April 20, 1943. C. A. COTMAN ET AL 2,317,031

ELECTRIC LAMP AND METHOD OF MANUFACTURE

Filed July 12, 1941 2 Sheets-Sheet 1

Fig. 2.

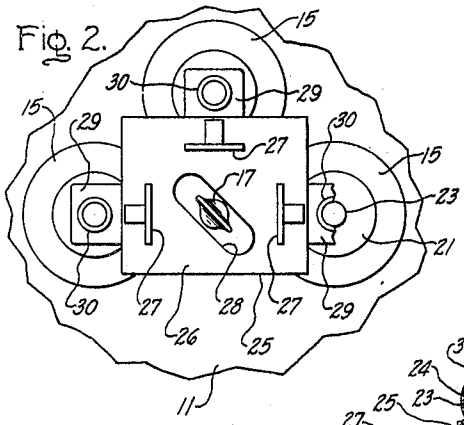


Fig. 1.

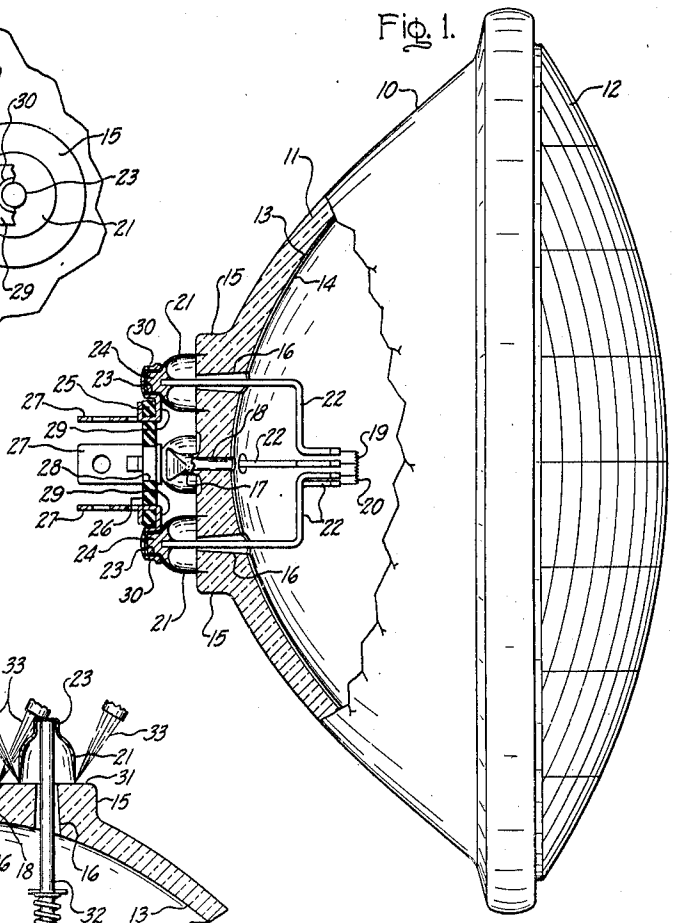


Fig. 3.

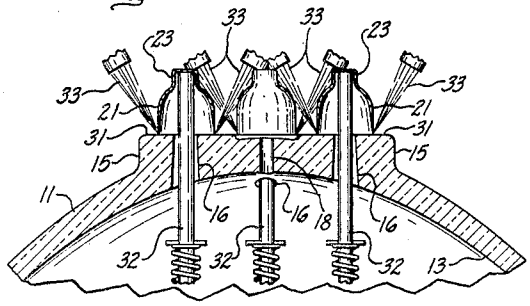
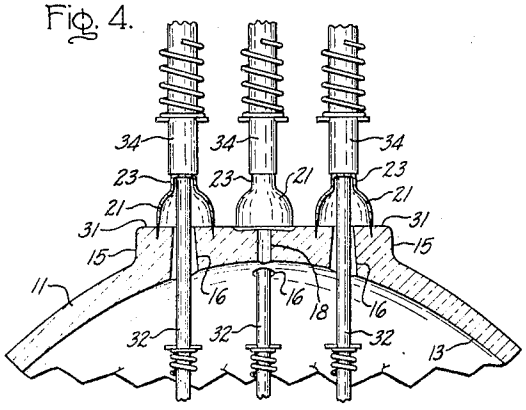


Fig. 4.



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ELECTRIC LAMP AND METHOD OF MANUFACTURE

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Fig. 5.

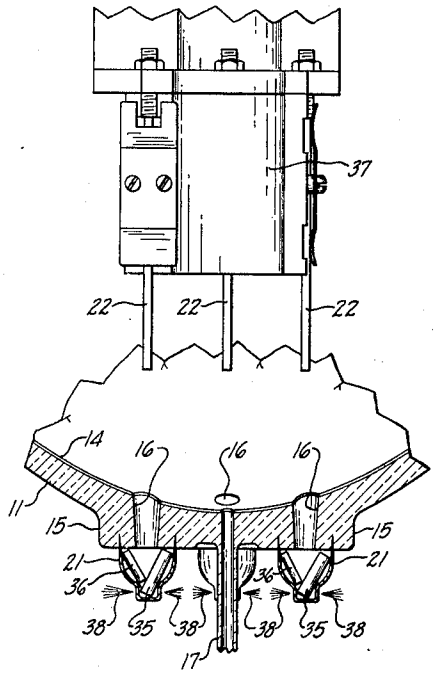


Fig. 6.

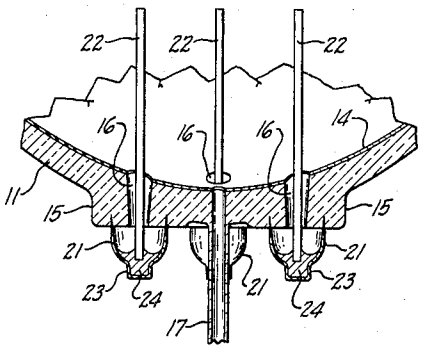


Fig. 7.

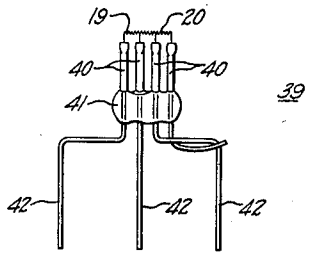


Fig. 8.

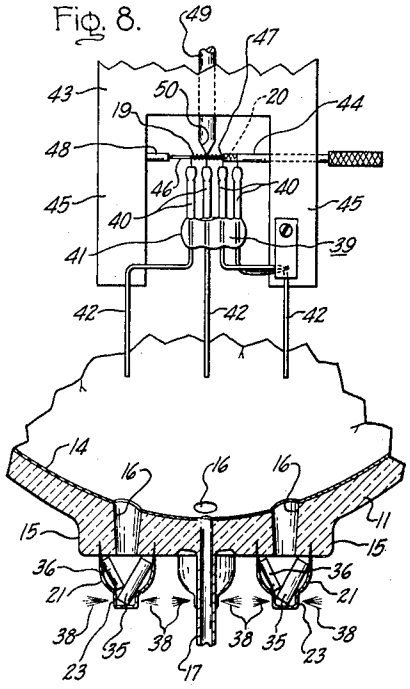
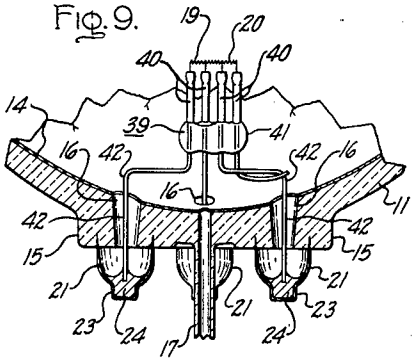


Fig. 9.



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UNITED STATES PATENT OFFICE

2,317,031

ELECTRIC LAMP AND METHOD OF MANUFACTURE

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Application July 12, 1941, Serial No. 402,120

17 Claims. (Cl. 176—2)

Our invention relates in general to electric incandescent lamps and similar devices, and to a method of manufacturing the same. More particularly, our invention relates to a filament mount and seal construction for such devices, and to a method of manufacture thereof. Still more particularly, our invention relates to the manufacture of a filament mount and seal construction especially suitable for devices such as described and claimed in U. S. Patents Nos. 2,148,314 and 2,148,315, issued February 21, 1939, to D. K. Wright.

Electric incandescent projector lamps of the well-known "sealed beam" type, such as disclosed in the above mentioned Wright patents, comprise in general a sealed glass envelope consisting of a preformed glass reflector section of definite optical shape and a preformed glass lens section sealed together at their peripheries by fusion so as to form a hermetically sealed envelope, together with one or more filaments mounted within the glass envelope in definite optical relation to the reflecting surface thereof and connected to externally disposed lamp terminals by leading-in conductors extending through the glass reflector section and hermetically sealed therein. Heretofore, the seal and terminal construction of such "sealed beam" lamps was such that the thin metal cups or thimbles, which were embedded and fused in the glass of the lamp envelope, were provided with metal posts which extended through the thimbles and were brazed thereto so as to form a hermetic joint therebetween. The metal posts extended through suitable openings in the wall of the lamp envelope into the interior thereof where they were connected to one or more filaments by inner lead wires.

In the manufacture of "sealed beam" lamps of the above-described construction, it has been customary to first unite or assemble the metal posts, inner wire leads and metal thimbles so as to form unitary skirted conductor members which are then mounted on the glass reflector section of the lamp envelope by embedding the edges or rims of the metal thimbles, i. e., the skirted portions of the conductor members, in the glass of the said reflector section. After the conductor members have been thus mounted in place on the reflector section, the reflecting coating is then applied to such section and the filament or filaments mounted on the inner wire leads in proper position relative to the reflecting surface of the reflector section.

With such a procedure and such a seal construction, there are some disadvantages which materially increase the cost of lamp manufacture and which are apt to result in the production of a lamp of poor quality unless caution is exercised. Thus, in sealing the conductor members into the glass reflector section, the movement of the metal thimbles into the softened, plastic glass of the reflector section, and therefore the location or positioning of the metal thimbles and associated metal posts and inner wire leads relative to the reflector section, cannot be controlled with any great degree of accuracy (except by the use of complicated and expensive machinery) with the result that the inner wire leads do not line up exactly with the wire lead shaping dies of the automatic filament mounting machine, and frequently are entirely outside of the operative limits for proper cooperation with such shaping dies. As a consequence, there is an appreciable amount of wear on the wire shaping dies necessitating their frequent replacement; and where the inner wire leads are actually outside of the operative limits for proper engagement with the shaping dies, the latter then distort or bend the wire leads to such an extent as to render that particular reflector section unfit for further use, thus resulting in what is known in the art as lamp "shrinkage."

The above mentioned manufacturing procedure has the further disadvantage that the heat required to soften the glass of the reflector section to permit the entry and fusion of the metal thimbles thereinto, as well as the heat which is applied to the reflector section to anneal the glass at the seal between the metal thimbles and the glass to remove the strains therein, results in the formation of an oxide coating on the inner wire leads which, in addition to being detrimental to lamp quality, also increases the wear on the wire shaping dies of the automatic filament mounting machine. Moreover, because of the particular manner of applying the reflecting material to the reflector section wherein the reflecting material is vaporized onto the reflector section after the conductor members have been sealed thereto, the inner wire leads also become coated with a layer of the reflecting material which then further increases the wear on the said wire shaping dies. Then again, in order to obtain an accurate mounting of the filament relative to the reflecting surface, where the above described manufacturing procedure is followed, it has been necessary to employ inner wire leads made of copper, which is relatively expensive, because of the greater pliability and therefore

the greater ability of such copper leads to remain in the position in which they have been set by the wire shaping dies over and above that possessed by wire leads made of iron or other less expensive material. If iron lead wires were used, the heat attending the sealing of the metal thimbles into the glass and the annealing of the glass would result in various tempers of the iron of such wire leads; and since the spring-back characteristic of such wires would differ with the different tempers of the iron, it would be impossible to obtain proper positioning of the wires and therefore proper positioning of the filament or filaments with respect to the reflecting surface.

The use of conductor members of the type heretofore in use, in which metal posts extend through the metal cups and are brazed thereto to form a hermetic joint therebetween, also has the disadvantage that if the braze between the metal thimble and the metal post is not absolutely perfect so as to form an effective hermetic joint therebetween, then a lamp known as a "slow leaker" is produced. Such defective lamps, of course, would have to be rejected, thus producing further lamp shrinkage.

One object of our invention is to provide an electric lamp having leading-in conductor seals of the metal thimble type and which does not possess any of the above enumerated disadvantages.

Another object of our invention is to provide an improved method of manufacturing electric lamps employing leading-in conductor seals of the metal thimble type, which method is not attended by any of the above enumerated disadvantages.

Still another object of our invention is to provide an improved method of manufacturing electric lamps employing leading-in conductor seals of the metal thimble type whereby the inner conducting leads of the lamp are mounted on the said metal thimbles and positioned in accurate predetermined relation with respect to that portion of the lamp envelope in which the metal thimbles are sealed.

A feature of the invention is the use of closed metal thimbles which are first sealed to the glass reflector section over the conductor lead openings therein, followed by the attachment to such thimbles of the inner conducting leads in accurate predetermined relation with respect to the reflecting surface of the reflector section.

Further objects and advantages of our invention will appear from the following description of a species thereof and from the accompanying drawings in which:

Fig. 1 is a bottom elevation, partly in section, of an electric incandescent lamp comprising our invention; Fig. 2 is a fragmentary rear view of the lamp shown in Fig. 1; Figs. 3 to 6 are views showing the steps involved in manufacturing the lamp shown in Fig. 1 by the method comprising our invention; and Figs. 7 to 9 are views showing a modification of the method of manufacturing electric incandescent lamps according to our invention.

Referring to the drawings, the lamp there shown comprises a sealed glass bulb or envelope 10 consisting of a preformed pressed glass concave reflector section 11 of heat-resisting glass and a cover glass or lens section 12, also of heat-resisting pressed glass, sealed together at their peripheries by fusion. The said reflector and cover glass sections 11 and 12 respectively are preferably made of low-expansion glass, such as that commercially known as "Pyrex" and described and claimed in United States Patent No. 1,304,623, Sullivan et al., issued May 27, 1919. The interior surface 13 of the reflector section 11 is of any suitable optical shape, preferably that of a paraboloid, and is covered with a reflecting metallic coating 14, preferably aluminum, so as to form a reflecting surface. The said coating 14 is preferably applied to the interior surface 13 by vaporization of the coating in a vacuum, as described and claimed in United States patent application Serial No. 292,315, R. F. Strickland, filed August 28, 1939. The exterior of the reflector section 11, adjacent the apex thereof, is formed with three glass bosses 15 arranged in triangular formation about the apex of the reflector section, as shown in Fig. 2, two of the bosses being disposed on opposite sides of the apex of said reflector section and the other boss being disposed directly above said apex. Each of the bosses 15 is provided with a concentric opening 16 extending through the wall of the reflector section and communicating with the interior of the lamp envelope 10. The envelope 10 is exhausted and filled with a suitable gas, such as argon or nitrogen or mixtures thereof, by means of an exhaust tube 17 sealed to the exterior of the reflector section at the apex thereof and communicating with the interior of the lamp envelope through an opening 18 extending through the wall of the reflector section at the apex thereof.

Mounted within the envelope 10, in definite optical relation to the reflecting surface 14 thereof, is a pair of spaced electric energy translation elements or filaments 19, 20, preferably in the form of concentrated linear coils of suitable metallic refractory material, such as tungsten. The said filaments are arranged parallel to one another in more or less side-by-side relation and in the focal plane of the parabolic reflecting surface 14, with one filament 19 (the major filament) disposed at the focal point of the reflecting surface 14 and the other filament 20 (the minor filament) offset a slight distance above and to one side of the said focal point.

For conveying current to the filaments 19, 20 and supporting the same in place within the lamp envelope 10, a plurality (three) of conductor members are provided on the reflector section each of which comprises a comparatively thin closed metal cup or thimble 21 mounted on the exterior of the reflector section on one of the glass bosses 15 thereof, and one or more relatively rigid inner wire leads 22 secured to the thimble interiorly thereof and extending through the corresponding opening 16 in the reflector section into the interior of the lamp envelope 10 where they are connected to and support the filaments 19, 20. The thimbles 21 are concentrically mounted on the glass bosses 15, as near as may be, so as to cover the openings 16 therein, and have their edges or rims sealed and embedded in the glass of said bosses so as to form a hermetic seal therebetween. The thimbles being closed and being hermetically sealed to the glass reflector section over the openings 16 therein, thus serve to hermetically seal the lamp envelope 10, the thimbles actually forming, in effect, a part of the envelope wall itself. The use of such closed thimbles provides absolute freedom from leaks through the thimbles themselves, with the result that the occurrence of "slow leakers,"

i. e., lamps into which air will slowly leak, is practically eliminated.

The metal cups or thimbles 21 should be made of a metal to which the fused or softened glass will readily "wet" and adhere, and preferably should have an expansion as near as possible to that of the glass. For low-expansion heat-resistant glass of the character hereinbefore indicated, the metal thimbles 21 are preferably made either of an alloy of iron, nickel and cobalt commercially known as "Fernico" and disclosed and claimed in United States Patent No. 1,942,260, issued January 2, 1934, to H. Scott, or an iron-nickel alloy containing approximately 42 per cent nickel. It has been found that both of these alloys effectively comply with the above mentioned requirements or conditions.

Each of the metal thimbles 21 is formed with a hollow cylindrical projection or teat 23 extending outwardly from the top or outer end of the thimble. The inner wire leads 22 extend into the thimbles 21 preferably to a point just short of the junction between the main or skirted portion of the thimbles and the cylindrical extensions 23, and are firmly secured to the thimbles, after the latter have been sealed to the reflector section 11, by means of a suitable metallic fusible material 24, preferably a hard solder or brazing compound having a relatively high melting point, such as, for instance, silver solder or brass spelter. Sufficient solder or brazing material is used to completely fill the hollow extensions or teats 23 as well as a part of the hollow interior of the main or skirted portions of the metal thimbles so that a sufficient length of the inner wire leads 22 is embedded in the solder or brazing compound 24 to insure a joint therebetween of adequate mechanical strength.

The dimensions of the hollow space within the projections or teats 23 and the main or skirted portion of the thimbles 21 are made considerably larger than the diameter of the inner wire leads 22 in order to permit an appreciable amount of lateral adjustment of the said leads 22 (even where two of such leads are placed side by side) relative to the thimbles prior to their attachment to the thimbles by the solder or brazing material 24. In this way, the inner leads 22 can be secured to the thimbles 21 in such a manner as to be positioned in exact desired predetermined position with respect to the reflecting surface 14 of the reflector section, regardless of any ordinary misalignment of the metal thimbles with respect to the glass bosses 15 and therefore with respect to the said reflecting surface 14. The inner wire leads 22 being thus secured to the reflector section in exact relation to the reflecting surface 14 thereof, they accordingly align exactly with the wire shaping dies of the automatic filament mounting machine, thus materially minimizing the wear and therefore the necessity for replacement of such dies. Moreover, since the wire leads 22 can be applied to the reflector section after the metal thimbles 21 have been sealed to such section and therefore after all the heating operations incident to such thimble sealing process have transpired, the formation of an oxide coating on the inner leads 22 by such heating operations is accordingly eliminated. Instead, the wire leads 22, by being soldered or brazed to the metal thimbles 21 after the latter have been sealed to the reflector section 11, remain clean and unoxidized so that there is no coating of foreign material on such leads which would tend to increase the wear on the wire shaping dies of the automatic filament mounting machine or which would be detrimental to lamp quality.

Mounted on the metal thimbles 21 is a lamp base or terminal structure 25 comprising a plate-shaped body member 26 of suitable insulating material, such as, for instance, a plastic material, provided with three insulated contact or terminal lugs 27 each secured to one of the metal thimbles 21. The insulating member 26 is disposed across the rear or thimbled portion of the lamp envelope 10 so as to more or less overlie and thus protect the tipped exhaust tube 17, a recess 28, however, being provided in the insulating member in line with the exhaust tube 17 for the accommodation of the latter therein should the tube extend too far out from the lamp envelope 10. The contact lugs 27 preferably extend rearwardly from the insulating member 26 in a direction substantially parallel to the axis of the reflector section 11, and are secured to the insulating member in any suitable manner, such as by being clamped thereto. The contact lugs 27 are formed with laterally projecting portions or ears 29 extending outwardly from the edges of the insulating member 26 and provided with eyelets 30 which fit over the teats 23 on the metal thimbles 21, the said eyelets being secured to the said teats by soft soldering. A firm mounting of the base 25 on the metal thimbles is thus provided.

Figs. 3 to 6 illustrate the steps involved in providing the reflector section 11 with a filament mount and seal construction by the improved method comprising our invention. Referring first to Fig. 3, a reflector section 11, not as yet coated with reflecting material, is positioned face down in a thimble sealing machine (not shown) so that the glass bosses 15 on the reflector section are disposed at the top with the top surfaces 31 of the glass bosses arranged in a horizontal plane. Three spring-resisted thimble support posts 32, corresponding to and aligned with the three openings 16 in the reflector section, are then inserted through the said openings from the bottom thereof until they project from the top surfaces 31 of the glass bosses 15. The posts 32 are made of a diameter approximately corresponding to, but slightly less than the inside diameter of the hollow projections or teats 23 on the metal thimbles. A closed metal cup or thimble 21 is then placed over the projecting upper end of each post 32 so as to rest thereon, with the posts entering the hollow projections 23 so as to more or less align the metal thimbles with the glass bosses 15 and the openings 16. The posts 32 project a sufficient distance above the top surfaces 31 of the glass bosses 15 to support the metal thimbles with their lower free edge or rim portions just touching the said top surfaces of the glass bosses. The glass of the bosses is then heated, by gas fires 33 of the rotating type, at points opposite the free edge or rim portions of the metal thimbles 21, the gas fires being inclined, as shown in Fig. 3, so as to be directed approximately at those points where the edges of the thimbles touch the glass bosses. When the glass has become sufficiently heated and plastic, the metal thimbles 21 are pushed down into the softened glass mass by suitable spring-operated pusher rods 34 (Fig. 4) until the free lower edges of the thimbles are inserted into and become embedded in the glass for a distance of approximately 0.080 of an inch or thereabouts.

After the glass solidifies, the glass at and adjacent the metal-to-glass seal is annealed by suitable annealing fires to remove any strains which may be present in the glass. The result is that the metal thimbles 21 are secured to the glass reflector section 11 by a strong and effective hermetic metal-to-glass seal.

After the metal thimbles 21 have been sealed to the reflector section 11, the reflecting coating 14 is then applied to the inner surface of such section. The reflecting coating is preferably applied by the vaporization method described and claimed in the above-mentioned Strickland application Serial No. 292,315.

The next operation is the attachment of the inner wire leads 22 to the metal thimbles 21. Referring to Figs. 5 and 6, the coated reflector section 11 with the metal thimbles 21 sealed thereto is first positioned face up, whereupon small pellets 35 and 36 of a suitable metallic fusible material and a suitable flux material are dropped into the metal thimbles 21 so as to lie within and adjacent the hollow projections or teats 23 on the thimbles. The fusible material 35 is preferably a hard solder, i. e., one having a relatively high melting point, such as silver solder, while the flux compound 36 may be of borax. Instead of separate pellets of solder and flux, the two materials may be combined into one pellet. With the pellets 35 and 36 in place within the metal thimbles, the reflector section is then mounted face up in a suitable holder (not shown) on the wire lead mounting machine. A jig 37, positioned on the mounting machine directly above the reflector section, supports three inner wire leads 22 in exact lateral relation with respect to the reflecting surface 14 of the reflector section and in alignment with the openings 16, the holder for the jig being provided with three or more reflector surface engaging elements (not shown) for such positioning and aligning purpose. Heat is then applied to the pellets 35, 36 in a suitable manner, such as by directing gas fires 38 against the lower portions of the metal thimbles 21 or by high frequency inductive heating, to thereby melt the solder pellets 35 and the flux 36. When the solder and flux have thus attained a molten state, the jig 37 is moved down until the wire leads 22 pass through the holes 16 and enter the thimbles 21 to a point just short of the junction between the main or skirted portion of the thimbles and the cylindrical extensions or teats 23 thereon. With the inner lead wires thus held in position, the molten solder is then allowed to solidify. Sufficient solder is contained in the solder pellets 35 to completely fill, when melted, the hollow extensions 23 of the thimbles as well as to partly fill the main or skirted portions of the thimbles so that the lower ends of the wires 22, when the latter have been inserted the proper distance into the thimbles, will extend into the molten solder a sufficient distance, preferably about $\frac{3}{32}$'' or so, to form, on solidification of the solder, a joint of adequate mechanical strength between the wires 22 and the solidified solder 24. Inasmuch as the jig 37 holds the wires 22 in the exact desired position relative to the reflecting surface 14 while the molten solder is solidifying, the said wires are consequently mounted on the reflector section in exact predetermined position relative to the reflecting surface 14 and therefore align exactly with the wire shaping dies of the filament mounting machine. Immediately after the soldering of the wire leads 22 to the metal thimbles 21, and while the latter are still hot, the exterior surfaces of the teats 23 and adjacent portions of the thimbles 21 may be suitably tinned to thereby prepare such surfaces for the soldering of the base contact lugs 27 thereto.

After the inner wire leads 22 have been applied to the reflector section 11, the latter is then placed in the filament mounting machine where the leads are bent into the shape shown in Fig. 1 and the filaments 19, 20 are attached thereto in exact position relative to the focal point of the reflecting surface 14, thus completing the manufacture of the reflector unit or mount structure of the lamp. The cover glass or lens section 12 is then sealed to the completed reflector unit or mount structure to form the lamp envelope 10, the latter then exhausted and filled with the desired type and amount of gas through the exhaust tube 17, and the said tube then tipped off to hermetically seal the lamp envelope. The base structure 25 is finally attached to the metal thimbles 21 to thereby complete the manufacture of the lamp according to the invention.

The modified lamp manufacturing method disclosed in Figs. 7–9 differs from that previously described mainly in that a complete filament mount, consisting of the inner conducting leads, filament or filaments, and other related parts thereof, is first preformed as an entirely separate unit which is then secured to the metal thimbles 21 to form the completed reflector unit, instead of securing just the inner leads 22 to the metal thimbles and afterwards shaping the leads and mounting the filaments thereon.

According to the modified method of manufacture, a unitary filament mount 39 is first formed, as shown in Fig. 7, comprising a plurality of inner leading-in wires or leads 40 tied together by a bead 41 of suitable insulating material, such as glass, and having the filaments 19 and 20 secured to the inner ends of such leads in approximate predetermined relation to the parallel outer end or free leg portions 42 of such leads, the said parallel leg portions 42 being arranged in the same triangular relation as that of the openings 16 in the reflector section 11 so as to be capable of insertion thereinto. As shown in Fig. 8, the completed filament mount 39 is then clamped and locked in place, in a suitable jig 43 on the mount fastening machine (not shown), with the filaments 19, 20 located in a predetermined position in the jig. To locate the filaments in such definite position in the jig, a movable positioning or centering pin 44 is provided on one of the legs 45 of the jig, the said pin having a reduced diameter or mandrel portion 46 at its inner end which is adapted to be inserted through the main filament coil 19 to thereby position the filaments longitudinally, i. e., vertically, of the jig. The reduced diameter or mandrel portion 46 of the positioning pin 44 forms a shoulder 47 on the pin which serves to laterally position the filaments. The pin 44 is moved through the filament coil 19 until its inner end strikes against a suitable stop member 48 on the other arm 45 of the jig, whereupon the filament mount 39 is adjusted laterally so that the end of the filament coil 19 abuts against the shoulder 47 on the pin, as shown, thus locating the two filaments 19, 20 in a definite lateral as well as longitudinal position in the jig. To lock the filaments against lateral displacement, a locking pin 49 slidably mounted on the jig 43 is

then moved down and allowed to rest against the filament coil 19 by its own weight, the lower end 50 of the locking pin 49 being wedge-shaped so as to more or less enter the space between adjacent turns of the filament coil to thereby positively lock the filament 19, and therefore the entire mount structure 39, against lateral displacement with respect to the jig.

With the filament mount 39 thus properly positioned within the jig 43, a reflector section 11, to which the metal thimbles 21 and reflecting coating 14 have been previously applied, is then mounted face up below the jig in a suitable holder (not shown) on the mount fastening machine with the openings 16 in the reflector in approximate alignment with the parallel leg portions 42 of the inner leads 40 and with pellets 35, 36 of metallic fusible material and flux disposed within the metal thimbles 21. As in the previously described method, the pellets 35, 36 of fusible material and flux are then melted by the application of heat thereto in a suitable manner, such as by directing gas fires 38 against the lower portions of the metal thimbles 21 or by high frequency inductive heating, after which the jig 43, with its associated filament mount 39, is lowered so as to insert the straight leg portions 42 of the inner leads 40 through the openings 16 in the reflector section 11 and into the molten fusible material within the metal thimbles 21. The jig 43, with its associated filament mount 39, is lowered into the reflector section 11 to the point where the filaments 19, 20 are positioned in exact relation to the focal point of the reflecting surface 14, the holder for the jig being provided with three or more reflector surface engaging elements (not shown) for effecting such accurate positioning of the filaments. In such inserted position of the filament mount 39, the free or straight leg portions 42 thereof extend into the metal thimbles 21 to a point just short of the junction between the skirted or main portions of the thimbles and the cylindrical extensions or teats 23 thereon, as in the previous form of the invention, whereby sufficient clearance is provided between the said leg portions 42 of the inner leads and the metal thimbles 21 to compensate for any ordinary lateral misalignment therebetween. While the filament mount 39 is thus held in such inserted position within the reflector section 11 with the free leg portions 42 of the inner leads inserted in the metal thimbles 21 and extending into the molten fusible material therein, the latter is allowed to cool and solidify with the result that the inner leads 40, and therefore the entire filament mount 39 itself, is rigidly secured to the metal thimbles 21 and thus to the reflector section 11 with the two filaments 19, 20 located in exact predetermined position with respect to the focal point of the reflecting surface 14.

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

1. An electric lamp comprising a sealed glass envelope having a plurality of openings through the wall thereof, a plurality of closed metal thimbles mounted on the exterior of said envelope over the said openings therein and having their edge portions hermetically sealed to the glass of said envelope around said openings, and rigid inner lead members in said envelope, said inner leads extending through said openings and having outer end portions disposed within portions of said thimbles but out of direct contact therewith, the said portions of said thimbles being of appreciably larger size than the size of the said outer end portions of said inner leads, and means securing said inner leads within said thimbles in exact predetermined lateral relation to a reference portion of said envelope independent of the lateral relation of said thimbles to the said reference portion of the envelope.

2. An electric lamp comprising a sealed glass envelope having a plurality of openings through the wall thereof, at least a portion of the wall of said envelope being formed as an optical surface, a plurality of closed metal thimbles mounted on the exterior of said envelope over the said openings therein and having their edge portions hermetically sealed to the glass of said envelope around said openings, and rigid inner lead members in said envelope, said inner leads extending through said openings and having outer end portions disposed within portions of said thimbles but out of direct contact therewith, the said portions of said thimbles being of appreciably larger size than the size of the said outer end portions of said inner leads, and means securing said inner leads within said thimbles in exact predetermined lateral relation to the said optical surface of said envelope independent of the lateral relation of said thimbles to the said optical surface of the envelope.

3. A reflector unit for electric projector lamps comprising a cup-shaped glass body having a plurality of openings through the wall thereof and having its inner surface formed as a reflecting surface of definite optical shape, a plurality of closed metal thimbles mounted on the exterior of said glass body over the said openings therein and having their edge portions hermetically sealed to the glass of said body around said openings, and rigid inner lead members in said glass body, said inner leads extending through said openings and having outer end portions disposed within portions of said thimbles but out of direct contact therewith, the said portions of said thimbles being of appreciably larger size than the size of the said outer end portions of said inner leads, and means securing said inner leads within said thimbles in exact predetermined lateral relation to the said reflecting surface of said glass body independent of the lateral relation of said thimbles to the said reflecting surface of said glass body.

4. An electric incandescent lamp comprising a sealed glass envelope having at least a portion of the inner surface thereof formed as a reflecting surface of definite optical shape, said envelope having a plurality of openings through that portion of the wall of said envelope which is formed with the said reflecting surface, a plurality of closed metal thimbles mounted on the exterior of said envelope over the said openings therein and having their edge portions hermetically sealed to the glass of said envelope around said openings, rigid inner lead members in said envelope, said inner leads extending through said openings and having outer end portions disposed within portions of said thimbles but out of direct contact therewith, the said portions of said thimbles being of appreciably larger size than the size of the said outer end portions of said inner leads, a fusible metallic material securing said inner leads within said thimbles in exact predetermined lateral relation to the said reflecting surface of said envelope independent of the lateral relation of said thimbles to the said reflecting surface of

said envelope, and a filament mounted within said envelope in definite optical relation to the said reflecting surface thereof and electrically connected to said inner lead members.

5. The method of manufacturing electric lamps which comprises sealing a plurality of closed metal thimbles to the glass around a plurality of openings in a glass body, and securing a plurality of inner lead members within the interior of said metal thimbles but out of direct contact therewith and in an exact predetermined lateral position with respect to a reference portion of said glass body independent of the lateral relation of said thimbles to the said reference portion of said glass body.

6. The method of manufacturing electric lamps which comprises sealing a plurality of closed metal thimbles to the glass around a plurality of openings in a glass body having a surface of definite optical shape, and securing a plurality of inner lead members within the interior of said metal thimbles but out of direct contact therewith and in an exact predetermined lateral position with respect to the said optical surface of said glass body independent of the lateral relation of said thimbles to the said optical surface of said glass body.

7. The method of manufacturing electric lamps which comprises sealing a plurality of closed metal thimbles to the glass around a plurality of openings in a glass body having a surface of definite optical shape, and securing a plurality of inner lead members within the interior of said metal thimbles but out of direct contact therewith by means of a metallic fusible material and in an exact predetermined lateral position with respect to the said optical surface of said glass body independent of the lateral relation of said thimbles to the said optical surface of said glass body.

8. The method of manufacturing electric lamps which comprises sealing a plurality of closed metal thimbles to the glass around a plurality of openings in a glass body having a surface of definite optical shape, depositing a layer of reflecting material on said optical surface by vaporization of a body of said reflecting material, and securing a plurality of inner lead members to the interior of said metal thimbles in an exact predetermined position with respect to the reflecting surface of said glass body.

9. The method of manufacturing electric lamps which comprises sealing a plurality of closed metal thimbles to the glass around a plurality of openings in a glass body having a surface of definite optical shape, placing a quantity of metallic fusible material in said metal thimbles and heating said thimbles to thereby melt said fusible material, and inserting the ends of a plurality of inner lead members through said openings into the molten mass of fusible material and allowing said molten fusible material to solidify while the said inner lead members are held in an exact predetermined position with respect to the said optical surface of said glass body.

10. The method of manufacturing electric lamps which comprises forming a portion of the lamp envelope as a separate cup-shaped glass body having a plurality of openings therethrough and an interior surface of definite optical shape, sealing a plurality of closed metal thimbles to the exterior of said glass body over the said openings therein, and inserting a plurality of inner lead members through said openings into said metal thimbles and securing said lead members within said metal thimbles but out of direct contact therewith and in an exact predetermined lateral position with respect to the said optical surface of said glass body independent of the lateral relation of said thimbles to the said optical surface of said glass body.

11. The method of manufacturing electric lamps which comprises forming a portion of the lamp envelope as a separate cup-shaped glass body having a plurality of openings therethrough and an interior surface of definite optical shape, sealing a plurality of closed metal thimbles to the exterior of said glass body over the said openings therein, inserting a plurality of inner lead members through said openings into said metal thimbles and securing said lead members within said metal thimbles but out of direct contact therewith by means of a metallic fusible material of relatively high melting point and in an exact predetermined lateral position with respect to the said optical surface of said glass body independent of the lateral relation of said thimbles to the said optical surface of said glass body.

12. The method of manufacturing electric lamps which comprises forming a portion of the lamp envelope as a separate cup-shaped glass body having a plurality of openings therethrough and an interior surface of definite optical shape, sealing a plurality of closed metal thimbles to the exterior of said glass body over the said openings therein and in approximate predetermined position with respect to the said optical surface of said glass body, and inserting a plurality of inner lead members through said openings into said metal thimbles and securing said lead members within said metal thimbles but out of direct contact therewith and in exact predetermined lateral position with respect to the said optical surface of said glass body independent of the lateral relation of said thimbles to the said optical surface of said glass body.

13. The method of manufacturing electric incandescent lamps which comprises sealing a plurality of closed metal thimbles to the glass around a plurality of openings in a glass body, and securing the leading-in wires of a preformed filament mount within the interior of, but out of direct contact with, said metal thimbles in a position laterally and longitudinally thereof in exact predetermined relation to a reference portion of said glass body to thereby locate the filament of the said preformed mount in an exact predetermined position with respect to the said reference portion of said glass body.

14. The method of manufacturing electric incandescent lamps which comprises sealing a plurality of closed metal thimbles to the glass around a plurality of openings in a glass body, and securing the leading-in wires of a preformed filament mount within the interior of, but out of direct contact with, said metal thimbles by a metallic fusible material and in a position laterally and longitudinally of said thimbles in exact predetermined relation to a reference portion of said glass body to thereby locate the filament of the said preformed mount in an exact predetermined position with respect to the said reference portion of said glass body.

15. The method of manufacturing electric lamps which comprises sealing a plurality of closed metal thimbles to the glass around a plurality of openings in a glass body having a sur-

face of definite optical shape, depositing a layer of reflecting material on said optical surface, and subsequently securing a plurality of inner lead members to the interior of said metal thimbles in an exact predetermined position with respect to the reflecting surface of said glass body.

16. A mount structure for electric lamps comprising a glass body having a plurality of openings through the wall thereof, a plurality of closed metal thimbles mounted on the exterior of said glass body over the said openings therein and having their edge portions hermetically sealed to the glass of said body around said openings, and rigid inner lead members extending through said openings and having outer end portions disposed within portions of said thimbles, the said portions of said thimbles being of appreciably larger size than the size of the said outer end portions of said inner leads, said inner leads being secured within said thimbles but out of direct contact therewith and in exact predetermined lateral relation to a reference portion of the said glass body independent of the lateral relation of said thimbles to the said reference portion of said glass body.

17. In the manufacture of an electric lamp comprising a glass member provided with openings around which are sealed hollow thimble members, the step of soldering the ends of lead wires within portions of said thimbles of larger diameter than said lead wires with the lead wires located in definite predetermined lateral positions relative to a reference portion of said glass member and independent of the lateral position of said thimbles relative to said reference portion of the glass member, so that said lead wires bear a predetermined relation to the dies of a shaping device which subsequently shapes said wires.

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