April 20, 1943. J. DANA 2,317,035

ELECTRIC LAMP

Filed March 28, 1941

Fig. 1.

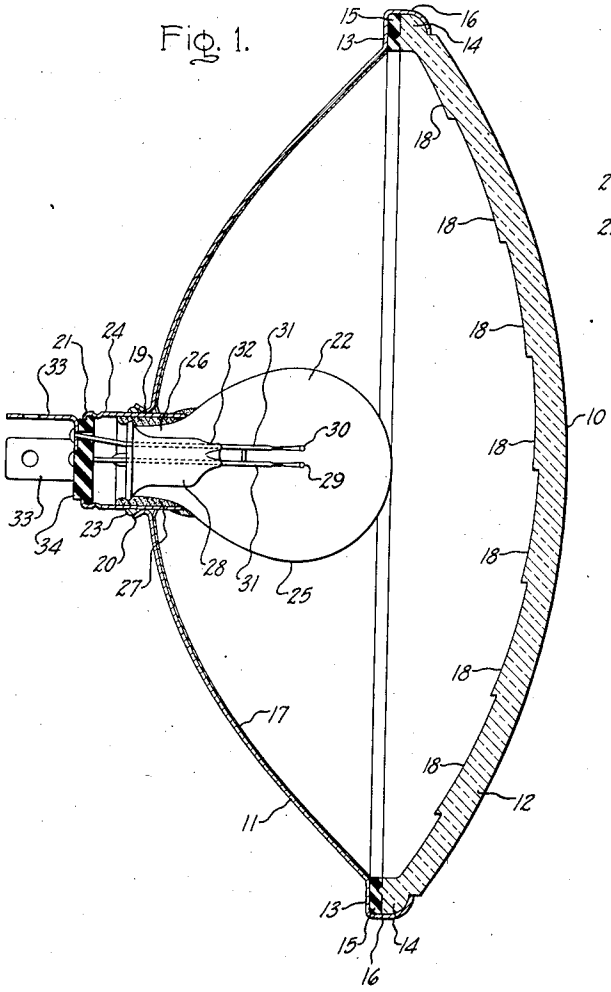


Fig. 2.

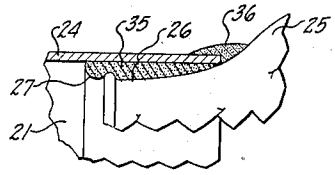


Fig. 3.

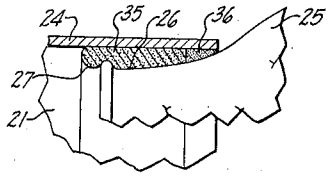
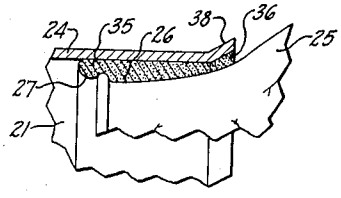


Fig. 4.



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2,317,035

ELECTRIC LAMP

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7 Claims. (Cl. 176—34)

My invention relates in general to electric light projection devices of the type in which a small electric lamp, such as an incandescent lamp, is mounted within a sealed enclosure comprising a reflector member and a cover glass or lens united thereto in an airtight manner. More specifically, my invention relates to electric incandescent lamps for such light projection devices, and particularly to the base construction of such lamps.

Automobile headlamps of the so-called "Sealed Beam" type have recently come into widespread commercial use. In one form of such type headlamps, hereinafter referred to as metal reflector lamps, a small electric incandescent lamp is mounted within an enclosure formed of a metal reflector section of parabolic or other suitable shape and a glass cover or lens section clamped or otherwise secured at its periphery to the metal reflector section in an airtight manner. The base of the electric incandescent lamp extends through an opening in the metal reflector, and the annular space between the lamp base and the reflector opening is filled with solder or other suitable material so as to secure the lamp in place within the enclosure and at the same time form a hermetic seal between the lamp base and the metal reflector. In this manner the headlamp enclosure is presumably rendered airtight whereby ingress of foreign matter thereinto is eliminated. However, in practice, it has been found that such is not the case. Thus, it has been found that the basing cement which is usually employed for attaching the base of the incandescent lamp to the glass bulb thereof is more or less porous in nature, with the result that foreign matter is eventually drawn into the headlight enclosure, during the use of the headlamp, under the influence of the alternate heating and cooling of the atmosphere within the headlamp.

When the atmosphere within the enclosure of such metal headlamps becomes heated, such as is occasioned by the heat radiated by the incandescent lamp during operation of the same, or by the exposure of the headlamp to the sun on hot days, the pressure of the atmosphere within the headlamp enclosure increases to a point above that of the external atmosphere with the result that a portion of the internal atmosphere is driven out through the porous basing cement. Then, when the headlamp cools down upon discontinuance of lamp operation or discontinuance of the heating action of the sun, the pressure of the atmosphere within the headlamp enclosure decreases to a point below that of the external atmosphere so that the resulting partial vacuum within the headlamp enclosure draws a quantity of the outside atmosphere into the enclosure, the foreign matter entrained or otherwise present in such atmosphere being drawn along therewith into the enclosure. Due to the repeated occurrence of such action during usage of the device, additional foreign material is drawn into the headlamp enclosure from time to time, with the result that the reflecting surface of the headlamp gradually becomes tarnished so as to decrease the efficiency of the device. The tarnishing action is particularly noticeable in smoky regions where a relatively high percentage of sulphur vapor is present in the atmosphere, such vapors being particularly detrimental to the reflecting surface. In addition, the water vapor which is present in the outside atmosphere, is drawn into the headlamp enclosure and condenses, from time to time, on the inner surface of the headlamp lens where it materially impairs the distribution of the light rays from the headlamp.

According to the invention, the above-mentioned disadvantages have been overcome by providing a hermetic seal between the base and the bulb of the incandescent lamp employed in such light projecting devices whereby there is no path for passage of the atmosphere into and out of the headlamp enclosure through the end of the lamp base and the annular space between the sleeve of the lamp base and the neck of the lamp bulb.

One object of my invention is to provide an electric light projection device of the above mentioned type having a hermetically sealed enclosure whereby ingress of foreign material thereinto is eliminated.

Another object of my invention is to provide an electric light projection device of the above mentioned type in which a hermetic seal is provided between the glass bulb and the outwardly extending base of the electric lamp mounted in such device.

Still another object of my invention is to provide an electric lamp having a hermetic seal between the base and bulb thereof so as to prevent the passage of a gaseous medium through the end of the base and through the annular space between the base shell and lamp bulb.

A feature of the invention is the provision of a compound basing cement for an electric lamp composed of two separate and distinct compositions, one of which functions to provide a bond of sufficient strength between the base and lamp

bulb to withstand normal handling stresses, and the other of which functions to provide an airtight seal between the base shell and the bulb neck.

Further objects and advantages of my invention will appear from the following description of species thereof and from the accompanying drawing in which:

Fig. 1 is a vertical section of an electric light projection device according to my invention; Fig. 2 is a fragmentary sectional view, on an enlarged scale, of the base construction of an electric incandescent lamp comprising my invention for use in the light projection device shown in Fig. 1; and Figs. 3 and 4 are views similar to Fig. 2 of modified forms of electric incandescent lamps according to my invention for use in the light projection device shown in Fig. 1.

Referring to Fig. 1, the light projection device there shown comprises an enclosure 10 formed of a metal reflector member 11 and a light-transmitting cover member or lens 12 of suitable material, such as glass, secured together at their peripheries or rim portions 13 and 14, respectively, by suitable means forming an airtight joint, a rubber gasket 15 being inserted between the opposing rim portions 13, 14 and compressed therebetween so as to form an airtight seal between the parts. As shown in the drawing, the reflector 11 and lens 12 are preferably secured together by means of a flange 16 extending forwardly from the outer edge of the rim 13 on the metal reflector and rolled over onto the top surface of the rim 14 of the lens 12 while the parts are in assembled relation with the rubber gasket 15 under compression. The reflector 11 is preferably formed as a paraboloid having a focal length of approximately 1⅛ inches, but obviously it may be formed of any other suitable reflector shape. The inner surface of the reflector 11 is provided with a coating 17 of aluminum, silver, or any other suitable reflecting material. The cover member 12 is preferably formed as a lens having suitable light-directing flutes and prisms 18 on its inner surface to provide the desired distribution of light from the device. At its apex, the metal reflector 11 is provided with an opening 19 which may be bordered by a rearwardly extending, outwardly flaring flange 20. Instead of extending rearwardly, the flange 20 may be turned inwardly (i. e., forwardly). It will be understood, however, that the use of such a flange at all is entirely optional. The base 21 of a small electric incandescent lamp 22 extends out through the opening 19 and is secured to the reflector 11 by a ring 23 of solder which completely fills the annular space between the shell 24 of the lamp base 21 and the reflector flange 20. The ring of solder 23 maintains the lamp in place within the enclosure and provides a hermetic seal between the lamp base 21 and the reflector 11.

The incandescent lamp 22 is of a type similar to that described and claimed in U. S. Patent 2,227,324, Severin, issued December 31, 1940, and comprises, in addition to the base 21, a glass bulb 25 having a neck portion 26 secured to the base 21 by a ring of basing cement 27 and provided with a reentrant stem 28. Mounted within the bulb 25 are a pair of concentrated filaments 29, 30 each consisting of a linear coil of tungsten or other suitable refractory metal. The filaments 29, 30 extend transversely of the axis of the bulb 25 and parallel to one another, and are spaced apart vertically a distance of approximately 0.100 inch and, in addition, are offset laterally a distance of approximately 0.105 inch with respect to one another. The lamp 22 is mounted in the parabolic reflector 11 with the filaments 29, 30 disposed horizontally, with the lower filament 29 arranged symmetrically about the focus of the reflector 11. The filaments 29, 30 are supported by, and are electrically connected to, three leading-in wires 31 (one common to both filaments) which are sealed into the press portion 32 of the stem 28 and extend therethrough to the terminals 33 of the lamp base 21. The said terminals are suitably fastened to a disc of insulating material 34 mechanically secured to and closing the outer end of the lamp base shell 24.

In accordance with the invention, the passage of a gaseous medium, such as the atmosphere, through the lamp base 21 and into the headlamp enclosure 10 is effectively prevented by the provision of a hermetic seal within or on the lamp base so as to effectively seal the path of flow of such a gaseous medium through the lamp base. In this manner, the ingress of foreign material into the headlamp enclosure is prevented so that tarnishing of the reflecting surface 17, and condensation of water vapor within the enclosure on the optical surfaces of the headlamp, are eliminated.

The hermetic sealing of the lamp base is preferably effected by means of a suitable sealing medium or compound disposed within or across the annular space between the shell 24 of the lamp base and the neck 26 of the lamp bulb, as shown particularly in Figs. 2 to 4. In sealing the lamp base by this method, a composite basing cement is preferably employed for attaching the lamp base 21 to the bulb 25, the cement being composed of two separate and distinct portions of different compositions each of which performs a separate and distinct function. Thus, as shown in Figs. 2 to 4, the lower portion 35 of the ring of basing cement 27 (i. e., that portion closest to the terminal end of the base) is formed of a composition which provides a bond of the necessary mechanical strength to withstand the stresses to which it may be subjected during the normal handling and usage of the lamp, while the upper portion 36 of the basing cement 27 (i. e., that portion adjacent the rim or edge of the base shell 24) is formed of a composition which will effectively seal the annular space between the base shell 24 and the bulb neck 26 against the passage therethrough of any and all gaseous mediums.

The lower bonding cement portion 35, which serves as the means for fastening the base to the bulb, fills the greater portion of the annular space between the base shell 24 and the bulb neck 26 so as to provide a bond of maximum strength therebetween, while the sealing portion 36 need only consist of a relatively small ring of material of sufficient section to insure an effective hermetic seal.

The bonding cement 35 used to secure the lamp base 21 to the bulb 25 is of the type commonly employed for such purposes comprising an inorganic filler, such as powder of marble, alumina, or magnesia, mixed with a suitable binding agent or agents, such as shellac, rosin, and suitable synthetic resins, for example, "Bakelite" or "Durite." Such type basing cements are more or less porous in nature, so that in the absence of a hermetic seal in the lamp base, the outside atmosphere slowly penetrates through the basing cement and enters the headlamp enclosure 10.

The sealing material 36 may consist of any suitable substance or compound which will pro-

vide a hermetic seal, and which possesses the necessary resistance to flow at the operating temperature of the lamp. Thus, I have found that a synthetic resin, such as that commercially known as "AYAB" or "AYAT vinylite" (made by the Union Carbide and Carbon Corporation), with or without a suitable filler such as that commercially known as "Asbestine," will provide a satisfactory seal if used in sections of sufficient thickness. The material preferably employed for the sealing cement, however, is one which is thermo-setting in character, i. e., one which does not resoften under heat once it has been cured. As an example of such a material, I have found a solution of urea formaldehyde, modified with a non-drying alkyd to prevent brittleness, to be particularly advantageous. The urea formaldehyde solution is applied to the junction of the base and bulb of a finished lamp, after which the material is dried at room temperatures or above until the solvent is removed, and then cured for a length of time depending on the temperature used. Since this material does not resoften at the operating temperature of the lamp, a relatively thin section may be used to provide a seal against pressure.

Obviously, instead of the urea formaldehyde gum referred to above, other suitable thermo-setting gums may be used, such as the phenol formaldehyde and phenol furfurol class of gums, or the gum commercially known as "Melamine," manufactured by The American Cyanamid Company; or various mixtures of such gums, the urea formaldehyde class included, may be used, an alkyd resin or other suitable non-drying material being preferably added in each case to prevent brittleness of the final product.

As shown in Fig. 2, the sealing material **36** may be applied to the junction between the edge of the base shell **24** and the bulb **25**, the material preferably extending a short distance down onto the outer surface of the base shell adjacent the edge thereof. Alternatively, the sealing material **36** may be disposed entirely within the base shell in the form of a ring of the material located immediately adjacent the edge of the base shell, as shown in Fig. 3; or a small portion of the base shell **24** at the outer edge thereof, may be flared outwardly, as indicated at **38** in Fig. 4, to conform more or less to the curvature of the bulb wall, and the sealing material **36** disposed within the annular space between the said flaring edge portion **38** and the wall of the bulb **25**.

It will be obvious that the invention may be applied equally as well to an electric lamp wherein the base is attached to the bulb by mechanical means instead of by the conventional basing cement as described hereinabove.

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

1. A light projecting device comprising an air-tight enclosure, an electric lamp sealed within said enclosure comprising a bulb having a neck portion and a base having a shell portion enclosing said neck portion and secured thereto, said base extending out through the wall of said enclosure and hermetically sealed thereto, and a sealing compound disposed adjacent the junction between said base shell and bulb for hermetically sealing the space therebetween to prevent leakage of air into said enclosure through the interior of said lamp base.

2. An electric lamp comprising a bulb having a neck portion and a base enclosing said neck portion and secured thereto by a composite basing cement having portions of different compositions, one of said portions being of a composition providing a bond of the required mechanical strength between said base and bulb to hold said parts together and the other of said portions being of a composition providing a hermetic seal between said base and bulb.

3. An electric lamp comprising a bulb having a circular neck portion, a cylindrical base enclosing said neck portion and secured thereto by a ring of basing cement disposed within the annular space between said base and neck portion, and a sealing compound disposed adjacent the junction between said base and bulb and covering the exposed surface of said ring of basing cement for hermetically sealing the said annular space between said base and bulb neck.

4. A light projecting device comprising an air-tight enclosure, an electric lamp sealed within said enclosure comprising a bulb having a neck portion and a base having a shell portion enclosing said neck portion and secured thereto, said base extending out through the wall of said enclosure and hermetically sealed thereto, and a thermo-setting sealing compound disposed adjacent the junction between said base shell and bulb for hermetically sealing the space therebetween to prevent leakage of air into said enclosure through the interior of said lamp base.

5. A light projecting device comprising an air-tight enclosure, an electric lamp sealed within said enclosure comprising a bulb having a neck portion and a base having a shell portion enclosing said neck portion and secured thereto, said base extending out through the wall of said enclosure and hermetically sealed thereto, and a sealing compound composed of a thermo-setting gum modified with a nondrying alkyd disposed adjacent the junction between said base shell and bulb for hermetically sealing the space therebetween to prevent leakage of air into said enclosure through the interior of said lamp base.

6. A light projecting device comprising an air-tight enclosure, an electric lamp sealed within said enclosure comprising a bulb having a neck portion and a base having a shell portion enclosing said neck portion and secured thereto, said base extending out through the wall of said enclosure and hermetically sealed thereto, and a sealing compound composed of urea formaldehyde modified with a nondrying alkyd disposed adjacent the junction between said base shell and bulb for hermetically sealing the space therebetween to prevent leakage of air into said enclosure through the interior of said lamp base.

7. An electric lamp comprising a bulb having a neck portion and a base enclosing said neck portion and secured thereto by a composite basing cement having portions of different compositions, one of said portions being of a composition providing a bond of the required mechanical strength between said base and bulb to hold said parts together and the other of said portions being of a composition providing a hermetic seal between said base and bulb, the second mentioned portion being composed of a thermo-setting gum modified with a nondrying material which inhibits brittleness.

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