

Feb. 27, 1951

R. K. BRAUNSDORFF
ELECTRIC LAMP

2,543,093

Filed Dec. 28, 1948

4 Sheets-Sheet 1

FIG. 1

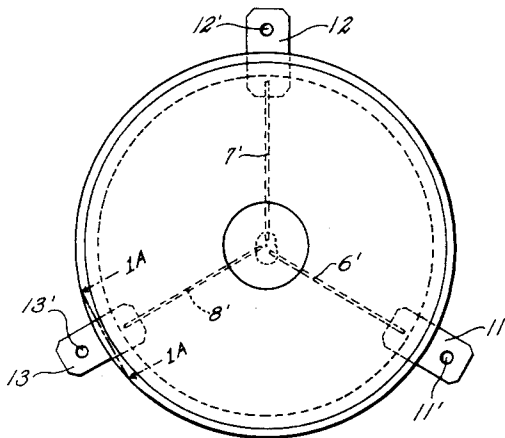


FIG. 2

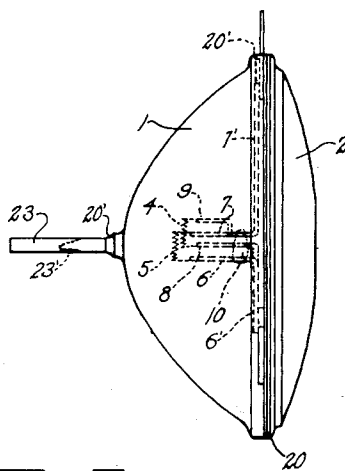


FIG. 3

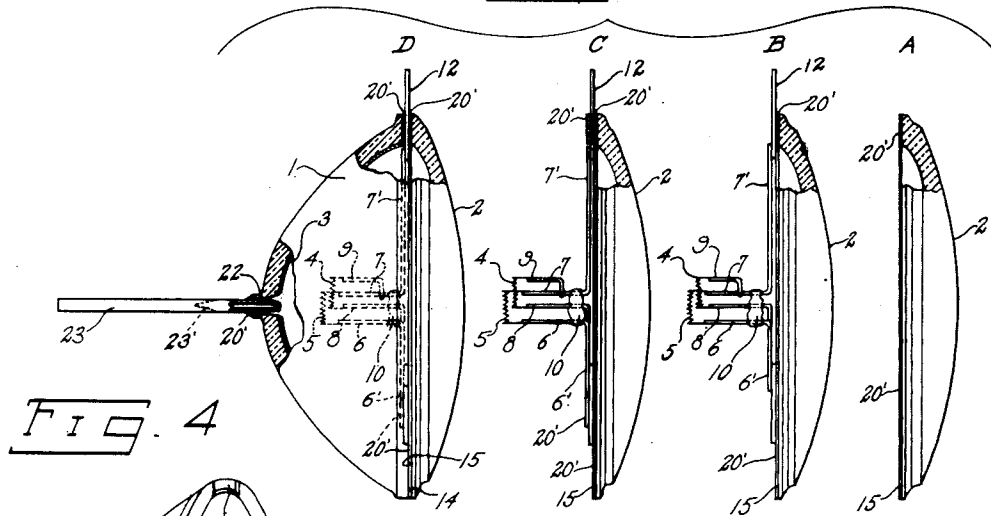


FIG. 4

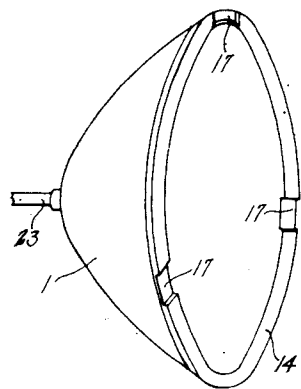
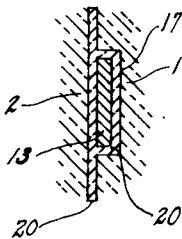


FIG. 1A



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Fig. 5

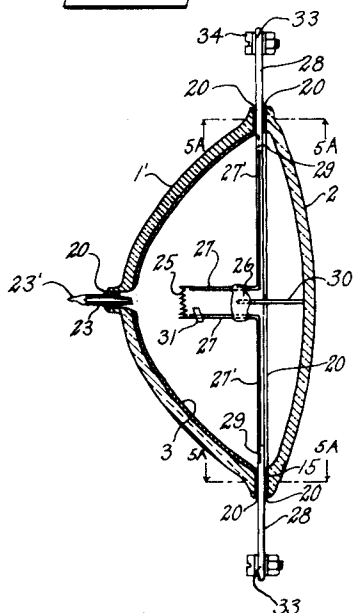


Fig. 6

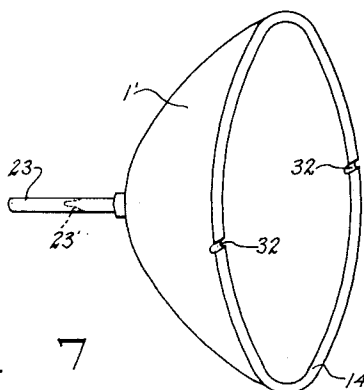


Fig. 7

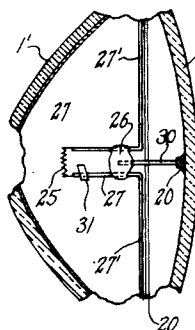


Fig. 5A

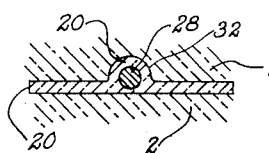


Fig. 8

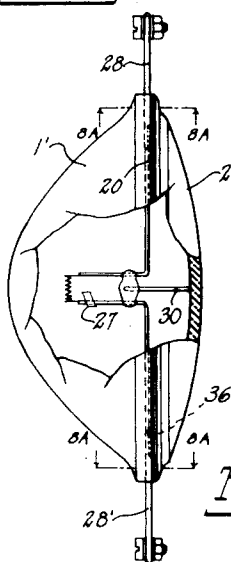


Fig. 10

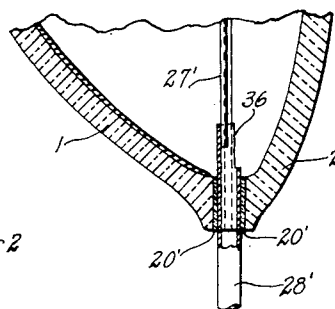


Fig. 11

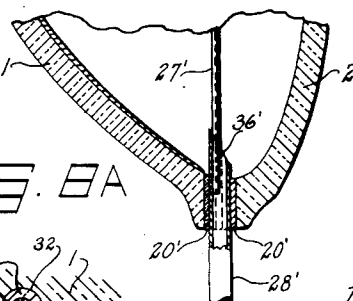
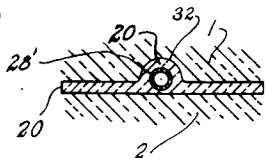


Fig. 8A



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FIG. 9

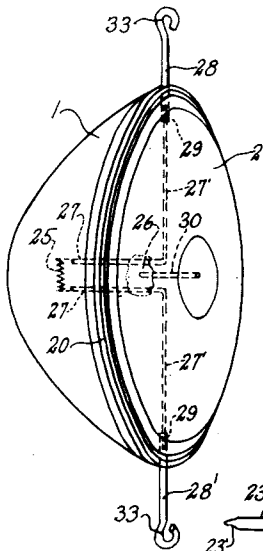


FIG. 12

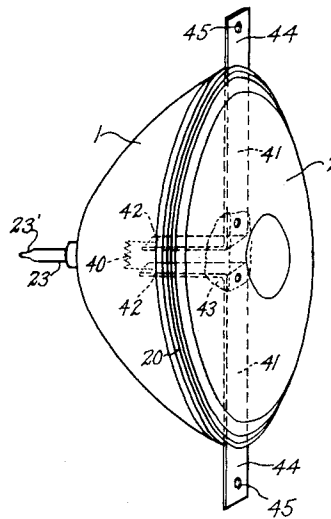


FIG. 13

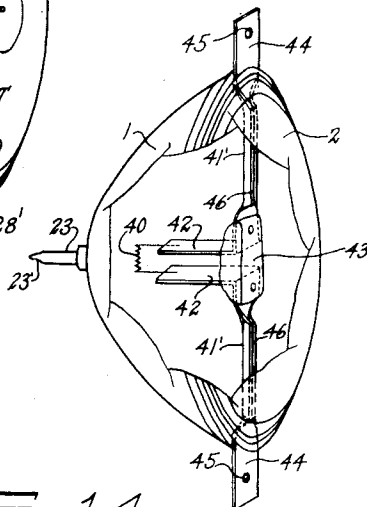


FIG. 14

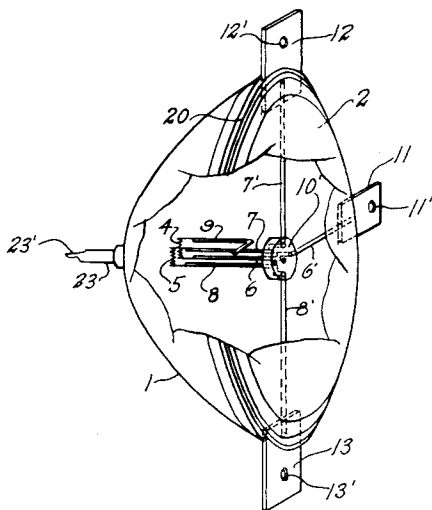
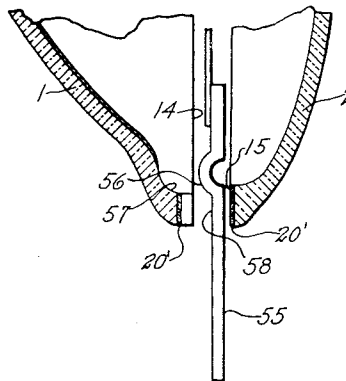


FIG. 16



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2,543,093

ELECTRIC LAMP

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Application December 28, 1948, Serial No. 67,643

8 Claims. (Cl. 176—34)

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This invention relates to electric lamps.

More particularly the invention relates to electric lamps comprising a reflector and a lens with the lighting filament or filaments sealed inside the reflector-lens unit, and one object of the invention is a novel and improved lamp of this general character.

A conventional lamp of the above indicated character comprises a reflector and lens assembly of Pyrex glass with the filament or filaments mounted in the desired focal relation with respect to the reflector upon supporting wires or posts passing through and sealed to the reflector. A conventional filament support is in the form of an assembly of a post having an alloy cup brazed thereto with the flange of the cup embedded in the softened Pyrex glass about the opening through which the post or rod passes into the rear of the reflector.

In the manufacture of these conventional lamps the peripheral edges of the reflector and lens are heated to the high temperature required for fusing and joining the two elements and carbon rollers are utilized to shape or prevent too great a distortion of the peripheral edges during this high temperature fusing operation, but the reflector elements often become distorted from their true parabolic or other desired contour due to the softening of the glass for the attachment of the filament supporting posts and due to the imperfect shaping of the carbon rollers. Moreover, these and other manufacturing steps of the conventional lamps are comparatively expensive operations, and the filaments must be precision mounted upon the supports after the supports are sealed into the reflector which requires expensive filament mounting equipment.

A further object of the invention is a lamp of the character which may be manufactured without subjecting the glass of the reflector and the lens to a softening or fusing temperature with the resultant freedom from distortion of the reflector contour.

A further object of the invention is a lamp of the above indicated character which is characterized by a novel reflector-lens-filament mount structure.

A further object of the invention is a lamp of the above indicated character which is characterized by the simplicity of the structure, the economy with which it may be manufactured and by its ability to stand up and withstand the rough usage to which lamps of this general character are subjected.

A further object of the invention is a lamp of

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the above indicated character embodying a reflector and a lens bonded together at their peripheries with the terminals passing through the bond and serving as supports for the unit.

A further object of the invention is a novel and improved method of sealing and securing the lens and reflector elements in the desired relation.

A further object of the invention is a novel and improved method of sealing the filament supports into the reflector-lens unit.

A further object of the invention is an improved structure and method of manufacture of a lamp of the above indicated character whereby the filament mount may be formed as a unit and the filament precision mounted thereon prior to mounting within the reflector with the filament being precision mounted with respect to the reflector by the mere act of assembling and sealing the elements together.

A further object of the invention is a novel and improved lamp unit of the above indicated character and a mount therefor characterized by the ease with which the unit may be mounted on a vehicle and its beam adjusted.

A further object of the invention is a novel and improved method and means for sealing together parts of incandescent electric lamps wherein the reflector element is contained within the evacuated lamp housing.

Other objects of the invention will hereinafter appear.

For a better understanding of the invention reference may be had to the accompanying drawings, wherein—

Fig. 1 is a front view of a lamp embodying the invention;

Fig. 1A is an enlarged sectional view along the line 1A—1A thereof;

Fig. 2 is a side view thereof;

Fig. 3 illustrates steps in the manufacture of the lamp;

Fig. 4 is a perspective view of the reflector element of the embodiments of Figs. 1, 2 and 3;

Fig. 5 is a sectional view through a modification;

Fig. 5A is a sectional view along the line 5A—5A thereof;

Fig. 6 is a perspective view of the reflector of this modification;

Fig. 7 is a sectional view through another modification;

Fig. 8 is a side view partly in section of another modification;

Fig. 8A is a sectional view along the line 8A—8A thereof;

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Fig. 9 is a perspective view thereof;
Fig. 10 is a sectional view through a part of Fig. 8;

Fig. 11 shows a modification;

Fig. 12 is a perspective view of a modified lamp;

Fig. 13 is a perspective view of a further modification;

Fig. 14 is a perspective view of a further modification;

Fig. 15 is a perspective view of a further modification;

Fig. 16 is a view diagrammatically illustrating the precision mounting of the filaments; and

Fig. 17 illustrates diagrammatically the mounting of a lamp embodying the invention on a vehicle.

Referring to the embodiment of Figs. 1 to 4, Figs. 1 and 2 illustrate diagrammatically the completed lamp unit embodying the invention. The glass reflector element is diagrammatically illustrated at 1 and the glass lens element is schematically illustrated at 2. The reflector element 1 has a conventional reflector surface 3, being formed for example of a coating of any conventional material for forming a reflecting surface, for example, it may be a conventional aluminized surface. The reflector element 1 may be of any conventional contour such as parabola and it is understood that the lens 2 may be of any suitable construction, namely, a plane cover without light directing or modifying means, or with such means for directing or modifying the reflected beam in the desired manner. The glass of the reflector element 1 and the lens element 2 is of the character of glass which is known in the trade as soft glass, such as lead glass, lime glass, etc., although it is understood that certain features of the invention are applicable to other types of glass.

The lamp of the invention may embody a single lighting filament or multiple filaments and in the embodiment of Figs. 1 to 4 there are two filaments 4 and 5. The mount for the filament comprises three support wires 6, 7 for supporting the filament 5, and the support wires 8, 9 for supporting the filament 4. The support wire 9 is an angle support wire welded to the support wire 7, the support wire 7 forming the common lead for the two filaments. The mount comprises a button or mass of insulating material 10 such, for example, as a suitable ceramic insulating material, glass, etc., and the support wires 6, 7 and 8 are embedded in this insulator 10 and thereby held in spaced relation for the support of the filaments 4 and 5. The mount also comprises two or more metallic supports 6', 7', 8', in the embodiment shown being of metallic wire which radiate outwardly from the central axis of the reflector and are attached at their outer ends respectively to metal tabs or terminals 11, 12, 13, these metal tabs 11, 12 and 13 being formed from comparatively thin metallic sheets and projecting out through the peripheral edge of the reflector-lens unit to form electrical supply connections for the filaments 4 and 5 and to form supports for the lamp unit. These terminal and supporting connections 11, 12 and 13 are provided with openings 11', 12', 13' for ready attachment to suitable lamp mount supports. The mount wires 6', 7' and 8' are at their inner ends embedded in the insulating mass 10 and are electrically connected in the mass 10 respectively with the support wires 6, 7 and 8. In the particular embodiment shown these mount wires 6', 7' and 8' have their inner ends formed at right angles

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to the main body thereof which right angle parts are embedded in the insulating mass 10 to form continuations of the filament support wires 6, 7 and 8.

These mounts including the filaments 4 and 5 are mounted and sealed in position when the reflector element 1 and the lens element 2 are bonded and sealed together at their peripheral edges. The reflector element 1 is provided with an abutting surface 14 near its peripheral edge and the lens 2 is provided with a corresponding abutting surface 15 and the reflector and lens elements are bonded and sealed into a sealed unit along these abutting surfaces 14 and 15 which extend all the way around the elements. In the particular embodiment shown these abutting surfaces 14 and 15 are in planes substantially at right angles to the central axis of the reflector. The filament mount is mounted in position in the unit at the time the reflector and lens elements are bonded and sealed together about their abutting surfaces 14 and 15 and this is effected by bonding and sealing the mount support tabs 11, 12 and 13 between the elements at their peripheral edges, namely between or at the abutting surfaces 14 and 15. To facilitate this operation one or both of the elements 1 and 2 are provided with notches or depressions in their abutting edges 14 and 15 for the reception of the supporting tabs 11, 12 and 13, thus enabling the bringing of the abutting surfaces 14 and 15 of the elements into engagement or sufficiently close proximity to enable the bonding and sealing of the three elements together as described below. In the particular embodiment illustrated these notches or depressions are wholly formed in the abutting surface 14 of the reflector element 1 and these are indicated at 17, these being of approximately sufficient depth and width to accommodate the thickness and width of the tabs 11, 12 and 13.

This bonding and sealing operation is effected at temperatures sufficiently below the softening or melting temperature of the glass of either the reflector 1 or the lens 2 to avoid any disturbance or distortion of the glass elements from their pressed form and further to obviate the necessity of simultaneous shaping operations or shape holding operations.

I have found that a perfect and permanent bond and seal may be effected between the elements 1 and 2 at their abutting surfaces 14 and 15 and all the way around these surfaces, with the lamp unit supporting tabs 11, 12 and 13 incorporated in this bond without interfering in any way with the bond and seal between the elements, by utilizing and fusing a layer of bonding material of suitable character applied to one or both of the surfaces 14 and 15 and the tabs 11, 12 and 13. I utilize a bonding material which fuses at a temperature below the softening or melting temperature of the glass and having other desired characteristics as to coefficient of expansion, elasticity, etc. This bonding material may generally be described as a pulverized or granular imperfectly vitrified fritted mass formed by the partial fusion of sand and fluxes.

In the conventional practice, as above indicated, the reflector and lens elements are joined and sealed to each other by melting and fusing their peripheral edges 14 and 15 together at the high temperatures required for this purpose and with the other accompanying disadvantages indicated.

I have found that the fusing and softening of the peripheral edges or rims 14 and 15 of the

conventional practice to a point where the glass tends to lose shape may be obviated along with other advantages, and a perfect seal and rugged joint or union between the peripheral abutting radial surfaces of the two glass elements may none the less be obtained, by interposing between the abutting surfaces of the peripheral edges 14 and 15 to be joined a suitable low melting point bonding material having the characteristics described below, and fusing the same in situ into a film-like bond between the glass elements. I have illustrated in somewhat exaggerated depth or thickness for convenience this bond at 20'.

I have obtained particularly good results by utilizing a low fusing material which may be described generally as of the lead or lead oxide family of such materials available on the market, although it is understood that other bonding materials having the same characteristics may be used; for example, a bonding material containing 50% or more of lead or lead oxide, and a suitable flux or fluxes and a suitable filler or fillers whose elasticity compensates for any irregularity in expansion of the flux or mass when fused and set between and to the abutting surfaces of the peripheral edges 14 and 15 and to impart the other desirable characteristics. It has a temperature coefficient of expansion around or fairly close to that of the soft glass used, namely a coefficient of expansion of 90 to 94×10^{-7} . Its softening point is below 450°C . (around 415 to 420°C .) and it melts or fuses at a temperature around 500°C . Its fluidity becomes quite marked at temperatures above 500°C . This marked fluidity of the bonding material is such that when a portion thereof in the pulverized or granular form is positioned on a glass slide and heated to the fusing and melting temperature, it tends to flow into a thin layer and when heated to above 500°C ., as for example to 575°C ., say for fifteen minutes, it flows very thin and spreads itself in a very thin flat layer on the slide. I believe this tendency of the fused bonding material to spread into a thin layer or film at around or above 500°C . is important in the forming of the seal and strong rigid joint, although I have obtained fairly good results with bonding materials whose fluidity at the fusing and melting temperatures is substantially less than that of the specific bonding material described above.

Any suitable soft glass may be used for the reflector and lens elements such, for example, as lead glass which softens at around 626°C . and lime glass which softens at around 696°C . and by softening is meant softening to a point where the glass becomes slightly flexible or distortable from its shape or begins to become flexible or distortable. I have obtained particularly good results by using glass reflector and lens elements of lime glass.

The temperature coefficient of expansion of lead glass at 0° – 310°C . is around 90×10^{-7} , and that of lime glass is around 92×10^{-7} . While the coefficient of expansion of the above described bonding material is somewhat different from that of the lead and lime glasses and while the coefficient of expansion of these materials may vary with the temperature, I have found that after heating up to 500°C . or above and during cooling the assembly down to room temperature, the bond is free from any tendency to craze and crack and that a durable firm bond and a secure seal are obtained between the glass elements. The elasticity of the bond material above described

accommodates it to and compensates for any irregularity in expansion within the material itself and for slight differences in coefficients of expansion between the glass of the reflector and cover or lens elements and the bond, and this characteristic of the bonding material is believed to be responsible at least in part for the freedom from craze and cracks in the joint formed between the glass elements. These and other characteristics of the bond contribute to its tensile strength and to the quality of forming a substantially integral bond between the abutting surfaces of the reflector and lens elements.

The bonding and sealing material when thus fused between the juxtaposed and abutting surfaces of the peripheral edges forms a firm union between the soft glass elements 1 and 2 which has been demonstrated by tests to be at least as strong, if not stronger, than the glass itself. This fused bonding material appears to merge into and in effect form an integral part of the glass of the elements 1 and 2 though the bonding operation is carried on at a temperature well below the softening temperature of the glass, and with the film or layer of bond having tensile strength adequate not only to firmly unite the elements when the lamp is evacuated but also when the lamp is pressurized with gas. With the preferred bonding material the layer 20' approaches molecular depth at the pressure points with a variation in thickness of the layer to compensate for the irregularities in the two abutting planar surfaces.

For lime glass which has a fusing or melting temperature of around 696°C I have obtained good results by heating the periphery of the assembly to a temperature within the range of 450°C . to 525°C . With the reflector and lens elements assembled as shown in Fig. 2 with their abutting surfaces having interposed between them the bonding material, the temperature of the whole assembly is gradually brought up to within the temperature range above indicated and the assembly is then gradually cooled and upon the temperature dropping below the fusing point of the bonding material the reflector and lens elements become a rigid unitary structure sealed all the way around at the peripheral edge with both the reflector and the lens element parts of the unitary structure retaining their pre-pressed optical form.

The tabs 11, 12 and 13 must have on each side thereof a layer of bonding material between it and the corresponding reflector or lens element and as indicated above this may be effected by applying layers of the bonding material to both annular abutting surfaces 14 and 15. I have obtained good results by applying a layer of the bonding material to the annular abutting surfaces 15 of the lens and to the side of the tabs 11, 12 and 13 away from the lens 2. This is diagrammatically shown in Fig. 3. At step A is illustrated the application of the bond 20' in paste form to the abutting surface 15. At B is illustrated the application of the mount to the lens 2 with the tabs 11, 12 and 13 in engagement with the layer 20'. At C is shown the next step of applying the bonding material to the opposite sides of the tabs 11, 12 and 13 in the vicinity of and coextensive with the length and depth of the abutting surface 15 which is in engagement with the tabs. The next step is the bringing together of the reflector 1 and the lens 2 with the filament mount caught therebetween with the surface 14

to be bonded engaging the tabs on the opposite side from the engagement of the abutting surface 15 with the tabs and in the vicinity of the layer of bonding material 20' applied to the opposite sides of the tabs from the abutting surface 15. The assembly of the four elements shown schematically at step D of Fig. 3, namely the reflector element, the mount element, the layer of bonding paste material 20' and the lens 2, is then heated at the periphery to the fusing temperature of the bonding material 20', whereby the reflector element and the lens element are firmly bonded and sealed at their abutting surfaces 14 and 15 and with the supporting tabs 11, 12 and 13 incorporated in the bond between the elements 1 and 2 in a union which as indicated above is at least as strong as the glass itself and under conditions such that the tendency to set up rupturing strains in the glass elements is minimized. The fusing of the bonding material 20' to effect the union may be effected by supporting the assembly in or transporting it through a simple oven as, for example, by transporting it through on conventional annealing conveyors. If the fusing of the bonding material 20' should be effected in a flame instead of in the oven this would require a separate annealing operation. A lamp unit is thus obtained in which the reflector element 1 and the lens element 2 are bonded at their peripheries with the supporting tabs 11, 12 and 13 incorporated in and surrounded by the bonding material and with the bonding material fused to the abutting surfaces 14 and 15 to form a perfect union therebetween without the melting or fusing of the glass of the elements 1 and 2 and without the setting up of dangerous strains either at the seal or at any other parts of the elements 1 and 2.

In sealing the elements 1 and 2 with the bonding material therebetween, they are preferably pressed together during the heating and cooling processes so that to insure but a thin film of the bonding material between the meeting surfaces of the elements. In certain instances the weight of one of the elements resting against the other is sufficient for the accomplishment of this end. The pressure is preferably maintained until after the sealed elements have cooled.

The reflector 1 is provided with the usual exhaust opening 22 and the next step includes the steps of attaching the exhaust tube 23 to the reflector within the opening 22 (which may be done in a conventional manner), the exhausting of the lamp unit through this tube, and the sealing of the same off at 23'. This exhaust tube 23 is preferably attached either to the reflector element 1 at and within the opening 22 by the utilization of the same or similar bonding and sealing material 20' between the exterior of the tube 23 and the interior walls of the opening 22 to form a bond and seal between the two elements indicated at 20. The exhaust tube 23 has applied thereto at or near its inner end the bonding material 20' and that part of the tube is then inserted within the opening 22 of the reflector, whereupon heat is applied to fuse the bonding material 20' to form the bond 20 similarly to the application of heat to the peripheral edge of the unit. This heating and fusing step is preferably carried on simultaneously with the heating of the periphery and the fusing of the bonding material thereabout as, for example, in an oven as described above.

In the embodiment of Figs. 5 and 6 I have shown a single filament lamp embodying a re-

flector element 1', a lens element 2 and a single filament 25. In this embodiment the mount comprises an insulating mass 26 such as glass, a ceramic material, etc. in which are embedded the filament support wires 27 and radiating wires 27' having their inner ends bonded at right angles and embedded in the mass 26 and in the particular embodiment shown the wires 27 and 27' are continuous, passing through the insulating mass 26. In this embodiment the wires 27' continue on through the bond 20 between the reflector and lens elements as lamp unit supporting sections 28 and in this particular embodiment the supporting sections 28 are of larger diameter than the wires 27' so as to add to their strength as supports. The sections 28 are electrically connected and fastened to the wires 27' in any suitable manner as, for example, by welding at 29. The mount is thus firmly supported in position from the outwardly projecting support wires 28. In order further to firmly support the mount of this embodiment, I have shown a wire 30 embedded at one end in the insulating mass 26 and engaging at its other end the inner surface of the lens 2. The wire 30 is made long enough to put the wires 27' under tension whereby by the constraint in these wires 27' the auxiliary supporting wire 30 is held firmly in engagement against the lens 2. I have found that this minimizes or prevents vibration of the mount and filament 25 notwithstanding the slender and springy character of the wires 27'. At 31 I have illustrated a tab of getter metal fastened to one of the filament support wires 27 so as to function as a getter for the lamp. This getter may be of any conventional metal. Either the reflector 1' or the lens 2 may be provided with grooves for the ends of the supporting wire sections 28 and in the particular embodiment shown I have illustrated the reflector 1' as provided with grooves 32, these grooves 32 having a depth approximating the diameter of the rod or wire supporting sections 28. At 33 I have illustrated eyelets formed in the ends of the rods or wires 28 to receive screws 34 for attaching the lamp unit to any suitable mount.

The assembly of the elements of the embodiment of Figs. 5 and 6 may be perfected as illustrated in Fig. 3, namely the application of a layer of the bonding and sealing material 20' between the abutting edges 14 and 15 respectively of the reflector 1' and the lens 2 with the bonding material 20' surrounding the support wires 28. With the parts thus assembled the bonding material 20' may be fused to unite the elements into a unitary structure as described with respect to the embodiment of Figs. 1 to 4. The exhaust tube 23 is preferably attached to the reflector element 1' in the same manner as described with respect to the embodiment of Figs. 1 to 4.

The embodiment of Fig. 7 differs from the embodiment of Figs. 5 and 6 in that the end of the auxiliary wire 30 in engagement with the lens 2 is bonded to the inner surface of the lens 2 by means of a bonding material 20 which may be like or similar to the bonding and sealing material described above. The end of the wire 30 which is to bear against the lens 2 has applied thereto the bonding material 20' in paste form as described above with respect to the bonding material so that when the assembled unit is heated in an oven or the like for the fusing of the bonding material disposed about the peripheral edges of the reflector and lens elements, the bonding material about the end of the wire

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30 is at the same time fused to bind the wire 30 firmly to the lens 2.

In the embodiments of Figs. 8, 9 and 10 the mount is generally similar to that described above with respect to Figs. 5 and 6 and it differs therefrom only in the forming of one of the supporting rods or wires designated 28', of a small hollow tube to function as an exhaust means. By this construction the necessity of an exhaust opening in the reflector element 1' is avoided since the lamp may be exhausted through this hollow supporting member 28' and sealed off in any suitable manner after exhausting. In this case one of the filament mount wire sections 27' is welded to the inner end of the member 28', the latter having a section on its inner end removed at one side 36 to facilitate the welding of the mount wire 27' to the inside of the member or tube 28'. After the tube 28' is sealed off at the end upon exhausting of the lamp the sealed off end may be formed into an eyelet 33' similar to eyelet 33 of Fig. 5 for attachment to a suitable mount for the lamp, or it may be flattened to form a flat terminal generally similar to flat terminals 11, 12 and 13 of Fig. 1. For example, one way would be to squeeze off tube, spot weld, shear and close the end of the tube by tipping in solder, and the flattened section used as a terminal and support.

The embodiment of Fig. 11 is similar to the embodiment of Figs. 8, 9 and 10 and differs therefrom in that the inner end of the section 28' is severed on a slant 36' to facilitate the welding of the wire 27' to the interior of the tube, without closure of tube.

In the embodiment of Fig. 12 there is a single filament 40 carried by a mount comprising a pair of L-shaped strips having radially extending legs 41 and axially extending legs 42, the filament 40 being mounted upon the latter. The angles of the L-shaped strips are bridged and held together by an insulating mass 43 which may be of glass or other suitable insulating material. This forms a rigid structure of the L-shaped strips forming the support for the filament, the legs 41 being in the plane of the bond or seal between the reflector element 1 and the lens element 2 and the legs 42 being rigidly held in spaced relation. The legs 41 of the mount extend to the outside to form supporting terminals 44 similar to the supporting terminals 11, 12 and 13 of Fig. 1. These supporting terminals are provided with openings 45 for ready attachment to a suitable mount. The legs 41, 44 are sealed in the bond between the reflector element 1 and the lens 2 in the manner described above with respect to the modification of Figs. 1 to 4. The abutting annular surfaces of the elements 1 and 2 are provided with recesses for the reception of the legs 41, 44, the recesses being of a depth approximating the thickness of the legs and these recesses may be formed in both of the abutting surfaces or as described with respect to the modification of Figs. 1 to 4, these recesses may be wholly formed in one of the elements as, for example, the reflector element 1. The legs 41, 44 are thus embedded in the bond 20 forming the bond and sealing medium between the reflector element 1 and the lens element 2.

The embodiment of Fig. 13 is similar to the embodiment of Fig. 12 and differs therefrom in that the legs 41' of the L-shaped members are folded edgewise along a center line to form a double web 46 in the plane of the axis so as to minimize light interference. This also renders the legs 41' more rigid.

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The embodiment of Fig. 14 is similar to the embodiment of Fig. 1 but differing therefrom in that the radially extending support wires 6', 7' and 8' of the mount (comprising the insulating mass 10') make straight and right angles with each other instead of the angles of 120° of Fig. 1. For example, the supporting wires 7' and 8' extend along the diameter and the supporting wire 6' extends radially from the insulating mass 10' at right angles to the support wires 7' and 8'. The supporting tabs 11, 12 and 13 are incorporated within the body of the bond 20 between the reflector element 1 and the lens element 2 and these tabs are disposed in recesses similar to the recesses 17 formed in the abutting surfaces of the reflector and lens elements described with respect to the embodiments of Figs. 1 to 4.

The embodiment of Fig. 15 is similar to that of Fig. 14 and differs therefrom in that the mount includes a third filament 50 for use in parking. This requires a fourth support wire 51 embedded in the insulating mass 10' and a radially extending lead 52 which is attached to a supporting tab 53 which is similar to the tabs 11, 12 and 13 and is similarly incorporated within the bond 20 formed between the reflector 1 and the lens 2, this tab having an opening 53' for attachment to the electrical terminal or to a support. The filament 50 is, as illustrated, carried by angle section 9 which is a common terminal and by the support wire 51, the latter being electrically connected with the radially extending wire support 52 and preferably being integral therewith.

In all the embodiments above set forth the filament mount is formed as a unit with the outside supporting extensions and electrical terminals. The filaments are precision mounted on the mounts with respect to predetermined reference parts of the mount structure so that when the mounts are assembled between the reflector and lens elements for forming the bond and seal between the mount and the glass elements, this assembly is made with the reference parts of the mount structure bearing such relation with the reflector element that the filament or filaments occupy the desired focal relation. Thus by the mere act of assembling the mount and bonding and sealing the reflector and lens elements about their periphery, the filament or filaments are properly mounted with respect to the focus of the reflector. This may be effected in a number of ways. I have illustrated in Fig. 16 one means of effecting this purpose. The reflector and lens elements are designated respectively by the numerals 1 and 2. The numeral 55 designates one of the terminals of the mount which is incorporated in the bond to be formed by the fusing of the bonding material 20' about the electrical connection 55 and to the abutting surfaces 14 and 15 of the glass elements. This terminal 55 is intended to represent one of the supporting tabs 11, 12, 13 and 53 of the embodiments of Figs. 1, 14 and 15 or one of the terminals 28 and 28' of the embodiments of Figs. 5 to 11, or one of the terminals 44 of the embodiments of Figs. 12 and 13. The filament or filaments are precision mounted on the mount with reference to the convex curved surface 56 formed on the side of the terminal 55 toward the reflector element 1. The reflector element is provided with a corresponding concave surface 57 which the convex part 56 of the terminal 55 engages and fits into when the reflector element and the mount are properly assembled for axial alignment of the filaments. The surfaces 56 and 57 thus form

centering locating surfaces for the filaments when the latter have been precision mounted on the mount with reference to the locating surface 56. The surface for locating for the focal point or for the light center length is indicated at 58 on the terminal 55 and this locating surface 58 on the terminal 55 corresponds to the plane abutting surface 14 of the reflector element 1 and accordingly when the locating surface 58, having, for example, a flat side thereof opposed to the abutting surface 14, is in engagement with the plane surface 14 of the reflector element, the filament or filaments have the proper light center length, assuming that the filaments have been precision mounted on the mount with the locating surface or plane 58 as a reference part. Thus by mounting the filament or filaments upon the mount so as to occupy a predetermined relation with respect to both the reference parts 56 and 58 of the mount, the filaments will occupy the desired operative position with reference to the reflector element 1 when the two glass elements and the mount are assembled and bonded together as described above.

By this invention a sealed reflector lighting unit is obtained wherein the filament mount itself is formed with the supporting and electrical terminals at the periphery of the unit for ready and convenient mounting on the vehicle. I have illustrated diagrammatically in Fig. 17 the simplicity and readiness with which the lamp unit may be mounted and adjusted on a vehicle and with equal ease dismounted therefrom. The fender or housing of the vehicle is indicated at 60 and a protective shell or housing 61 is provided therein for the reception and protection of the lamp unit. The housing 61 may be provided with a flange 62 to which are attached one or more insulating blocks 63 to serve as attachments for mounting the lamp unit in position. In the particular embodiment shown only two of these insulating blocks 63 are shown. The supporting terminals 12 and 13 of the lamp embodying the invention are attached to the supporting blocks 63 by means of the screws 64 passing through the openings 12' and 13' of the terminals and being screw-threadedly attached in openings 63' formed in the blocks 63. Interposed between the supporting terminals 12 and 13 and the blocks 63 are the required washers 65 so as to provide for the desired tilt elevation and side adjustment of the beam. At 66 is illustrated any conventional trimming which may be attached in any suitable manner to the fender 60, the details of fastening forming no part of the invention being omitted for convenience. When the mount carries only one filament then only one of the supporting blocks 63 need be of insulation since one of them may be the ground. Likewise where there are two or more filaments in the lamp one of the blocks 63 may be of metal as, for example, forming the electrical connection for the common lead or ground. This indicates the simplicity and ease of mounting and adjusting the lamp unit on the vehicle, with the conventional socket and electrical terminal connections at the rear of the reflector being entirely obviated and the electrical connections simplified.

In the manufacture of the lamp embodying the invention the manufacturing operations are reduced in number and simplified as compared with the manufacture of the conventional unit of the glass reflector sealed beam type. The reflector and lens elements of the lamp unit may by this invention be made of the soft glasses, such as the lime and lead glasses, with a reduction in

shrinkage or rejects or at least with no greater rejection or shrinkage as compared with conventional lamp units of this general character which are made of Pyrex glass. The manufacturing operations are carried out at temperatures not only below the melting or fusing temperatures of Pyrex glass but also at temperatures below the fusing temperatures of the lower temperature fusing or melting soft glass like lead and lime glass, and this results in less strains being set up in the glass and in simplified annealing. The temperature manufacturing operations are always below the fusing or melting point of the soft glass of the reflector and the lens and the conventional carbon roller shaping operations in the making of conventional Pyrex lamp units are entirely obviated. There is no impairment or disturbance of the pressed contours of the glass reflector and lens since they are never subjected to temperatures high enough to fuse or soften them and accordingly the pressed contour of these glass elements remains in the complete lamp. Moreover, the binding and sealing of the reflector and lens elements may be effected on a quantity production basis without injury to the aluminized surface of the reflector and as indicated above the filament mount supporting terminals are firmly bonded and sealed into the bond at the periphery of the lens and the reflector, thereby rendering unnecessary special supports for the lamp unit or the conventional socket and post electrical connections at the rear of the reflector. The supporting terminals which are sealed in the bond between the reflector and lens elements may be of any suitable metal and I have obtained particularly good results with the use of an alloy known in the trade as #4, which is generally understood to comprise around about 40% nickel, about 5%-7% chromium, fractions of 1% of silicon, manganese and carbon and the balance iron. The anti-vibration wires 30 may be of any conventional metal but I have used wires of this alloy #4.

Where one of the supporting terminals has an inside passage to serve as the exhaust means, as shown in Figs. 8 to 11, the necessity for attachment of the exhaust tube to the reflector element is entirely avoided, thereby presenting a continuous reflecting surface uninterrupted either by terminal openings or by an exhaust tube opening. This arrangement of exhaust tube is more satisfactory than the conventional glass exhaust tube in that it is stronger. When the degree of exhaust required has been attained it is only necessary to squeeze off tube, spot weld, shear and close the end of the tube by tipping in solder. This flattened section of the tube serves as a satisfactory terminal for the lamp unit, the details of the sealing off and flattening of the exhaust tube being omitted for convenience in illustration. This embodiment of the invention thus requires no special processing of glass parts and permits the incorporation of the reflecting surface on the reflector, as for example by aluminizing, without interference of holes or openings in the back section of the reflector. The conventional structure having both the exhaust tube opening and the terminal openings presents a considerable problem with respect to these processing operations, which problem is entirely obviated by the invention. A true parabolic surface is moreover maintained with maximum degree of light output, including the center section of the reflector which heretofore frequently has been disturbed by the heat working of glass in this area. The freeing of the center section of the reflector of the post

assembly openings and structures provides a greater area of parabolic curvature which is undisturbed and when the terminal passing out through the seal between the reflector and the lens forms the exhaust tube, the whole of the reflector directly behind the filament presents an uninterrupted reflecting surface.

As pointed out above and as particularly illustrated on an enlarged scale in Figs. 1A, 5A and 8A, with the film or layer of bond 20 exaggerated in depth, the terminals are totally embedded and enclosed in the bond 20, thereby assuring a firm bond and seal both between the reflector and the lens and between the terminals and the reflector and lens elements. These terminals, as indicated, may be of any suitable form in cross section and of a metal or alloy to which the bonding material may be fused to form both a bond and seal.

The invention enables, as described above, the utilization of all or substantially all of the reflecting surface of the reflector, thereby increasing the over-all efficiency of light projection, notwithstanding the small quantities of light blocked by the radiating mount supporting wires. The center ceramic insulator of the mount may be adjusted in size to cut off the direct light rays emanating from the filaments. Under the prior practice this is frequently effected by a metal cap on the end of the bulb or a Vis-aide coating and accordingly this desirable feature of eliminating the direct rays from the filaments is present in the structure of this invention.

The bonding material may be applied to the parts of the cover or lens and the reflector elements to be bonded in any suitable and convenient manner. For example, the bonding material in the dry powdered form may be applied in the dry powdered form and fused in situ to the elements, and application in the dry form may be facilitated by the previous application of an adhesive binder to the surfaces to be bonded so as to cause the dry material to adhere thereto. Another method is by a brush or painting application, in which case the dry powder is incorporated in a suitable medium to form the desired paint or paste for this purpose. Another method is to incorporate the dry powder in a carrying medium to form a liquid for spray coating application, the parts not to be applied with the material being masked out. Another method is to melt the dry powder to a flowing or liquid state for dipping the parts to be coated therein.

The circle in the cover or lens element shown in Figs. 1, 9, 12 and 15 indicates a flat spot in the center of the cover or lens but it is understood that this flat spot has no relation to the invention and may be omitted.

Instead of the shim or washer adjustment means shown in Fig. 17, compression springs may be interposed between the lugs 12 and 13 and the mounting blocks 63 whereby the lamp unit may be tilted or adjusted in any direction by simply tightening or loosening the screws (for example screws 64) passing through the lugs down through the springs and screw-threadedly engaging the blocks 63.

This is a continuation of my application for United States Patent, Serial No. 629,277 filed November 17, 1945, entitled "Electric Lamp" now abandoned.

I claim:

1. A sealed lighting unit comprising a glass reflector element, a glass lens element, said elements being bonded and sealed together at their

peripheral edges by a layer of bonding material fused to the adjoining surfaces of the elements, and a filament mount having combined electrical terminal and mount supporting members passing out through the periphery of the unit and wholly embedded in the layer of bonding material.

2. A sealed lighting unit comprising a glass reflector element, a glass lens element, said elements being bonded and sealed together at their peripheral edges by a layer of bonding material fused to the adjoining surfaces of the elements and a filament mount having supporting metallic terminals passing outwardly through the bonded area of the elements, one of said elements being provided at their adjoining surfaces with depressions to accommodate the supporting terminals.

3. A sealed lighting unit comprising a glass reflector element, a glass lens element, said elements being bonded and sealed together at their peripheral edges by a layer of bonding material fused to the adjoining surfaces of the elements and a filament mount having supporting metallic terminals passing outwardly through the bonded area of the filaments, said supporting terminals comprising flat portions at the points where they pass through the bond between the elements and one of said elements having depressions for the reception of said flattened portions.

4. A sealed lighting unit comprising a glass reflector element, a glass lens element, said elements being bonded and sealed together at their peripheral edges by a layer of bonding material, fused to the adjoining surfaces of the elements and a filament mount having supporting metallic terminals passing outwardly through the bonded area of the elements, one of said supporting terminals comprising a hollow exhaust tube at the bond between the elements.

5. A sealed lighting unit comprising a glass reflector element, a glass lens element, said elements being bonded and sealed together at their peripheral edges by a layer of bonding material fused to the adjoining surfaces of the elements and a filament mount having supporting metallic terminals passing outwardly through the bonded area of the elements and an anchor wire engaging at one end the mount and engaging at its other end the unit for preventing vibrations of the mount.

6. A lighting unit comprising a reflector element and a lens element sealed together at their peripheral edges, a filament and a filament mount having mount supporting terminals passing outwardly between the peripheral edges of the elements at the seal line and having extensions forming supports for the unit.

7. A sealed lighting unit comprising a glass reflector element, a glass lens element, said elements being bonded and sealed together at their peripheral edges by a layer of bonding material fused to the adjoining surfaces of the elements, and a filament mount having supporting metallic terminals passing outwardly through the bonded area of the elements wherein the reflector element and one or more of the metallic terminals passing outwardly through the bonded area of the elements are provided with cooperating corresponding reference parts bearing a predetermined relation with respect to the focal point of the reflector and the filament bears the same relation to the reference parts of the terminals.

8. The method of making a sealed lighting

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unit comprising glass cover and reflector elements with a filament sealed therein which comprises the steps of forming a filament mount with the filament mounted thereon in predetermined relation with respect to reference parts of one or more of the terminals of the mount and then bonding and sealing the reflector and cover elements at their adjoining peripheral surfaces by fusing a layer of bonding material to and between the adjoining surfaces with the terminals bonded and sealed between the adjoining peripheral surfaces when the glass elements are bonded and with the reference parts of the terminals bearing a predetermined relation with respect to corresponding reference parts of the reflector element.

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