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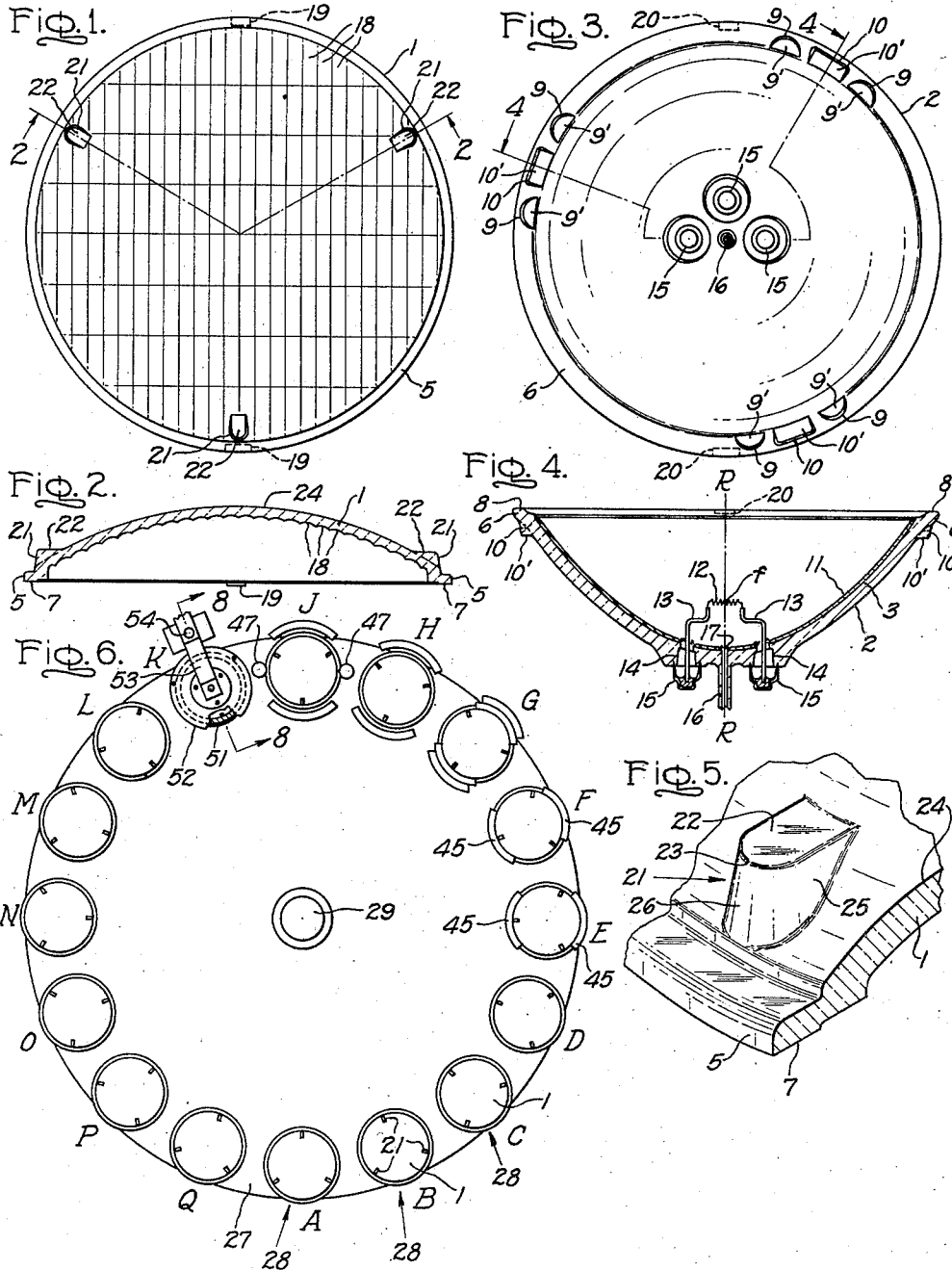
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2,951,735

METHOD OF MAKING ELECTRIC LAMPS

Filed March 1, 1956

2 Sheets-Sheet 1



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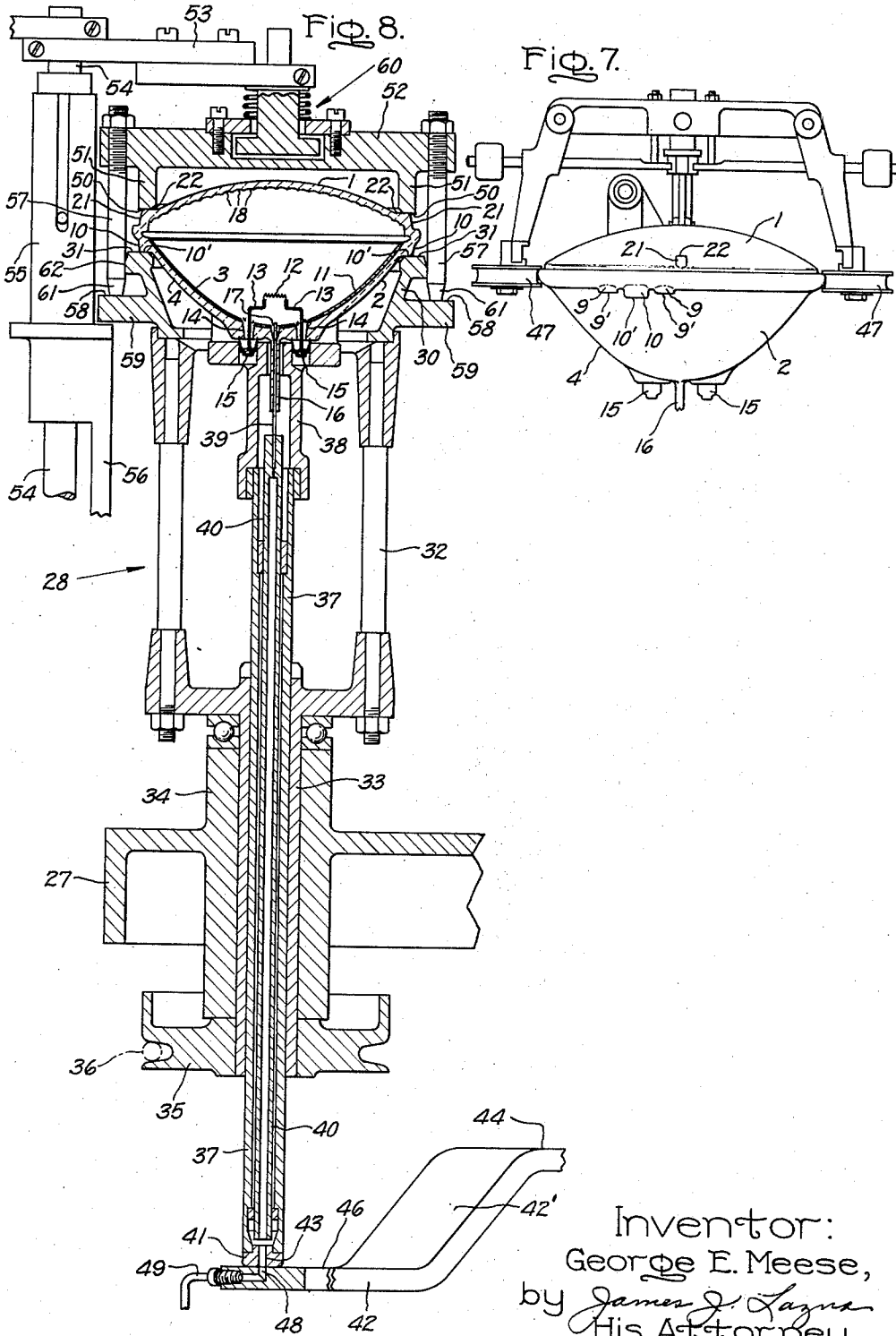
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METHOD OF MAKING ELECTRIC LAMPS

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2 Sheets-Sheet 2



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METHOD OF MAKING ELECTRIC LAMPS

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2 Claims. (Cl. 316—20)

My invention relates in general to a method for making electric lamps and more particularly lamps of the sealed beam type such as disclosed in U.S. Patent 2,148,314, issued February 21, 1939 to D. K. Wright and assigned to the assignee of the present invention.

Electric lamps of the type disclosed in the above-mentioned Wright patent comprise an accurately formed pressed glass reflector section which supports a concentrated filament or other light source accurately located with respect to the interior surface of the reflector section, the said interior surface being accurately formed to a very definite optical shape, usually paraboloidal, and having a reflecting coating thereon adapted to re-direct the light from the filament in a definite manner. Across the mouth opening of the reflector section, which has the general shape of a cup and constitutes one portion of the lamp bulb, is sealed another pressed glass cover or lens section, conventionally of dished form, constituting the other portion of the bulb and usually provided with light-refracting media such as flutes and prisms, for concentrating or diffusing the light in a definite manner. The sealing together of the two glass sections is effected at their peripheral edges which are provided, for this purpose, with cooperating annular sealing surfaces.

For certain applications, as where the lamp is to be employed as a vehicle headlamp, it has been proposed to provide the lamp with one or more accurately located reference shoulders or surfaces on the exterior of the lens section adjacent the peripheral seal portion thereof, which reference surfaces are adapted to be engaged by a mechanical aiming device for the purpose of properly aiming the lamp when installed in place on a vehicle. These reference surfaces, which may be constituted by the tops of three or more bosses or lugs on the lens section located immediately inward of the sealing flange thereof at widely spaced points therearound, are accurately located in a plane bearing a definite transverse relation to the axial center line of the lamp as well as to the optical axis of the reflecting surface of the lamp. Since the reflecting surface and the mounting of the filament or filaments in lamps of the above-mentioned type are customarily made with great accuracy, the provision of such external reference surfaces on the lamp lens accurately located in definite predetermined planar relation to the axial center line of the lamp and to the optical axis of the reflecting surface, therefore affords a ready means for mechanically aiming the lamp while mounted in place on the vehicle inasmuch as the said reference surfaces then bear, in turn, a definite predetermined relation to the light beam projected by the lamp.

It is an object of my invention to provide a novel method of making an electric lamp of the above-mentioned character having reference surfaces on the exterior of the lens section thereof accurately located in a predetermined plane bearing a definite transverse relation to the axial center line of the lamp and to the axis of the reflecting surface thereof.

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Another object of my invention is to provide a simple and inexpensive method of making an electric lamp with reference surfaces such as described above which does not require expensive, complicated and additional manufacturing equipment and which does not involve any additional separate manufacturing operations over those which have been customary heretofore in the manufacture of similar type lamps without such reference surfaces.

Still another object of my invention is to provide a method of making an electric lamp with reference surfaces of the character described which can be performed at high speeds and with great reliability and uniformity and practically without any increased production rejects or equipment maintenance over that normally encountered with previously customary procedures employed to manufacture lamps of similar type but without such reference surfaces.

Briefly stated in accordance with one aspect of the invention, the lens or cover glass sections for electric lamps of the character described are preformed with reference surfaces on the outward side of the lens, located immediately inward of the sealing flange thereof at widely spaced points therearound and in a plane bearing a definite transverse relation, e.g., normal, to the axial center line of the lens, and the said reference surfaces are then accurately positioned in a predetermined transverse plane relative to the optical axis of the reflector section of the lamp during the sealing together of the lens and reflector sections thereof. According to a further aspect of the invention, the location of the reference surfaces on the lens section in the said predetermined transverse plane relative to the optical axis of the lamp, during the sealing of the lens and the reflector sections, is accomplished by displacing the lens and reflector sections axially away from each other to stretch and work the plastic glass at the seal therebetween and accurately controlling or limiting the extent of the axial displacement of the peripheral portions of the lens section relative to the reflector section, at the region of the said reference surfaces, through the engagement of the reference surfaces with limiting stop surface means accurately located in the said predetermined transverse plane relative to the optical axis of the reflector section.

Further objects and advantages of my invention will appear from the following detailed description of a species thereof and from the accompanying drawing.

In the drawing, Fig. 1 is a plan view of the front side of a glass lens formed in accordance with the invention for producing a lamp by the method of my invention.

Fig. 2 is a section on the line 2—2 of Fig. 1.

Fig. 3 is a plan view of the rear or outer side of a conventional type glass reflector section for producing a lamp by the method of my invention.

Fig. 4 is a section on the line 4—4 of Fig. 3.

Fig. 5 is a fragmentary perspective view, on a greatly enlarged scale, of the lens illustrated in Figs. 1 and 2 and showing one of the lamp-aiming lugs or reference pads on the lens.

Fig. 6 is a diagrammatic plan view of a lamp sealing machine for sealing together the lens and reflector sections of a lamp in accordance with the method of my invention.

Fig. 7 is a fragmentary side elevation of the seal reshaping means of the lamp sealing machine as shown in Fig. 6, and

Fig. 8 is a vertical section through the turret and one of the heads of the sealing machine on the line 8—8 of Fig. 6.

In the customary manufacture of sealed beam type incandescent lamps such as disclosed in the aforementioned Wright Patent 2,148,314, a glass lens section 1,

and a glass reflector section 2 having an accurately formed concave inner surface 3 of the desired optical shape such as paraboloidal, ellipsoidal or other suitable shape, are first pressed out of a suitable glass composition, preferably a low-expansion "hard" type glass of the borosilicate type such as that commercially known as "Pyrex" and described and claimed in U.S. Patent 1,304,623, Sullivan et al. By pressing the reflector section 2, rather than blowing the same as where it is formed as a part of a blown glass bulb, the interior surface 3 can be made with extreme accuracy, much more so than is possible with stamped metal reflectors or with blown glass reflectors, since the plastic glass conforms precisely to the curvature of the accurately formed surface of the plunger of the pressing apparatus. The two preformed glass sections 1 and 2 are sealed together at their peripheries to form the bulb or envelope 4 (Figs. 7 and 8) of the lamp. For this purpose, the two sections 1 and 2 are formed with annular sealing flanges 5 and 6, respectively, at the periphery thereof. The said sealing flanges 5 and 6 are provided with flat sealing surfaces 7 and 8, respectively, which are disposed in planes accurately located in predetermined relation (e.g., perpendicularly in the particular case illustrated) to the axial center line of the respective sections 1 and 2. For properly mounting the lamp in a supporting fixture or holder on a vehicle, the reflector section 2 is further provided at widely spaced points around its periphery (e.g., in tripodal arrangement thereabout) with three or more lamp seating pads 9 and preferably, in addition, three or more lamp orienting lugs 10 all located on the outer side of the reflector section on the sealing flange 6 thereof. These seating pads 9 and orienting lugs 10 are formed with flat seating surfaces 9' and 10', respectively, which are respectively disposed in common planes bearing the same predetermined transverse (e.g., perpendicular) relation to the axial center line R—R (Fig. 4) of the reflector section 2.

Prior to the sealing together of the lens and the reflector sections 1 and 2 to form the lamp envelope 4, the interior surface 3 of the reflector section 2 is provided with a reflective coating 11 to constitute a reflecting surface, and one or more concentrated light sources, such as coiled or coiled-coil tungsten filaments 12 preferably of linear form as shown, are accurately mounted within the reflector section 2 in definite optical relation to the focal point f thereof. Thus, in the case of a conventional vehicle headlamp such as illustrated, two such linear coil filaments 12 are employed disposed transversely of the optical axis of the reflecting surface 11 and in parallel relation to one another, one of the filaments (the main filament) being located at the focal point of the reflecting surface 11 and the other filament being offset a slight distance above and to one side of the main filament as viewed when the lamp is mounted in place on the vehicle. The filament or filaments 12 are mounted on, and connected at their ends to the inner ends of rigid lead-in conductors or wires 13 which extend through corresponding apertures 14 in the wall of the reflector section 2 and are electrically connected to and supported from metal thimbles or ferrules 15 fusion sealed into the outer side of the reflector section 2 over the said apertures 14 therein. To permit evacuation and, if desired, gas filling of the lamp envelope 4 after the sealing together of the lens and reflector sections 1 and 2, the reflector section is provided with an exhaust tubulation 16 which communicates with the interior of the lamp envelope through an exhaust aperture 17 in the wall of the reflector section. The lens section 1 is provided with suitable light refracting media, preferably on the inner surface thereof, in the form of flutes and/or prisms such as indicated at 18, and to properly orient or rotatively position the lens section 1 with respect to the reflector section 2 during the fusing together thereof,

the lens and reflector sections are provided with interlocking keys in the form of matching keys 19 and keyways 20 respectively formed on the sealing surface 7 of the lens section 1 and on the sealing surface 8 of the reflector section 2.

In the production, according to the method of my invention, of an electric lamp of the character described having reference shoulders or surfaces on the exterior of the lens section 1, accurately located in predetermined transverse planar relation to the optical axis as well as to the axial center line of the lamp, the lens section 1, at the time it is pressed, is initially formed with three or more upstanding bosses or pads 21 on its outer face located immediately inward of the sealing flange 5 at widely, e.g., more or less uniformly spaced points around the lens section such as in a tripodal arrangement therearound, and having accurately formed top surfaces 22, preferably of flat shape as shown, disposed in predetermined transverse planar relation to, such as approximately normal to, the axial center line of the lens section. As molded during the lens-pressing operation, these bosses or pads 21 are formed with rounded top edges 23 (Fig. 5) and with their flat top surfaces 22 extending radially inward of the lens section the necessary distance to join the convex outer face 24 thereof and thus form, in effect, a continuation of the said lens face 24 in the axial plane of the lens section through the respective boss 21 so as to not leave an objectionable shoulder at the inner side of the boss such as would be the case where the top surface 22 of each boss terminated short of the curved outer face 24 of the lens section. The provision of the smooth rounded edges 23 on the bosses 21, and the joining or blending of the top surfaces 22 of the bosses into the convex outer face 24 of the lens section, are of particular advantage in that they prevent, during the periodic cleaning operations normally performed on the lens of the lamp when in service, the catching of the wash or wiping cloths on the bosses 21 and the cutting of the operator's hand by contact with the edges 23 of the bosses. In addition, the formation of the aiming bosses or pads 21 in the manner such as described affords a boss which is of sturdy and strong character and therefore highly resistant to breakage by accidental impact directed thereagainst. As shown, the aiming bosses or pads 21 are formed on, and upstand from the outer periphery of the outer convex face portion 24 of the lens section 1 and, for the purposes of the invention, need only be of relatively short height such as, for example, $\frac{3}{16}$ inch or so at the outermost sides of the boss. Also, as shown, the side wall 25 of the bosses or pads 21 are well rounded off at the outermost side of the boss, as by being curved on a radius so as to have a semicircular shape as indicated at 26 in Fig. 5. The comparative short height of the bosses 21 and their rounded side wall portions 26 are of further advantage in respect to added boss strength and resistance to breakage and affording easier and safer cleaning of the lens because of the absence of sharp or roughened glass edges which would be apt to catch onto cleaning cloths or cut the hand of the person cleaning the lens.

In the further conduct of the lamp-making method according to the invention the lens section 1, having aiming bosses or pads 21 of their final shape and form molded thereon, is then assembled in proper sealing relation (Fig. 8) with a reflector section 2 which has been previously provided with an internal reflective coating 11 and one or more light-producing filaments 12. In such sealing relation, the two glass sections 1 and 2 are assembled with their sealing flanges 5 and 6 in abutting relation and with their matching keys 19 and keyways 20 interengaged so as to properly orient the two sections 1 and 2 with respect to one another.

The sealing together of the lens and reflector sections 1 and 2 to form the lamp envelope 4 is preferably carried out on a lamp sealing machine of the type disclosed and claimed in co-pending application Serial No. 568,729

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filed Mar. 1, 1956, Schoenoff et al., filed of even date herewith and assigned to the assignee of the present invention, which machine is of the general character and operates in the general manner described and claimed in U.S. Patents 2,237,186, Malloy, dated April 1, 1941 and 2,334,123, Perkins, dated November 9, 1943.

As shown in Figs. 6-8, the sealing machine comprises in general a turret or carrier 27 provided around its periphery with a plurality of rotatable heads 28 each adapted to support and carry a glass reflector section 2 in an upright position with its concave reflecting surface 11 facing upwardly. The turret 27 is rotatably mounted on a vertical center shaft or column 29 and it is intermittently indexed about the shaft 29, by suitable indexing means (not shown) of conventional type, to carry the assembled reflector and lens sections 1 and 2 in each head 28 progressively to a succession of work stations A to Q where various operations are performed on the said assembled sections.

As shown more particularly in Fig. 8, each head 28 comprises a ring-shaped main holder 30 having a flat upper surface 31 on which the seating surface 10' of the lamp orienting bosses 10 on the reflector section 2 are adapted to rest to thereby support the reflector section in the head. The holder 30 is carried at the upper end of a spindle 32 having a depending vertical sleeve or hollow shaft portion 33 rotatably mounted in a bearing 34 on the turret 27. The heads 28 are rotated, at each station around the machine except the loading and unloading stations A and Q and the seal-stretching or lens blow-up station K by means of a pulley 35 fastened to the lower end of the sleeve 33 and engaged by a moving belt as indicated in dotted lines at 36 in Fig. 8. Extending through and vertically movable in the sleeve 33, but rotatively interlocked therewith so as to rotate as a unit with said sleeve, is an inner sleeve 37 which carries at its upper end a secondary support or holder 38 for the reflector section 2. Located within and protruding upwardly beyond the secondary holder 38 is a small metal tube 39 which is arranged to extend through the slightly larger exhaust tube 16 on the reflector section 2 when the said reflector section is properly supported in position on the secondary holder 38. The metal tube 39 is supported on the upper end of and communicates with the interior of an inner tube 40 extending through the inner sleeve 37 and rotatively interlocked therewith. The passageway through the inner sleeve 37 is closed off at its lower end except for the passageway through the inner tube 40. At its lower end, the inner sleeve 37 is provided with a shoe 41 which, during rotation of the turret 27 and consequent movement of the respective head 28 in a circular path around the machine, rides on the upper surface of a cam track 42 extending circularly around the machine and supported from a stationary part of the machine. The shoe 41 is provided with an aperture 43 extending therethrough from its under surface and communicating with the hollow interiors of the inner sleeve 37 and inner tube 40. When the head 28 is positioned at different stations around the machine, the aperture 43 in the shoe 41 aligns with different ports in the cam track 42 at such stations, such as indicated at 44 in Fig. 8, different ones of said ports being connected to a source of inert or reducing gas for flushing purposes, to a source of vacuum, or to a source of inert or reducing gas under pressure, depending upon the particular operation which is to take place at each station.

At the first or loading station A of the machine, a reflector section 2 and a lens section 1, properly assembled in sealing relation to one another as previously described, are placed on and properly mounted in the secondary holder 38 of the head 28 at the said station A so as to rotate therewith, the said holder being in an elevated position relative to the ring-shaped main holder 30 at such time because of the engagement of the shoe 41 at the lower end of the inner sleeve 37 with an elevated

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portion 44 of the cam track 42. The turret 27 then indexes the head 28 with the assembled reflector and cover glass sections thereon progressively through stations B, C and D where the glass sections, while rotating, are successively preheated by gas flames (not shown) and an inert gas, such as nitrogen, introduced through ports (not shown) in the cam track 42 and through the inner tube 40 and metal tube 39 into the space enclosed by the reflector and cover glass sections to flush the said space and protect the reflecting coating 11 on the interior of the reflector section 2 from the oxidizing effect of the atmosphere. During the movement of the head 28 through the said stations B, C and D, the secondary holder 38 supporting the assembled reflector and cover glass sections 2, 1 is continuously maintained in an elevated position by the engagement of shoe 41 with the said elevated portion 44 of the cam track 42 to thereby position the reflector section 2 above the ring-shaped holder 30 and thus enable the preheating of said section by gas flames directed thereagainst.

Following the preheating of the assembled reflector and cover glass sections at stations B, C and D, the head 28 supporting the said glass sections is then successively indexed through stations E, F, G, H and J where the rims or sealing flanges 5 and 6 of the lens and cover glass sections, respectively, are progressively heated and fused together by gas fires from pairs of diametrically opposite burners 45 (Fig. 6) which are moved down into operative relation after the head 28 is positioned at each of said stations. In the course of movement of the head 28 from stations D to E, the shoe 41 on the lower end of inner sleeve 37 passes down an inclined portion 42' of cam track 42 to a depressed portion 46 thereof, causing the said inner sleeve and the secondary holder 38 to be lowered just enough to permit the lamp orienting bosses 9 on the sealing flange 6 of the reflector section 2 to engage and rest on the seating surface 31 of the ring-shaped main holder 30 so that the glass sections 1, 2 are then supported and definitely positioned thereby. This positioning of the glass sections 1, 2 on the main holder 30 then continues throughout the movement of the head 28 through stations E to K inclusive, the cam track 42 remaining at a depressed level throughout the said movement of the head.

During the course of the fusing and sealing operation at stations E to J, a vacuum is created in the space enclosed by the assembled lens and reflector sections 1, 2 as soon as the sealing surfaces of both said sections become sufficiently plastic to fuse together, which condition ordinarily first develops at station G. The vacuum pulls or draws the two glass sections tightly together at all points around their circumference and across the entire width of their sealing surfaces 7, 8 regardless of any warpage in the glass, thereby insuring the intimate contact of the sealing surfaces which is essential to a strong and tight seal between the glass parts. A vacuum of from one to three inches of mercury has been found to be ample to accomplish the desired object of pulling or drawing the two glass sections 1 and 2 together with sufficient force to press the sealing surfaces 7, 8 thereof into the intimate contact necessary for a strong seal therebetween. The evacuation of the space within the assembled glass sections 1 and 2 is first effected at station G, where the sealing surfaces 7, 8 of both sections first become sufficient plastic to be fused together, and then is continued at the next succeeding station H. The evacuation is accomplished through the metal tube 39, the inner sleeve 37 and the opening 43 in shoe 41, which opening aligns with vacuum ports (not shown) in the cam track 42 when the head 28 is successively positioned at stations G and H, the said ports being connected to a source of vacuum (not shown). The comparative close fit between the metal tube 39 and the exhaust tube 16 of the reflector section 2 sufficiently closes off the interior of the glass enclosure 4 from the sur-

rounding atmosphere to enable the desired degree of vacuum to be obtained within the glass enclosure.

After the fusion of the sealing flanges 5, 6 of the glass sections 1, 2 and the evacuation of the glass enclosure or envelope 4 at stations G and H, the head 28 is indexed to station J where the said sealing flanges are additionally heated to further soften the glass and complete the fusion and sealing together of the sealing surfaces 7, 8. Also, the positioning of the sealed glass envelope 4 at station J provides a time interval for permitting the interior space of the glass envelope, which is again connected to a source of inert gas at said station through a port (not shown) in the cam track 42, to again become filled with such gas up to atmospheric pressure or nearly so.

In addition to the heating of the sealing flanges 5, 6 of the glass sections 1, 2 at station J, the peripheral edges of the said sealing flanges are also engaged at said station by a pair of diametrically opposite rollers 47 (Fig. 7) which press against the said peripheral edges of the sealing flanges to thereby form or shape the same and further promote the fusion and sealing together of the sealing surfaces 7, 8. While the rolling of the edges of the sealing flanges 5, 6 is preferably performed at station J, this operation may be effected instead at either one of the two preceding stations G and H, or at any two or even at all three of the stations G, H, and J by the provision at such stations of sets of rollers similar to the rollers 47.

From station J the head 28 is then indexed to station K where the sealed lens and reflector sections 1 and 2 are axially, i.e. vertically, displaced a limited distance away from each other and through the required distances, at the region of each of the aiming bosses or pads 21 on the lens section, to accurately locate the top surfaces 22 of each boss 21 a predetermined (e.g., a uniform) vertical distance above the plane of the seating surfaces 10' of the orienting lugs 10 on the reflector section 2. This axial displacement of the lens and reflector sections 1, 2 at the same time serves to stretch and work the still plastic glass at the seal between the two glass sections, thereby partially relieving the glass seal of internal strains. By so locating the top surfaces 22 of the aiming bosses 21 on the lens section 1 at predetermined distances, e.g., uniformly at the same distance, axially of the lamp envelope 4 from the plane of the seating surfaces 10' on the reflector section 2, which plane is parallel to the plane of the seating surfaces 9' of the lamp seating pads 9 and occupies a predetermined transverse relation to the reflector optical axis R—R, the top surfaces 22 of the aiming bosses 21 therefore will, in turn, be disposed in a plane bearing a predetermined transverse relation to the reflector axis R—R and preferably the same transverse relation thereto as that occupied by the planes of the orienting lug surfaces 10' and the lamp seating pad surfaces 9' on the reflector section.

The axial displacement of the lens and reflector sections 1 and 2 at station K is preferably accomplished by introducing inert or reducing gas under pressure into the sealed glass envelope 4 through the metal tube 39, inner sleeve 37 and the opening 43 in shoe 41, which opening aligns with the cam track port 48 (Fig. 8) when the head 28 is positioned at station K, the said port 48 being connected by pipe 49 to a source of inert or reducing gas. The inert gas entering the space within the sealed glass sections 1, 2 causes an upward movement of the lens section 1 relative to the reflector section 2 around the annular extent of the seal therebetween, thereby stretching and working the still plastic glass at the seal.

In accordance with the invention, the amount of such upward axial movement or raising of the lens section 1 relative to the reflector section 2, at the region of each of the aiming bosses 21 on the lens, is limited and accu-

ately controlled by the engagement of the top surface 22 of each boss 21 with the undersurface 50 of a depending annular flange or collar 51 on a horizontally disposed stop plate member 52 which overlies the lens section 1 when located at station K. The stop plate member 52 is carried by a support arm 53 overhanging the periphery of the turret 27 and fastened to the upper end of a vertically extending operating rod 54. The operating rod 54 is mounted for vertical reciprocating movement in a support or bearing 55 fastened on a bracket 56 secured to a stationary part (not shown) of the machine frame. The operating rod 54 is vertically reciprocated by suitable actuating means (not shown) operating in timed relation to the index movements and dwell periods of the turret 27, to carry the stop member 52 and associated parts from an elevated inoperative position clear of the path of movement of the lamp envelope 4 and the associated head 28 to and away from station K, to a lowered operative position after a lamp envelope 4 is positioned at station K. As shown in Fig. 8, the lowered operative position of the stop member 52 is determined by the engagement of the lower ends of three or more stop pins 57 depending from the stop member 52 with the upper surface 58 of an outwardly extending stop flange or ledge 59 on the main holder ring 30 of the head 28. The group of stop pins 57 are located on the stop member 52 outwardly of and spaced more or less equally around and concentric with the annular stop flange 51 thereon so as to just clear the outer periphery 62 of the upper rim of the lampholder ring 30 when the stop member 52 is vertically aligned therewith and moved down to its lowered operative position. The stop pins 57 are mounted for longitudinal or vertical adjustment in the stop member 52, and they are so adjusted thereon as to locate the annular stop surface 50 of the stop member 52 in the exact desired predetermined, e.g., parallel, relation to the annular seating surface 31 of the holder 30 and spaced a predetermined distance upwardly therefrom when the stop member 52 is in its lowered operative position with the stop pins 57 in engagement with the annular flange or ledge 59 on the main holder 30.

To permit the engagement of all the stop pins 57 with the flange 59 on the main holder 30 when the stop member 52 is lowered to its operative position, thereby insuring the proper positioning of the annular stop surface 50 of the stop member in the desired predetermined relation, e.g., parallel, to the reflector section seating surface 31 of the main holder, the stop member 52 is supported on the support arm 53 through a suitable connection (as by means of a floating connection such as illustrated at 60 in Fig. 3) which allows a limited amount of rocking movement of the stop member 52 and preferably, in addition, a limited amount of lateral shifting movement as well. When moved to its lowered operative position, the stop member 52 is vertically aligned or centered with respect to the main holder 30 so as to locate the annular flange 51 of the stop member concentric with the seating surface 31 of the main holder. To this end, the stop pins 57 are provided with tapered lower ends 61 which, during the downward movement of the stop member 52 to its lowered operative position, engage with the outer periphery 62 of the upper rim of the reflector section holder 30 to effect the vertical aligning of the stop member 52 with the holder 30.

During the so-called "blow-up" or upward displacement of the lens section 1 relative to the reflector section 2 at station K to effect the precise locating of the upper surfaces 22 of the aiming bosses 21 on the lens section in a predetermined plane relative to that of the seating surfaces 10' of the reflector section 2, and at the same time to stretch the plastic glass seal to remove the internal strains therefrom, the gas pressure is maintained within the lamp envelope 4 for a period of time sufficient to allow the plastic glass at the seal to cool and rigidify.

After this condition occurs, the gas pressure is removed

from the gas line 49 and the stop member 52 then raised to its upper or inoperative position clear of the lamp envelope 4, whereupon the turret 27 then indexes to carry the lamp envelope 4 successively to the succeeding stations L to Q where the lamp envelope is annealed by means of gas flames directed against the glass sections 1 and 2. The annealing of the lamp envelope 4 is controlled, however, at the successive stations L to Q so that the lamp envelope loses heat more rapidly than it gains and the lamp envelope gradually drops in temperature until further annealing is not required when station Q is reached, which is the unloading station for the completed lamp envelopes.

From the above, it will be evident that I have provided a simple, inexpensive and effective way of producing a sealed beam type of electric lamp with external reference or lamp-aiming surfaces on the cover glass or lens section of the lamp envelope accurately located in predetermined planar relation to the optical axis of the lamp and to the beam projected thereby so that the said reference surfaces can be expeditiously used to properly aim the lamp while mounted in place on a vehicle through the use of a mechanical aiming device engaging with the said reference surfaces. The method according to the invention can be carried out with great reliability and uniformity of results on existing lamp-making equipment with only a slight modification thereto, and it does not require any additional separate manufacturing operations or additional manufacturing equipment of complicated and expensive character and having high maintenance cost.

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

1. The method of making an electric lamp which comprises the steps of, pressing a cover glass section with a peripheral sealing flange and external reference surfaces located immediately inward of said sealing flange at widely spaced points therearound with said reference surfaces being disposed in a predetermined transverse plane with respect to the axial center line of the cover glass section, assembling said cover glass section with a reflector section having a peripheral sealing flange so that the said sealing flanges are in opposed contiguous sealing relation-

ship to one another, heating both said sealing flanges to a plastic condition to fuse and seal them together, displacing said sections axially away from each other to stretch and work the plastic glass at the sealing flanges, and then maintaining said reference surfaces against limiting stop means during displacement of the sections until the plastic glass at the flange seal solidifies to thereby accurately locate the said reference surfaces in a predetermined transverse plane with respect to the optical axis of said reflector section.

2. The method of making an electric lamp which comprises the steps of, pressing glass reflector and lens sections each having a peripheral sealing flange and at least three upstanding bosses on their outer faces located adjacent said sealing flanges at widely spaced points therearound with the bosses having top surfaces disposed in a predetermined transverse plane with respect to the axial center line of the respective section, assembling said sections with their sealing flanges in opposed contiguous sealing relationship to one another, heating said sealing flanges to a plastic condition to fuse and seal said sealing flanges together, evacuating the enclosure formed by the sealed reflector and lens sections to pull them together and compress the said sealing flanges tightly together while in a plastic condition, introducing a gaseous medium under pressure into said enclosure while the sealing flanges are still in a plastic condition to displace said sections axially away from each other so as to stretch and work the glass at the flanges, and then maintaining said upstanding bosses on the lens section against limiting stop means during displacement of the sections until the plastic glass at the sealing flanges solidifies to thereby accurately locate the top surfaces of the bosses on said lens sections in a predetermined plane relative to the plane of the top surfaces of the bosses on said reflector section.

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