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(54) IMPROVEMENTS IN OR RELATING TO BASE STRUCTURES FOR ELECTRIC LAMPS

(71) We, WESTINGHOUSE ELECTRIC CORPORATION of Westinghouse Building, Gateway Center, Pittsburgh, Pennsylvania, United States of America, a company organised and existing under the laws of the Commonwealth of Pennsylvania, United States of America do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to single-ended electric lamps and base assemblies therefor.

Present practice in the electric lamp industry is to manufacture the base members as completely-assembled components by placing a metal shell and one or more eyelets in a suitably-contoured die, feeding a gob of molten glass into the die, and molding the glass into an insulator which joins the base and eyelet(s) together and forms the desired unitary structure. While this technique produces base of acceptable quality, it leaves much to be desired insofar as the heat introduced into the metal parts by the molten gob of glass inherently anneals and discolors the metal. In the case of aluminium bases, the initial bright luster and sheen of the shell is lost and the finished bases have a dull tarnished appearance—even after they are chemically treated in an attempt to clean and brighten the shell and eyelet. Moreover, the annealing weakens the thin sheet metal to such a degree that some of the shells are frequently deformed while being shipped en masse to the lamp-making machines, resulting in a serious quality control problem. This problem, in turn, necessitated the use of sheet aluminium having an initial wall thickness of at least 0.0113 inch (0.287 mm.).

It has also been found that the glass insulators sometimes crack before or during the lamp-basing operation. Such cracks, in addition to being objectionable from an appearance and functional standpoint, can cause a piece of the insulator to subsequently break off and produce a disconcerting rattling noise within

the base after the latter has been attached to the lamp envelope.

Among the various alternative base-making proposals made down through the years are designs in which the insulator component of the base was formed separately and mechanically locked to the metal shell. For example, base structures have been disclosed wherein the end of the metal shell is bent inwardly to form a re-entrant annular pocket which nestingly receives a preformed insulator-eyelet component and permits it to be anchored in place by spinning the upstanding lip of the shell down onto the insulator.

It has also been proposed in the prior art to make the shell pocket and insulator of such configuration that the latter can be snap-locked within the base shell and the end contact member, in turn, to be snap-locked with the insulator or mechanically anchored therein.

The invention consists in a base assembly for a single-ended electric lamp having a vitreous envelope containing an energisable light source and terminated by a sealed end portion from which lead-in conductors extend, said lamp being of a type which requires a controlled light-centre-length dimension and said assembly comprising: a hollow metal shell adapted to be fastened to the sealed end portion of said envelope in encircling relationship therewith and having at its outermost end a flange extending laterally of the longitudinal axis of said shell and defining an opening into the interior of the shell and a transverse reference plane for spacing a predetermined axial distance from said light source, a preformed insulator having a rim portion disposed within the outer end of said metal shell and clamped in abutting engagement with the flange thereat by indented portions of the shell so that said insulator is thereby mechanically locked in predetermined spacial relationship with said shell and light source, and a protruding portion having an aperture therethrough and a substantially flat transversely extending end face located a predetermined axial distance from the reference plane defined by the shell

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flange, and a metallic contact member secured to the protruding portion of said insulator and arranged so that at least a part of said contact member is located on the said end face of the insulator and defines an end contact also for spacing a predetermined axial distance from said light source thus providing a controlled light-centre-length dimension.

Conveniently, the metal shell is of generally cylindrical configuration, the insulator is of generally circular configuration and the protruding portion thereof comprises a frusto-conical medial portion terminated by a depending boss to which the contact member is secured.

In one form of base assembly, the rim portion of the insulator is locked within the shell by indented portions of the shell wall which defines a circumferential groove, the insulator being composed of ceramic material with its aperture extending through the boss, and the contact member is in the form of a sheet metal cap having a hole in its end face, the relative dimensions of the metal cap and insulator boss being such that the cap is in tight force-fitted relationship with and is thus frictionally locked in overlying position on the boss solely by such relationship, said cap being joinable to one of the lead-in conductors by a fused body of solder which fills the hole.

The invention also includes a single-ended electric lamp having a vitreous envelope containing an energisable light source and terminated by a sealed end portion from which lead-in conductors extend, said lamp being of a type which requires a controlled light-centre-length dimension and which comprises a base assembly of the abovesaid one form, one of said lead-in conductors being fastened to said metal shell and another extending through the aperture in said insulator and being electrically connected to said contact member.

Besides utilizing a base assembly in which the contact member is in the form of a sheet metal cap having hole in its end face and the cap is joined to one of the lead-in conductors by a fused body of solder which fills the hole, the lamp's base assembly can have a sheet metal cap and insulator boss with relative dimensions such that the cap is in tight force-fitted engagement with and is thus locked in overlying position on the boss, the end of the lead-in conductor extending through the aperture in the boss being located and clamped between said boss and the overlying portions of the force-fitted cap.

The present invention provides an improved base assembly which permits the shell, insulator, and end contact components to be separately formed on a continuous-mass-production basis with a minimum amount of time, equipment, and material. The insulator is preferably molded from a fast-firing ceramic which contains up to 45% by weight of scrap glass in powdered form and thus constitutes a durable

low-cost material. The insulator is subsequently securely locked in precisely-controlled spatial relationship with the metal shell by inserting the insulator into the shell, seating the rim of the insulator against a flat intumed flange provided on the opposite end of the shell, and then rolling an indent or groove in the side wall of the shell that securely clamps the insulator in place within the flanged end of the shell. The intumed flange defines a reference plane which, in conjunction with the configuration and careful dimensioning of the insulator, insures that the "light-center-length" dimension of the lamp which is fitted with the base will be maintained within the prescribed limits.

The end contact member is preferably made from the disc of sheet metal and is punched from the bottom of the base shell by forming the disc into a hollow cap which is force-fitted onto a cylindrical boss provided on the protruding end of the molded insulator and has its peripheral edge recessed in an annular groove formed in the insulator. The base is thus not only tamper-proof but is fabricated in such a way that there is practically no waste material and, in fact, utilizes and "recycles" scrap glass. Since literally millions of such bases are made and used each year in the incandescent lamp industry, the cost savings and the amount of scrap glass that is recycled are quite substantial.

The manufacturing cost of the improved base is further reduced by the fact that each of the operations required to form the various parts and assemble them with the sealed-in lamp can be readily performed by high-speed machines without the assistance of any operators. Since there is no annealing and weakening (or tarnishing) of the base shells by molten glass as in the case of in situ molded insulators, the shells can also be made from thinner sheet metal and both the shells and end contacts retain their original lustrous finish.

In order that the invention can be more clearly understood, convenient embodiments thereof will now be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is an elevational view of an electric incandescent lamp embodying the improved base assembly of the present invention;

Fig. 2 is an enlarged perspective view of the performed insulator employed in the base assembly shown in Fig. 1;

Fig. 3 is an enlarged elevational view of the basal end portion of the lamp shown in Fig. 1, a part of the base being removed to illustrate the spatial relationship of the various parts;

Fig. 3a, is an enlarged cross-sectional view of the capped end portion of the base insulator, taken along line III_a—III_a of Fig. 3;

Figs. 4a to 4f are sectional views illustrating the various steps in fabricating the base com-

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ponents and assembling them with the lamp envelope and lead wires;

Fig. 5 is an elevational view, partly in cross-section, of the basal end of a lamp having an alternative form of threaded base wherein the metal cap is apertured and soldered to one of the lead wires;

Fig. 6 is a fragmentary view, partly in section, of another base embodiment wherein a soldered "washer-like" member constitutes the end contact;

Fig. 7 is an enlarged elevational view of the basal end of a "tamper-proof" lamp embodiment, portions of the base being broken away and shown in section;

Fig. 8 is a perspective view of the grooved insulator employed in the base shown in Fig. 7;

Fig. 9 is an elevational view, partly in section, of another "tamper-proof" lamp wherein a soldered end cap is used;

Fig. 10 is a perspective view of the end cap employed in the base structure shown in Fig. 9;

Figs. 11 and 11a are perspective and cross-sectional views, respectively, of an alternative end cap embodiment;

Figs. 12 and 14 are cross-sectional views of various other types of base embodiments having eyelet type end-contact members;

Fig. 15 is a cross-sectional view of another form of screw-type base assembly;

Fig. 15a is a plan view of the aforementioned base assembly taken along line XVa—XVa of Fig. 15;

Fig. 16 is a sectional view of a three-light lamp base structure according to another form of the invention; and

Fig. 17 is a fragmentary elevational view of an electric lamp having an alternative base structure that includes depressible elements which permit the lamp to be inserted in "plug-like" fashion into a threaded socket.

In Fig. 1, there is shown a representative electric incandescent lamp L for general lighting applications that comprises the usual vitreous envelope 15 which has a sealed neck portion 16 and contains a coiled filament 17, lead wires 18 and 19, and a suitable inert gas, such as a mixture of nitrogen and krypton. The improved screw type base assembly 20 is attached to the envelope neck 16 and consists of a threaded metal shell 21 and an insulator 24 that is provided with a contact member 30 which serves as the end terminal for the lamp L. As will be noted, the flat face of end contact cap 30 is spaced a predetermined axial distance "z" from the filament 17 and thus defines the "light-center-length" dimension of the lamp L. Since this dimension determines the type of fixture in which the lamp L can be used, it is quite important and must be maintained within a certain tolerance.

The insulator 24 is separately formed from a suitable non-conductive material, preferably a fast-firing ceramic composition of the type

referred to above. Such a material and a method of molding it into an insulator that has a predetermined shape and dimensions is disclosed in Belgian Patent Specification No. 780962. As shown in Fig. 2, in this particular embodiment the molded insulator 24 is of button-like configuration and has a flat circular rim portion 25, a frusto-conical shaped or tapered medial portion 26, and a depending centrally-disposed boss 27 that has a central aperture 28 which extends through the insulator.

As illustrated in Fig. 3, the base shell 21 has a series of threads formed therein and it is made from a suitable sheet metal, such as aluminium for example. One end of the shell 21 is attached to the sealed neck 16 of the lamp envelope 15 by suitable means, such as a quantity of cured basing cement B, and its opposite end is partly closed by a laterally-extending flange 22. As will be noted, the flange 22 extends around the shell periphery and defines a reference plane x—x that is normal to the longitudinal axis of the lamp L. The flat outer face of the insulator rim 25 is seated against the flange 22 and is firmly clamped in this position by an indented portion 23 of the shell 21 which defines a circumferential groove and is in pressured engagement with the inner peripheral lip of the insulator rim 25. The insulator 24 is thus securely locked to the shell 21 and its tapered medial portion 26 and cylindrical boss portion 27 extend axially beyond the flanged end of the shell.

As will be noted in Fig. 3, one of the lead wires 18 extends through the basing cement B between the bulb neck 16 and base shell 21 and is joined, as by welding or soldering, to the rim of the shell in the usual manner to form an electrical juncture 29. The other lead wire 19 extends through the aperture 28 in the insulator boss 27 and around the end face and side of the boss and is thus clamped in place by the end cap 30. The length of the lead wire 19 is such that it is entirely enclosed by the cap 30. The cap 30 is of cylindrical configuration and has an inside diameter that is slightly less than the combined diametrical dimensions of the lead wire 19 and the cylindrical boss 27 so as to effect a force fit with the latter and remain in positive contact with the lead wire. The peripheral edge of the boss 27 is also tapered to facilitate the force fitting of the cap 30 onto the boss.

The relative dimensions of the insulator boss 27 and end cap 30 are such that the end of the lead wire 19 is tightly wedged therebetween and causes the overlying side wall portion of the cap to bulge outwardly, as shown in Fig. 3a.

Alternatively, a loose-fitting contactor cap can be used and cemented in place on the insulator boss in electrical engagement with the lead wire.

Since the insulator 24 extends a predetermined distance beyond the shell flange 22 (as shown in Fig. 3), the outer surface of the end cap 30 is disposed in a plane y—y that is spaced a controlled distance "w" from the reference plane x—x defined by the flange 22 of the base shell 21. The flat contact surface of the end cap 30 is thus located a controlled axial distance "z" from the lamp filament 17 (see Fig. 1) and insures that the "light-center-length" dimension of the lamp L is maintained within the prescribed limits.

A preferred "tamper-proof" base structure and its premolded insulator are depicted in Figs. 7 and 8, respectively. As will be noted, the lamp L is identical to that previously described in that it has the usual glass envelope 115 with a neck portion 116 that is attached to the threaded shell 121 of the base assembly 120 by basing cement B. One of the lamp leads 118 is joined at 114 to the shell rim, the other lead 119 is clamped in place on the cylindrical boss 127 of the preformed insulator 124 by a force-fitted end cap 130, and the insulator rim 125 is locked in seated engagement with the intumed flange 122 of the base shell 121 along reference plane x—x by a circumferential indent 123 in the shell as before.

However, according to this embodiment the medial portion 126 of the shell has an outer surface (see Fig. 7) that is sharply curved in an axial direction (rather than gradually tapered) and the aforesaid medial portion is terminated by a retroverted shoulder S which defines an annular channel such as a groove or recess R that extends around the bottom of the insulator boss 127 (see Fig. 8). The inner rim or edge of the end cap 130 is located within this recess (as will be noted in Fig. 7) and is thus protectively "countersunk", so to speak, within the confines of the insulator 124. It is thus impossible, as a practical matter, to pry the cap off of the insulator by inserting a pointed instrument (or a finger-nail) under the edge of the cap and applying pressure. As an additional safeguard, a series of radially-spaced indents 131 are made in the side wall of the end cap 30 (after the latter has been forced down onto the insulator boss 127 and lead 119) to tightly crimp the cap in place on the insulator.

The portion of the insulator boss 127 around the aperture 128 is also beveled to provide an outwardly-flared recess 129 thereat (see Fig. 8).

An alternative "tamper-proof" lamp L is illustrated in Fig. 9. As shown, the end cap 130a according to this embodiment is provided with a hole 133 that is aligned with the aperture 128a in the insulator boss 127a and receives the end of the lead wire 119a. The latter is joined to the end cap 130a by a globule 134 of solder that is located within a pocket formed by an inwardly-tapered portion 132

(best seen in Fig. 10) of the cap which surrounds the hole 133. As will be noted in Fig. 9, the tapered portion 132 of the end cap 130a nests within the flared cavity 129a in the insulator boss 127a and the boss aperture 128a is made smaller than the cap hole 133. This arrangement prevents molten solder from falling through the aperture 128a into the base 120a during the basing operation. It also prevents the lead wire 119a from snagging on the tapered edge portion 132 of the cap 130a and buckling while it is being threaded through the passageway formed by the boss aperture 128a and cap hole 133.

An alternative form of metal end cap 130b is shown in Figs. 11 and 11a. In this embodiment, a suitable protuberance such as an annular bead or ridge 135 of arcuate cross-section is formed on the flat end face of the cap 130b during the stamping operation. This ridge is of such dimensions that it provides a contactor surface on the end cap which is of uniform and precisely-fixed height pursuant to the teachings of U.S. Patent No. 2,999,220 issued September 5, 1961 to L. C. Werner. The pocket formed by the tapered segment 132b around the cap hole 133b is large enough to receive the droplet of solder (not shown) and prevent it from extending beyond the ridge 135.

An important feature of the present invention is the cost savings derived from the unique manner in which the improved base is manufactured and assembled with the sealed-in lamp, which operations will now be described.

As shown in Fig. 4a, the first step consists of stamping or otherwise forming a hollow cylindrical metal shell 21' from suitable sheet metal of the proper thickness, which shell has a flat bottom wall.

The next operation is illustrated in Fig. 4b and consists of punching or otherwise removing a blank such as a disc 30' from the bottom wall of the metal shell 21', thus leaving a narrow laterally-protruding flange 22 that extends around the periphery of the shell. The disc 30' is then formed (as by stamping or other suitable means) into a cylindrical metal cap 30 of the proper dimensions, as shown in Fig. 4c.

The preformed button-like insulator 24 is then inserted (with its boss portion 27 facing downwardly as shown in Fig. 4d) into the non-constricted end of the shell 21' so that the flat rim 25 of the insulator 24 is seated against the shell flange 22, and the shell 21' is subjected to suitable tools that form the threads and peripheral indent 23—thus locking the insulator 24 and resulting threaded shell 21 together and completing the manufacture of the base components, as shown in Fig. 4e.

The assembly of the base components with the sealed end of the lamp envelope 15 is shown in Fig. 4f and consists of slipping the subassembly formed by the conjoined base

shell 21 and insulator 24 over the envelope neck 16 and concurrently threading the lead wire 19 through the insulator aperture 28 and positioning the other lead wire 18 between the bulk neck 16 and threaded portion of the shell 21. Of course, the shell 21 contains a filling of basing cement (not shown) which is subsequently heated and cured to securely anchor the shell 21 to the lamp envelope 15 in the well known manner.

The protruding ends of the lead wires 18 and 19 are then trimmed to the proper length, lead 19 is bent around the lip of the insulator boss 27, and the cylindrical cap 30 is force-fitted over the boss in tightly-clamped and positive electrical engagement with the entrapped end of the lead 19.

The end cap 30 is thus formed from the offal produced when making the shell portion 21 of the base 20 and the cap, accordingly, has a planar configuration and dimensions that correspond exactly with the configuration and dimensions of the opening into the base shell 21 defined by the inturned flange 22.

Experience has shown that the threads and locking indent 23 in the shell 21 can be formed by modifying standard thread-forming equipment known in the art, such as a "Barth Threading Machine", and that the shells can be processed at a rate of about 800 units per minute—thus enabling the base-insulator sub-assemblies to be manufactured automatically at a high rate of speed.

In the embodiment shown in Fig. 5, the base assembly 20a incorporates the same threaded metal shell 21a and mechanically locked preformed insulator 24a as those previously described but is provided with a metal end cap 32 that has a central aperture 33. The cap 32 is force-fitted over and locked in place on the insulator boss 27a as before, but the end of the lead wire 19a is threaded through the boss aperture 28a and the aligned opening 33 in the cap 32, trimmed to the proper length, and is then joined to the cap by a globule of solder 34. In this particular embodiment, since the "light-center-length" dimension of the lamp L will be measured from the outer surface of the globule 34, the axial dimensions of the insulator 24a or base shell 21a will be correspondingly shortened. Cap 32 can also be loose fitting and cemented in place on the boss 27a if desired.

In the embodiment shown in Fig. 6, the end terminal for the lamp consists of a sheet metal washer 35 that is provided with an inwardly-concave central portion 36 that is nestingly seated in the suitably recessed end face of the insulator boss 27b and fastened to the latter by a suitable cement (not shown). The lead wire 19b is threaded through the apertured boss 27b and the hole in the washer 35, and (after being trimmed flush with the outer surface of the washer) is anchored in place by a globule 38 of solder that fills the small pocket

formed by the indented central part 36 of the washer.

The present invention is not limited to screw-type bases or cap and washer-type contact members. For example, the preformed insulator concept and associated concept of locking such insulators to a metal base shell in precisely-controlled dimensional relationship can be applied to various sizes and varieties of bases known in the art.

In Fig. 12, for example, there is shown a miniature-type base assembly 20c which has a non-threaded base shell 21c with an end segment 39 that is of reduced diameter, terminated by an inturned flange 22c, and is tightly clamped around the rim portion 25c of the preformed insulator 24c and thus locks the insulator in predetermined relationship with the shell. In this embodiment the insulator 24c does not have a conical-shaped medial portion and the lug or protruding portion 27c is tapered inwardly at its free end, as shown. The contactor member in this embodiment consists of a metal eyelet 40 that extends through the insulator aperture 28c and is mechanically locked to the insulator 24c by peening of flaring the inner end of the eyelet 40 outwardly against the concave inner wall 41 of the insulator.

A candelabra type base 20d is shown in Fig. 13 and consists of a threaded base shell 21d that is provided with the same type of insulator 24d and staked eyelet end contact 40d described above. A circumferential indent 23d formed at the end of threaded portion of the shell 21d is used to lock the insulator 24d in place as in the previous threaded-base embodiments.

In Fig. 14 there is shown a bayonet type base 20e comprising an unthreaded metal shell 21e that has a pair of oppositely-oriented extruded pins 42 extending laterally from its side walls and a preformed insulator 24e that is mechanically locked in place by the clamping effect produced by an inturned flange 22e and a circumferential indent 23e located directly below the aforesaid pins. As shown, the insulator 24e has a pair of apertures therein each of which are fitted with staked eyelets 40e which serve as the end contacts. A series of spaced indents instead of a continuous indent or groove can be used to lock the insulator 24e in place if the pins 42 interfere with the indent-rolling operation.

The invention can also be used in base types which require more than one metal shell or end contact. A base having this feature is shown in Fig. 15 and comprises a base assembly 20f which includes a preformed insulator 24f of elongated configuration that has a rim portion 25f which is provided with a circumferential recess 43, an axially-dependent tubular body portion 44 that has a similar recess 45 formed at its outer end, and a conical-shaped medial portion 26f which is terminated by a cylindrical

boss 27f having an aperture 28f therethrough.

The shell 21f in this instance is not threaded and is mechanically locked to the insulator 24f by a circumferential indent 23f that extends into the recess 43 in the insulator rim portion 25f and firmly clamps the flat underside of the rim portion against the intumed flange end 22f of the shell. A second shell 46 having threads formed therein is locked with its intumed flanged end 47 seated against the flat face of the tubular body portion 44 of the insulator 24f by a peripheral indent 48 that extends into the recess 45 located at the end of the aforesaid body portion.

A cylindrical metal end cap 30f is force-fitted over the cylindrical boss 27f and clamps one of the lead wires 19f in place as in the previously-described embodiments. The other lead wire 18f extends through an opening 50 in the insulator rim 25f, as more clearly shown in Fig. 15a, and is attached as by soldering to the rim of the threaded shell 46.

A base assembly 20g for a three-light lamp is shown in Fig. 16 and consists of a threaded metal shell 21g that is locked with its intumed flange 22g in seated engagement with the flat underside of the insulator rim portion 25g by a circumferential indent 23g that is disposed in clamping engagement with the upper edge of the preformed insulator 24g. As will be noted, the insulator 24g is of modified configuration and has a first boss 51 of cylindrical configuration with a tapered rim and an offset aperture 52 that extends from the flat outer face of the boss into the interior of the shell 21g, and a smaller cylindrical boss 27g that has a similarly-shaped rim and a centrally-disposed aperture 28g which also extends into the base interior. The side contact or terminal for the lamp is effected in the usual manner by bringing the end of one of the lead wires 18g out over the upper rim of the shell 21g and soldering or otherwise fastening it to the outer surface of the shell. The end terminal is fashioned in the same manner as previously described by threading the second lead wire 19g through the boss aperture 28g and clamping it in place against the lip and side of the small boss 27g by a force-fitted cylindrical metal cap 30g whose flat end face is spaced a predetermined distance from the reference plane defined by the intumed flange 22g.

The intermediate contact or terminal for the lamp comprises a second and larger metal cylindrical cap 53 that is force-fitted over and mechanically locked in place on the end of the large boss 51 in clamped and positive engagement with the end of the third lead wire 54 that is threaded through the boss aperture 52 and is bent around the lip and side of the boss 51.

The end faces of the respective bosses 27g and 51 are substantially flat and spaced predetermined distances from each other and the reference plane defined by the shell flange 22g

so that the contact surfaces defined by the respective metal caps 30g and 53 are parallel to one another and axially spaced apart the required distance to insure proper engagement with the terminals of the three-light socket into which the lamp is screwed.

In Fig. 17 there is shown an alternative type of electric lamp L_1 having a vitreous envelope 15h with a constricted neck portion 16h that is cemented or otherwise fastened to a "push-in" type base assembly 20h. As shown, the base assembly consists of a non-threaded cylindrical metal shell 21h having a peripheral indent 23h which mechanically locks it to a preformed insulator 24h that has a force-fitted metal end cap 30h which serves as one of the lamp terminals, as described above in connection with the Figs. 1-3 embodiment.

In contrast to screw-type or bayonet-type bases, the base assembly 20h shown in this embodiment is adapted to be inserted in "plug-like" fashion into a threaded socket. This is accomplished by forming a plurality (preferably three) elongated recesses 55 in the medial portion of the base shell 21h, which recesses extend longitudinally along the shell and are spaced equal distances from one another circumferentially. A corresponding number of outwardly-bowed leaf springs 56 are attached to the base shell 21h by spot welding or otherwise securing one end 57 of the springs in overlapped relationship with the shell, as shown in Fig. 17. The springs 56 are thus aligned with the respective openings 58 into the recesses 55 and are free to flex inwardly and outwardly with respect to the shell 21h. Each of the leaf springs 56 can be provided with a nodule or projection 60 to insure a positive interlock with the socket threads when the lamp L_1 is pushed into the socket and the springs 56 are depressed. Such "push-in" type bases are well known in the art and the particular leaf-spring design illustrated is disclosed in U.S. Patent No. 1,761,344 issued June 3, 1930 to J. Huber.

While aluminium has been specifically mentioned as being the material from which the shell and end caps are formed, the invention is not limited to this material but permits the use of plated sheet metal which heretofore could not be used in conventionally-manufactured bases having molded glass insulators due to the corrosion which subsequently formed at the cut unplated end edges of the metal. The present invention overcomes this difficulty since the metal pieces can be completely protected by plating them en masse after they have been formed. Thus, brass-plated or zinc-plated steel in sheet form can be used.

Experience has also shown that a considerable cost saving is also achieved by the invention in that the base shells can be made from thinner sheet metal since heating and annealing of the shells by molten glass is eliminated. In the case of aluminium, shells of satisfactory

compressive strength and rigidity have been made from stock 0.0100 inch (0.254 mm.) thick compared to the 0.0113 inch (0.287 mm.) thick stock heretofore required. A further reduction to aluminium sheet stock 0.006 inch (0.1524 mm.) thick appears feasible. While those differences seem trivial and miniscule, they represent savings of many thousands of dollars due to the large numbers of bases made and the tops of sheet metal used each year in the lamp industry for such bases.

Since neither the base shells nor end caps are heated during the fabricating or assembly operations, the sheet metal retains its original clean lustrous finish and the completed base structures thus have a very attractive appearance.

WHAT WE CLAIM IS:—

1. A base assembly for single-ended electric lamp having a vitreous envelope containing an energizable light source and terminated by a sealed end portion from which lead-in conductors extend, said lamp being of a type which requires a controlled light-centre-length dimension and said assembly comprising: a hollow metal shell adapted to be fastened to the sealed end portion of said envelope in encircling relationship therewith and having at its outermost end a flange extending laterally of the longitudinal axis of said shell and defining an opening into the interior of the shell and a transverse reference plane for spacing a predetermined axial distance from said light source, a preformed insulator having a rim portion disposed within the outer end of said metal shell and clamping in abutting engagement with the flange thereat by indented portions of the shell so that said insulator is thereby mechanically locked in predetermined spacial relationship with said shell and light source, and a protruding portion having an aperture therethrough and a substantially flat transversely extending end face located a predetermined axial distance from the reference plane defined by the shell flange, and a metallic contact member secured to the protruding portion of said insulator and arranged so that at least a part of said contact member is located on the said end face of the insulator and defines an end contact also for spacing a predetermined axial distance from said light source thus providing a controlling light-centre-length dimension.

2. An assembly according to claim 1, wherein the metal shell is of generally cylindrical configuration, the insulator is of generally circular configuration and the protruding portion thereof comprises a frusto-conical medial portion terminated by a depending boss, and the contact member is secured to said boss.

3. An assembly according to claim 2, wherein the opening into the shell interior

defined by the flange is of predetermined configuration and dimensions.

4. An assembly according to claim 2 or 3, wherein the rim portion of the insulator is locked within the shell by indented portions of the shell wall which define a circumferential groove, the insulator being composed of ceramic material with its aperture extending through the boss, and the contact member is in the form of a sheet metal cap having a hole in its end face, the relative dimensions of the metal cap and insulator boss being such that the cap is in tight force-fitted relationship with and is thus frictionally locked in overlying position on the boss solely by such relationship, said cap being joinable to one of the lead-in conductors by a fused body of solder which fills the hole.

5. An assembly according to claim 4, wherein the sheet metal cap is composed of the same metal as the shell and formed from a piece of sheet metal of the same size and shape as the shell opening.

6. An assembly according to claim 4 or 5, wherein the metal cap and insulator boss are both of generally cylindrical configuration.

7. An assembly according to claim 4, 5 or 6, wherein the ceramic insulator is composed of a molded and fired mixture of materials including up to 45% by weight of powdered glass, and the shell is fabricated from aluminium having at least one thread formed therein.

8. An assembly according to any of claims 4 to 7, wherein the medial portion of the insulator is terminated by an annular recess which is located at and extends around the bottom of the boss, the inner peripheral edge of the cap being disposed in said annular recess and thus rendered inaccessible.

9. An assembly according to claim 8, wherein the annular recess is defined by an arcuate retroverted shoulder on the exterior surface of said insulator.

10. An assembly according to any of claims 4 to 9, wherein the cap has at least one indent in its side wall portion which crimps the cap on said insulator boss.

11. An assembly according to claims 4 to 10, wherein the boss has a flared cavity in its end face merging with the aperture in the boss, and the part of the metal cap defining the hole is tapered inwardly and seated in the flared cavity in said boss, the tapered portion of said cap forming a pocket adapted to receive the body of solder.

12. An assembly according to claim 11, wherein the end face of the cap has a protuberance thereon constituting the contactor surface of said cap.

13. An assembly according to claim 12, wherein the protuberance comprises an arcuate ridge adapted to extend around and beyond the body of solder.

14. An assembly according to any of claims



compressive strength and rigidity have been made from stock 0.0100 inch (0.254 mm.) thick compared to the 0.0113 inch (0.287 mm.) thick stock heretofore required. A further reduction to aluminium sheet stock 0.006 inch (0.1524 mm.) thick appears feasible. While those differences seem trivial and miniscule, they represent savings of many thousands of dollars due to the large numbers of bases made and the tops of sheet metal used each year in the lamp industry for such bases.

Since neither the base shells nor end caps are heated during the fabricating or assembly operations, the sheet metal retains its original clean lustrous finish and the completed base structures thus have a very attractive appearance.

WHAT WE CLAIM IS:—

1. A base assembly for single-ended electric lamp having a vitreous envelope containing an energizable light source and terminated by a sealed end portion from which lead-in conductors extend, said lamp being of a type which requires a controlled light-centre-length dimension and said assembly comprising: a hollow metal shell adapted to be fastened to the sealed end portion of said envelope in encircling relationship therewith and having at its outermost end a flange extending laterally of the longitudinal axis of said shell and defining an opening into the interior of the shell and a transverse reference plane for spacing a predetermined axial distance from said light source, a preformed insulator having a rim portion disposed within the outer end of said metal shell and clamping in abutting engagement with the flange thereof by indented portions of the shell so that said insulator is thereby mechanically locked in predetermined spacial relationship with said shell and light source, and a protruding portion having an aperture therethrough and a substantially flat transversely extending end face located a predetermined axial distance from the reference plane defined by the shell flange, and a metallic contact member secured to the protruding portion of said insulator and arranged so that at least a part of said contact member is located on the said end face of the insulator and defines an end contact also for spacing a predetermined axial distance from said light source thus providing a controlling light-centre-length dimension.

2. An assembly according to claim 1, wherein the metal shell is of generally cylindrical configuration, the insulator is of generally circular configuration and the protruding portion thereof comprises a frusto-conical medial portion terminated by a depending boss, and the contact member is secured to said boss.

3. An assembly according to claim 2, wherein the opening into the shell interior

defined by the flange is of predetermined configuration and dimensions.

4. An assembly according to claim 2 or 3, wherein the rim portion of the insulator is locked within the shell by indented portions of the shell wall which define a circumferential groove, the insulator being composed of ceramic material with its aperture extending through the boss, and the contact member is in the form of a sheet metal cap having a hole in its end face, the relative dimensions of the metal cap and insulator boss being such that the cap is in tight force-fitted relationship with and is thus frictionally locked in overlying position on the boss solely by such relationship, said cap being joinable to one of the lead-in conductors by a fused body of solder which fills the hole.

5. An assembly according to claim 4, wherein the sheet metal cap is composed of the same metal as the shell and formed from a piece of sheet metal of the same size and shape as the shell opening.

6. An assembly according to claim 4 or 5, wherein the metal cap and insulator boss are both of generally cylindrical configuration.

7. An assembly according to claim 4, 5 or 6, wherein the ceramic insulator is composed of a molded and fired mixture of materials including up to 45% by weight of powdered glass, and the shell is fabricated from aluminium having at least one thread formed therein.

8. An assembly according to any of claims 4 to 7, wherein the medial portion of the insulator is terminated by an annular recess which is located at and extends around the bottom of the boss, the inner peripheral edge of the cap being disposed in said annular recess and thus rendered inaccessible.

9. An assembly according to claim 8, wherein the annular recess is defined by an arcuate retroverted shoulder on the exterior surface of said insulator.

10. An assembly according to any of claims 4 to 9, wherein the cap has at least one indent in its side wall portion which crimps the cap on said insulator boss.

11. An assembly according to claims 4 to 10, wherein the boss has a flared cavity in its end face merging with the aperture in the boss, and the part of the metal cap defining the hole is tapered inwardly and seated in the flared cavity in said boss, the tapered portion of said cap forming a pocket adapted to receive the body of solder.

12. An assembly according to claim 11, wherein the end face of the cap has a protuberance thereon constituting the contactor surface of said cap.

13. An assembly according to claim 12, wherein the protuberance comprises an arcuate ridge adapted to extend around and beyond the body of solder.

14. An assembly according to any of claims



- 4 to 13, wherein the hole in the metal cap is centrally-located and substantially in alignment with the aperture in the boss.
15. An assembly according to claim 2, wherein the contact member comprises a metal washer cemented to the end face of the insulator boss, said washer being solderable to an end of one of the lead-in conductors or passing end said through said boss.
16. An assembly according to claim 1, wherein the inner surface of the insulator around the aperture therein is tapered toward said aperture, said contact member comprising a metal eyelet located in said insulator aperture and having laterally-flared end portions extending around the adjacent lip portions of said insulator and locking the eyelet in the insulator aperture, and said flared end portions being solderable to an end of one of the lead-in conductors on passing said end through the insulator aperture.
17. An assembly according to claim 1, wherein a pair of integral metal pins extend laterally from the shell which is of cylindrical non-threaded configuration and the base assembly thus comprises a bayonet type assembly insertable into a non-threaded bayonet-type socket and then locked therein solely by said pins, the protruding portion of said insulator has a pair of spaced apertures therein, and a metal eyelet is disposed in each of the respective apertures and is mechanically locked in place therein, the eyelets being respectively solderable to the lead-in conductors on introducing the latter therein.
18. A single-ended electric lamp having a vitreous envelope containing an energizable light source and terminated by a sealed end portion from which lead-in conductors extend, said lamp being of a type which requires a controlled light-centre-length dimension and which comprises a base assembly according to claim 1, one of said lead-in conductors being fastened to said metal shell and another extending through the aperture in said insulator and being electrically connected to said contact member.
19. A lamp according to claim 18 which utilizes a base assembly as claimed in claim 4, the cap being joined to one of the lead-in conductors by a fused body of solder which fills the hole.
20. A lamp according to claim 18, which utilizes a base assembly as claimed in claim 2 or 3 and wherein the rim portion of the insulator is locked within the shell by indented portions of the shell wall which define a circumferential groove, the insulator being composed of ceramic material with its aperture extending through the boss, and the contact member is in the form of a sheet metal cap, the relative dimensions of the metal cap and insulator boss being such that the cap is in tight force-fitted relationship with and is thus frictionally locked in overlying position on the boss solely by such relationship and the end of the lead-in conductor extending through the aperture in the boss being located and clamped between said boss and the overlying portions of the force-fitted cap.
21. A lamp according to claim 19 or 20, wherein the cap has at least one indent in its side wall portion which crimps the cap on said insulator boss.
22. A lamp according to claim 18, 19, 20 or 21 wherein the medial portion of the insulator is terminated by an annular recess which is located at and extends around the bottom of the boss, the inner peripheral edge of the cap being disposed in said annular recess and thus rendered inaccessible.
23. A lamp according to claim 22, wherein the annular recess is defined by an arcuate retroverted shoulder on the exterior surface of said insulator.
24. A lamp according to any of claims 19 to 23, wherein the ceramic insulator is composed of a molded and fired mixture of materials including up to 45% by weight of powdered glass and the shell is fabricated from aluminium having at least one thread formed therein.
25. A lamp according to any of claims 19 to 24, wherein the sheet metal cap is composed of the same metal as the shell and formed from a piece of sheet metal of the same size and shape as the shell opening.
26. A lamp according to claim 19 or any of claims 21 to 25 when dependent thereon, wherein the boss has a flared cavity in its end face merging with the aperture in the boss, and the part of the metal cap defining the hole is tapered inwardly and seated in the flared cavity in said boss, the tapered portion of said cap forming a pocket adapted to receive the body of solder, flared cavity in said boss, the body of solder being located in the pocket formed by the tapered portion of the cap.
27. A lamp according to claim 26, wherein the end face of the cap has a protuberance thereon constituting the contactor surface of said cap.
28. A lamp according to claim 27, wherein the protuberance comprises an arcuate ridge extending around and beyond the body of solder.
29. A lamp according to claim 19 or any of claims 21 to 28 when dependent thereon, wherein the hole in the metal cap is centrally-located and substantially in alignment with the aperture in the boss.
30. A lamp which utilizes a base assembly as claimed in claim 2 or 3, wherein the contact member comprises a metal washer cemented to the end face of the insulator boss, the end of one of the lead-in conductors extending through the boss and being soldered to said metal washer.



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31. A lamp according to claim 18, wherein the inner surface of the insulator around the aperture therein is tapered toward said aperture, said contact member comprising a metal eyelet located in said insulator aperture and having laterally-flared end portions extending around the adjacent lip portions of said insulator and locking the eyelet in the insulator aperture, and said flared end portions being solderable to an end of one of the lead-in conductors on passing said end through the insulator aperture, locking the eyelet in the insulator aperture and the end of one of the lead-in conductors extending through the insulator aperture and being soldered to an exposed flared end portion of the eyelet.

32. A lamp according to claim 18, wherein a pair of integral metal pins extend laterally from the shell and the base assembly thus comprises a bayonet type assembly, the protruding portion of said insulator has a pair of spaced apertures therein, and a metal eyelet is disposed in each of the respective apertures and is mechanically locked in place therein, the eyelets being respectively solderable to the lead-in conductors or introducing the latter therein, locked in place therein and the lead-in conductors extending into the respective eyelets and being soldered thereto.

33. A lamp according to claim 18 of the incandescent three-light type having three lead-in conductors extending from the sealed end portion of the envelope, wherein the protruding portion of the insulator is of such configuration that it defines (a) a first generally-cylindrical boss that has an offset aperture therein and (b) a second generally-cylindrical boss which is of smaller diameter than and projects outwardly from the center of said first boss and has a centrally-located aperture therein that extends into the base interior. first and second metal contact caps are secured to the respective first and second bosses in force-fitted telescoped relationship therewith, and one of said lead-in conductors is connected to said metal shell, another of said lead-in conductors is connected to said first metal contact cap, and the remaining lead-in conductor is connected to said second metal contact cap.

34. A lamp according to claim 18, wherein the metal shell is of non-threaded and generally cylindrical configuration, and integral resiliently-depressible means are carried by a medial portion of said cylindrical shell, said means being so arranged and movable that they cooperate with a threaded socket and permit the based end of the lamp to be slip-fitted into said threaded socket and locked in positive electrical engagement with the socket terminals.

35. A lamp according to claim 34, wherein the resiliently-depressible means comprises (a) at least two outwardly-bowed and circumferentially-spaced leaf springs that extend in the

same general direction as the longitudinal axis of the lamp and are attached at one end to the metal shell, and (b) a corresponding number of recess openings in said metal shell that are aligned with and permit the respective leaf springs to flex inwardly toward and into the shell during the placement of the lamp into the socket.

36. A method of manufacturing a base assembly and fastening it in operative relationship on a single-ended electric lamp having a vitreous envelope and a pair of depending lead wires, which comprises stamping a generally-cylindrical cup-like member from sheet metal, cutting a disc from the bottom wall of said cup-like member and thereby forming a hollow metal shell having an intumed flange at one end which partly constricts the shell opening thereat, separately forming an insulator having a substantially flat rim and a protruding medial portion terminated by a depending boss, placing said insulator, boss portion down, into said metal shell through the non-constricted end thereof until the rim portion of the insulator is seated against the intumed flange at the opposite end of the shell, holding said shell and insulator in the aforesaid position and concurrently bending selected portions of the side, wall of the shell inwardly into overlying relationship with the peripheral edge of the insulator to thereby lock the flanged end of the shell around the enclosed rim of said insulator and provide a shell-insulator sub-assembly, forming the cut-out disc of sheet metal into a hollow cap having an inner dimension slightly smaller than the dimension of the insulator boss, fastening the open end of said shell-insulator sub-assembly to the vitreous envelope, and then force-fitting the cap onto the insulator boss and locking it thereon.

37. A method according to claim 36, wherein the insulator is mechanically locked to said shell by rolling in the side wall of the shell a circumferential indent which effects a pressured interlock with the rim of the insulator and thus clamps the members together, the shell-insulator sub-assembly being fastened to the vitreous envelope by biasing cement.

38. A method according to claim 37, wherein the insulator is formed with an aperture extending through its boss, one of the lead wires being threaded through the insulator aperture as the shell-insulator sub-assembly is placed on and cemented to said envelope, and the end of said one lead wire being bent over and around said boss and mechanically clamped in such position by the force-fitted metal cap which thus serves as an end contact for the lamp.

39. A method according to claim 38, wherein the other of the lead wires is positioned and entrapped between the shell and vitreous envelope as the shell-insulator sub-assembly is placed on and cemented to said

envelope, and the end of said other lead wire is electrically connected to said shell.

5 40. A method according to claim 37, wherein the insulator, when formed, is provided with an annular groove extending around the bottom of the boss along the region where said boss merges with the protruding medial portion of the insulator, and the cap is made of such length that the inner edge thereof is
10 recessed within said groove when the cap is force-fitted onto the boss.

41. A method according to claim 37, wherein the insulator is formed with an aperture extending through the insulator boss, one of
15 the lamp lead wires being threaded through said insulator aperture as the shell-insulator sub-assembly is placed on and cemented to said envelope, the cap is provided in its end wall with a hole aligned with the insulator
20 aperture when the cap is force-fitted onto the boss, one of the lamp lead wires being threaded through said insulator aperture and cap hole as the shell-insulator sub-assembly is placed on and cemented to said envelope, and the
25 end of said one lead wire being joined to the cap by soldering.

42. A method according to claim 41 wherein the portion of the cap around the hole is tapered inwardly to form a pocket, and the
30 soldering of the one lead wire to the cap is performed in a manner such that the solder is located within said pocket.

43. The method of claim 41 or 42, wherein the cap, when formed, is provided with a protuberance on its end face extending beyond
35 the soldered lead wire juncture and thus constituting the contactor surface of the cap.

44. Base assemblies fastened in operative relationship on single-ended electric lamps having a vitreous envelope and a pair of
40 depending lead wires, when made by a method according to any of claims 36 to 43.

45. Base assemblies for single-ended electric lamps having a vitreous envelope terminated by a sealed end portion from which a pair of
45 lead-in conductors extend, said lamps being of a type which requires a controlled light-centre-length dimension, and said assembly being substantially as described herein with particular reference to Figure 1 to 4f or
50 Figure 5 or Figure 6 or Figures 9 and 10, or Figures 11 and 11a or Figures 12, to 14 of the accompanying drawings.

46. Single-ended electric lamps as claimed in claim 18, and substantially as described
55 herein with particular reference to Figures 1 to 4f or Figure 5 or Figure 6 or Figures 7 and 8 or Figures 9 and 10 or Figures 11 and 11a or Figures 12 to 14 or Figures 15 and 15a or Figure 16 or Figure 17 of the accompanying
60 drawings.

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