, 1949 D. F. WAY 2,491,237

MANUFACTURE OF MINIATURE LAMPS

Filed May 17, 1947

Fig. 1.

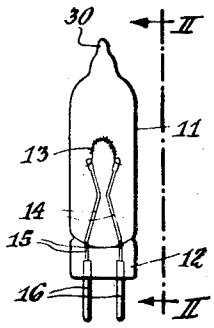


Fig. 2.

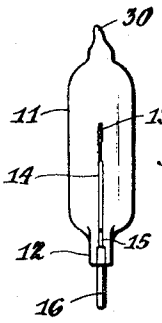


Fig. 3.

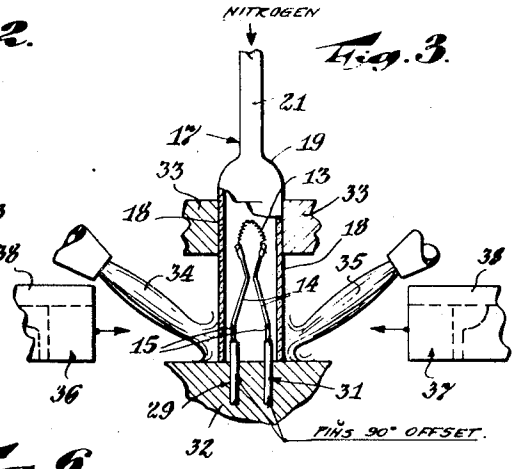


Fig. 4.

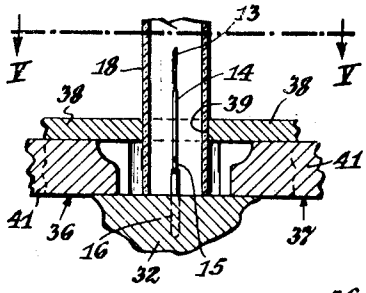


Fig. 5.

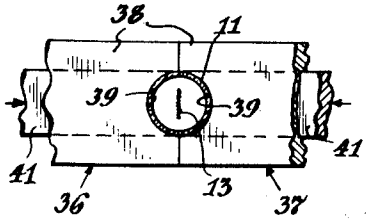


Fig. 6.

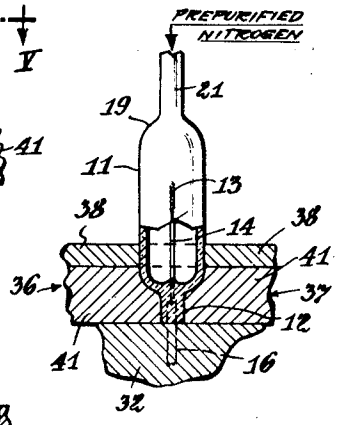


Fig. 9

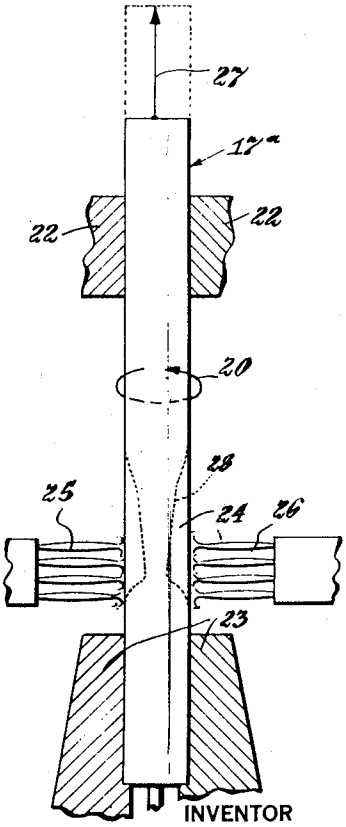


Fig. 7.

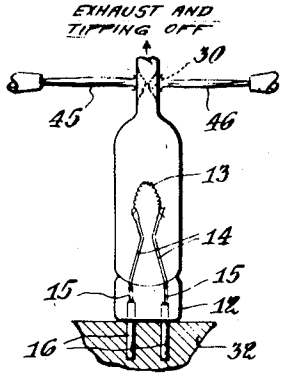
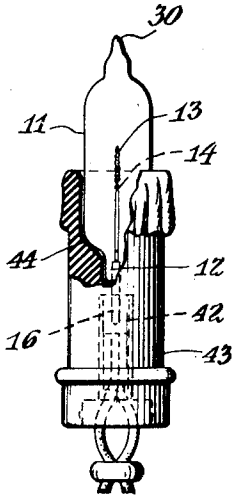


Fig. 8.



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MANUFACTURE OF MINIATURE LAMPS

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9 Claims. (Cl. 176—16)

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This invention relates to the manufacture of miniature lamps and particularly such adapted for use as radio panel lamps and in decorating Christmas trees.

The principal object of my invention, generally considered, is the manufacture of miniature lamps very cheaply and in a form in which they may be used as radio panel lamps or simulate candle flames for Christmas tree decoration.

Another object of my invention is to completely manufacture miniature lamps by the mere assembly of leads, a filament and a bulb, a pressed portion of the bulb and protruding ends of the leads functioning as a base.

A further object of my invention is to economically produce Christmas tree lamps from short pieces of tubing, small in diameter, by directly assembling therewith the leads and filament, with protruding portions of the leads functioning as contact pins or prongs.

A still further object of my invention is to produce a miniature lamp with integral combined base and mount portions, by heating and compressing an end portion of a glass tube about leads which support a filament, thereby simultaneously forming a press which not only functions to complete the mount, but also makes a base for the lamp.

Other objects and advantages of the invention will become apparent as the description proceeds.

Referring to the drawing—

Figure 1 is an elevational view of a lamp embodying my invention.

Figure 2 is an elevational view of said lamp on the line II—II of Figure 1, in the direction of the arrows.

Figure 3 is a fragmentary diagrammatic elevational view, with parts in vertical section, of the parts of such a lamp in a machine during the process of manufacture, but showing the leads rotatively offset 90° out of actual position, in order to illustrate the spacing.

Figure 4 is a view corresponding to Figure 3, but showing the parts of the machine in a subsequent position where pressing elements have moved closer together preparatory to forming the combination base-press.

Figure 5 is a horizontal sectional view on the line V—V of Figure 4, in the direction of the arrows.

Figure 6 is an elevational view corresponding to Figure 4, but showing the machine parts after they have come together to complete the formation of the bulb.

Figure 7 is a view corresponding to Figure 6, but showing the lamp turned 90° about its axis and a pair of fires engaging the exhaust tube for the purpose of tipping it off.

Figure 8 is an elevational view, with parts in

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axial section, of a lamp such as illustrated in Figures 1 and 2 after being positioned in a preferred form of socket.

Figure 9 is an elevational view, with parts in section, of a piece of tubing during the process of forming a bulb blank for the lamp, which blank is a modification of that illustrated in Figure 3.

Referring to the drawing in detail, Figures 1 and 2 show a complete lamp embodying my invention, comprising a transparent vitreous or glass bulb or envelope 11, with a combined press and base 12. The lamp mount consists of a filament 13, support wires 14, wires 15 sealed through the press 12, and contact members or prongs 16 protruding beyond the bottom of the combination base-press 12. The weld knots at the junctions between the wires 14 and 15 and the wires 15 and 16, are desirably embedded in the press 12, as illustrated. The lamp was completed by evacuating or gas filling, and then tipping off at its upper end, as indicated at 30.

Figure 3 shows one form of bulb blank 17, for making a lamp embodying my invention, consisting of a piece of glass tubing 18, relatively small in diameter, say from about $\frac{9}{32}$'' to $\frac{5}{16}$'' in outside diameter, with one end decreased or drawn down in size, as indicated at 19, and connected to an exhaust tube portion or tubulation 21 of still smaller diameter, say about $\frac{1}{8}$'' outside diameter.

Instead of making the blank of two pieces of glass tubing of different diameters, as illustrated in Figure 3, a single piece of tubing 17^a may be employed, as illustrated in Figure 9. While opposite ends are held respectively in clamps 22 and 23, an intermediate portion 24 is heated, as by fires 25 and 26, until soft. The clamps then separate, as indicated by the arrow 27, to draw a reduced or restricted portion 28, comparing with the exhaust tube 21 of Figure 3. This is desirably effected while the clamps 22 and 23 or the fires 25 and 26 are rotated, as indicated by the arrow 20.

A preferred method of manufacturing the lamp of Figures 1 and 2 will now be described with reference to Figures 3 to 7, inclusive. Two lead wires 29 and 31 are fed to the machine 32, desirably automatically, where they are held tightly in upright position as illustrated in Figure 3. Although the leads may each consist of a single piece of wire, yet because of the triple characteristics required of said wire, it is desirable to form each lead in three parts. If a lead is a single piece of wire, it should have the characteristics of being relatively rigid or stiff enough to function as external contact pins or supporting prongs for the lamp, yet be of the proper coefficient of expansion to provide a seal through the glass press 12, and yet have the inner or filament supporting por-

tions not too heavy, yet stiff enough to rigidly support the filament. In order to avoid expense, and at the same time have such leads, I prefer to make them with the contact prong portions 16 of degassed nickel, desirably 40 mils in diameter and about 8.1 mm. long, pointing or rounding the outer ends. The intermediate portions 15 are desirably of 14 mil dumet about 2.28 mm. long, or other material which forms a tight seal through the soft glass of bulb blank 17 or 17a desirably employed. The support portions 14 are desirably of 16 mil copper, about 12.7 mm. long.

After the leads have been mounted, as illustrated in Figure 3, the support wire portions 14 are desirably bent so that the intermediate portions are closely adjacent, while the portions above are flared as indicated. Filament 13 is then desirably automatically mounted on said leads. The filament 13 is desirably formed of 1.13 mil wire wound on a 5 mil mandrel. Straight end portions of said filament are connected to the upper or extreme inner ends of the leads 29 and 31 in any desired manner, as by press clamping. Although the sizes given are for a lamp adapted to operate on 5.9 volts with a current of .22 ampere, it will be understood that variations are permissible within the spirit and scope of the invention.

After the filament has been mounted, the bulb blank, 17 or 17a as the case may be, is desirably automatically inserted over the mount and held in position, as by a clamp 33. Heat is applied to the lower portion of the bulb as by means of fires 34 and 35, while some protective non-inflammable gas, such as pre-purified or "cascade" nitrogen, is fed into the exhaust tube to avoid oxidization of the metal parts during the manufacturing operation, and press the glass against the formers.

After the glass of the bulb blank has been softened sufficiently adjacent the connecting points between the parts of the leads 29 and 31, press-forming members 36 and 37 move together from a position as shown in Figure 3 to that of Figures 4 and 5. Each forming member consists of an inverted U-shaped plate 38 with a semi-circular cut 39 corresponding in diameter with that of the larger portion of the lamp blank. In each plate 38 reciprocates a press-forming plunger 41. The members 38 first come together and embrace the lamp blank, to thereby prevent distortion of the bulb above the press being formed. The press-forming plungers 41, which also act as a mold, then come together, as in Figure 6 pressing and forming the glass about the leads 29 and 31, desirably covering the junctions between the parts and said leads, as illustrated, while the glass is under the influence of the pressure of the protective gas or nitrogen. The plungers may then separate for one or more reheats and repeated pressing or pressings. The lower parts of the relatively stiff or rigid portions 16 are left projecting below the lower edge of the press 12 which is formed, to function as contact pins. These portions 16 are each for reception in a contact element 42 of a socket 43, desirably formed as described and claimed in the Rively et al. application, Serial No. 748,776, filed of even date herewith.

It will be noted that the forming plungers 41 are so shaped that they provide a press 12 which is not only flat, but which has a width corresponding with the normal bulb diameter and flares to gradually merge into the lower portion of the bulb. This form is made use of by having the socket 43 with a lamp receiving pocket 44 correspondingly shaped, so that the contact pin portions 16 are guided into the receiving elements 42 thereof, without the necessity of manually turning the lamp to grope for said elements.

After a lamp has been formed as illustrated in Figure 6, it is exhausted and tipped off, as by fires 45 and 46 illustrated in Figure 7. As an alternative however, the lamp may be tipped off after being filled with inert gas, such as that used during the sealing operation, to thereby form a gas filled, rather than a vacuum type, lamp, for example.

After the lamp has been tipped off, it will be seen to be of simple form. When used in a socket such as 43, shaped to simulate a candle, the protruding lamp part has the appearance of a candle flame, thereby giving a desirably decorative effect when used on a Christmas tree.

Although I have described the formation of a single lamp embodying my invention, it will be understood that I may make such miniature bipin lamps on automatic equipment, such as a commercial 24 head stem machine, appropriately modified. The two lead wires of each lamp would then be automatically fed into the machine, then the filament coil would be automatically mounted on the leads while held tightly in position. The bulb, with the exhaust tube or portion attached, would then be automatically inserted over the mount, heat applied, and the lamp made, and finally automatically released to the exhaust machine. During the making and forming of the press, a continuous flow of a protective gas, such as pre-purified or "cascade" nitrogen would be used. Production of about 1200 per hour is contemplated.

After exhaust, each lamp would be automatically tipped off and carried to the coloring machine, if colored lamps were to be made. The lamps would be lighted as they left the exhaust machine, as a test of operativeness. The coloring, if used, would be effected on a 25 head modified commercial Christmas tree coloring machine, which machine would be adapted to color about 2500 per hour. However, I may make clear lamps for use with sockets of different colors.

The details of sealing on the 24 head miniature stem machine, previously referred to, are as follows:

In position #1, the leads would be loaded to the stem block and clamped.

In position #2, the leads could be flattened and have hooks formed thereon, unless press clamping of the filament thereto is employed.

In position #3, the filament is fed and attached to the leads.

In position #4, the leads and filament are formed to the shape illustrated in Figures 1 and 3, and the mount centered for the bulb.

In position #5, the bulb would be inserted over the mount, using an automatic feed, said bulb being held in correct position.

In position #6, the preliminary heat would be given.

In positions #7 to #10, inclusive, the glass would be heated preparatory to forming the press.

In position #11, the glass would be heated and a first pressing operation effected.

In positions #12, #13 and #14, the bulb would be heated for a second pressing operation, which would take place at position #15 where molding of the lower part of the bulb and press would be effected.

In positions #16 to #19, inclusive, heat for a third pressing, which takes place at the last-

mentioned position would occur, which third pressing would mold the lower part of the bulb and press to maintain a uniform and proper shape thereof.

At positions #20, #21, #22 and #23, the lamp would be annealed, and

At position #24 automatic unloading would occur.

From positions #6 to #23, inclusive, prepurified or "cascade" nitrogen would continuously flow to keep the metal parts of the lamp clean and bright. The tubing from which each bulb is made is desirably 33B .012. The bulb holders would grip the bulb as far as possible from the seal. The burners would have the proper design and capacity necessary to heat the glass uniformly to the correct temperatures at the speed required, for example, to make about 1200 lamps per hour. Because of the small size of the lamps, they may be exhausted without the necessity of ovens, although they are heated, as by radiant heat elements, to temperatures from about 500° to 525° C.

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. Although the drawing accompanying this application shows the lamp to scale and about 1 and ½ times the natural size, it will be understood that I do not wish to be limited to dimensions.

I claim:

1. A miniature lamp comprising an envelope formed as a small vitreous tube, one end of which terminates in a press through which leads extend, a filament mounted on the inner ends of said leads, those portions of said leads which project through said press to the outside of the envelope being relatively rigid to function as contact elements, and the other end of said envelope being tipped off.

2. A miniature lamp comprising an envelope formed as a small glass tube, one end of which terminates in a press through which leads extend, the inner portions of said leads being bent to closely approach one another and then diverge to their inner ends, a filament mounted on said inner ends, the outer end portions of said leads being relatively rigid to function as contact elements, and the other end of said envelope being tipped off.

3. A miniature lamp comprising a glass envelope of small diameter, one end of which terminates in a flat press through which leads extend, each lead comprising a relatively rigid outer section to function as a contact prong, an intermediate section of proper coefficient of expansion to form a seal, and imbedded in said press, and inner portions functioning as supports, a filament mounted on the inner ends of said leads, and the other end of said envelope being tipped off after exhaust.

4. A miniature lamp comprising a cylindrical envelope of small diameter, one end of which terminates in a flat press of width corresponding with the envelope diameter, leads extending through said press, a filament mounted on the inner ends of said leads, the outer end portions of said leads being relatively rigid to function as contacts and supports, and the other end of said envelope being tipped off after exhaust.

5. A miniature lamp comprising a cylindrical glass envelope of small diameter, one end portion of which gradually flattens and terminates in a relatively flat press of width corresponding with the envelope diameter, and leads extending through said press, a filament mounted on the inner ends of said leads, the outer end portions of said leads being relatively rigid to function as contacts and supports, the formation of the envelope at the press end being such that it is usable in a socket with a receiving pocket of complementary shape to guide said outer end portions to socket contact portions.

6. A miniature lamp comprising an envelope formed as a small vitreous tube, one end of which terminates in a press through which leads extend, a filament mounted on the inner ends of said leads, the press being flattened to fit a socket for the purpose of guiding the leads to socket-contact portions, and the other end of said envelope being tipped off.

7. A miniature lamp comprising an envelope formed as a small glass tube, one end of which terminates in a flat press through which leads extend, the inner portions of said leads being bent to closely approach one another and then diverge toward their inner ends, a filament mounted on said inner ends, the outer end portions of said leads being relatively rigid to function as contact elements without bending in normal use, and the other end of said envelope being tipped off.

8. A miniature lamp comprising an envelope formed as a small vitreous tube, one end of which terminates in a press through which leads extend, the inner portions of said leads being bent to closely approach one another and then diverge to their inner ends, a filament mounted on said inner ends, and the other end of said envelope being tipped off.

9. A miniature lamp comprising an envelope formed as a small vitreous tube, one end of which terminates in a press through which leads extend, each lead being formed in three parts, first a contact prong portion of degassed nickel about 40 mils in diameter and about 8.1 mm. long, an intermediate portion of dumet about 14 mils in diameter and about 2.28 mm. long, said intermediate portion serving to form a tight seal through the glass of the press, and a support portion of copper about 16 mils in diameter about 12.7 mm. long, and the free end of which serves for connection with a filament, a filament mounted on the inner ends of said leads, those portions of degassed nickel which project through said press to the outside of the envelope functioning as contact elements.

DONALD F. WAY.

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