

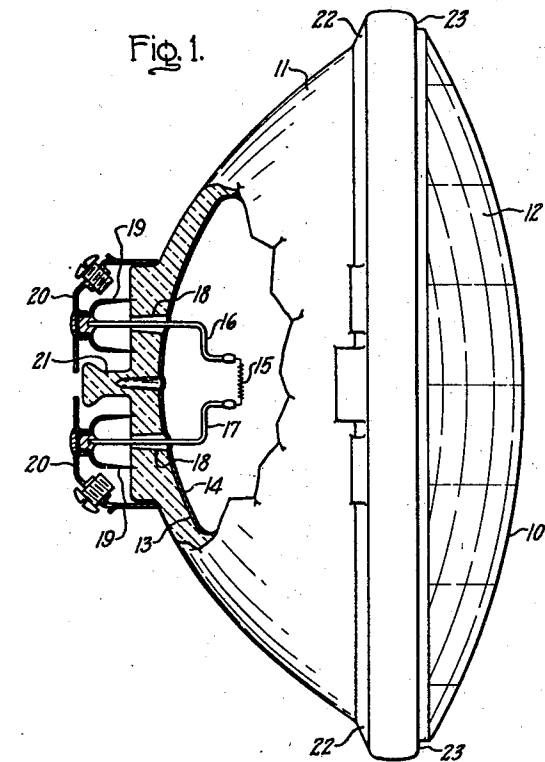
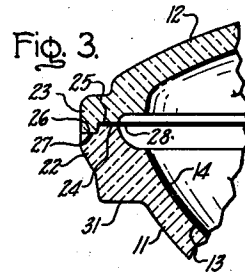
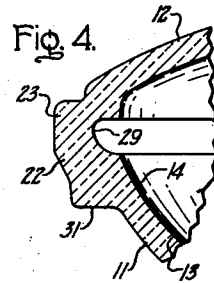
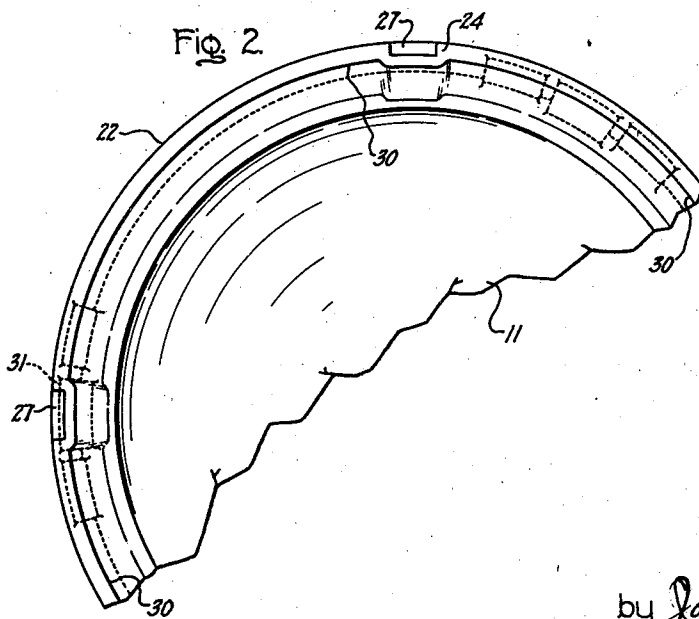
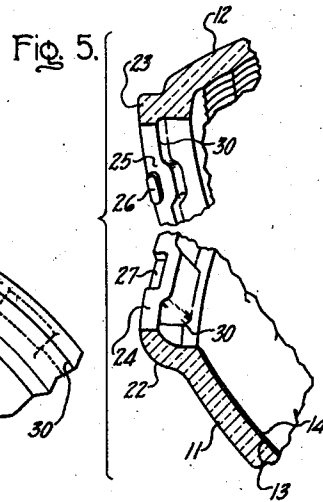
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D. K. WRIGHT

2,324,972

ELECTRIC LAMP

Filed Nov. 27, 1941



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UNITED STATES PATENT OFFICE

2,324,972

ELECTRIC LAMP

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Application November 27, 1941, Serial No. 420,641

6 Claims. (Cl. 176—34)

My invention relates to glass envelopes of the type formed by sealing two or more component glass sections together, and more particularly to glass envelopes for electric light projection lamps of the "Sealed beam" type disclosed in my U. S. Patents #2,148,314 and #2,148,315, issued February 21, 1939. Still more particularly, my invention relates to the construction of the sealing surfaces between the glass parts which are to be sealed together to form the completed envelope.

In electric projection lamps of the above-mentioned "Sealed beam" type, the glass envelope thereof is formed of two preformed molded glass sections, comprising a reflector section and a lens section which are provided with co-operating sealing surfaces, at their peripheral or rim portions, of relatively narrow width. The two glass sections are assembled with their sealing surfaces in abutting interengagement and the said surfaces then heated to fuse the glass and thus seal the two sections together. While the glass at the seal is still hot and in a plastic condition, air under pressure is forced into the closed envelope through the exhaust tube thereof to produce a slight separating movement of the lens from the reflector section, thus working or stretching the glass at the seal and insuring a stronger and better seal.

In the sealing of the two glass sections together, the reflector section is held in a rotatable holder arranged to rotate about a vertical axis. The lens section is then simply rested or placed on top of the reflector section and the assembled glass parts then rotated while the sealing fires are directed against the abutting sealing surfaces. To prevent the lens section from slipping off the reflector section, and in addition, to insure that the said sections are sealed together in correct angular or rotative relation so that the prisms and flutes on the lens, and the filaments mounted on the reflector section, are properly oriented with respect to each other, it has been found necessary to provide suitable interlocking positioning elements on the lens and reflector sections in the form of interfitting projections and recesses. However, such interlocking positioning elements have either been provided, heretofore, at points wholly within the sealing surfaces so as to be removed from the outer edges thereof, or have been entirely separate from and spaced inwardly of the said sealing surfaces. Where the interlocking positioning elements are located intermediate the outer and inner edges of the sealing surfaces, or at the inner edges of the sealing surfaces, there is always the possibil-

ity that the sealing surfaces will not be sealed all the way through, that is, across the entire width or inward extent of the sealing surfaces, with the result that an unsatisfactory seal, which is quite apt to crack, is formed between the two glass sections. Likewise, where the interlocking positioning elements are entirely separate from and spaced inwardly of the sealing surfaces, they are more or less apt to become partly fused or stuck together at one or more points around the annular extent of the assembled glass sections with the result that when the compressed air is introduced into the sealed envelope during the sealing operation to raise the lens off the reflector section and so stretch the plastic glass at the seal, the lens raises unevenly from the reflector section around the annular extent thereof, thus producing a defective glass envelope in which the lens and reflector sections are improperly positioned with respect to one another.

One object of my invention is to provide a two-piece glass envelope for electric lamps and similar devices in which the sealing surfaces are completely sealed by fusion at all points therearound and the two glass bodies forming the envelope are in proper predetermined relation to one another.

Another object of my invention is to provide the sealing surfaces of a pair of glass bodies with interlocking positioning elements so formed and arranged as not to interfere with the complete fusion and sealing together of the sealing surfaces across their entire inward extent at all points therealong.

Still another object of my invention is to provide a pair of glass bodies with co-operating peripheral sealing surfaces having interlocking positioning elements so formed and arranged as to insure a substantially uniform plasticity of the glass at all points around the periphery of said sealing surfaces, during the sealing operation, and therefore a uniform raising of the upper glass body from the lower glass body by the compressed air which is introduced into the sealed container during the sealing operation.

A further object of my invention is to provide a pair of glass bodies with co-operating sealing surfaces so constructed and arranged as to lock the two bodies in a predetermined position with respect to one another during the sealing operation, and to permit the complete fusion and sealing of the glass at such surfaces in the shortest possible period of time and without the formation of sharp corners or crevices at the inner edges of said surfaces.

A feature of the invention is the provision of interfitting projections and recesses at the outermost edges of the sealing surfaces of the glass parts, at which location the said interfitting elements will be directly exposed to the sealing fires so as to thereby attain a maximum temperature during the sealing operation, thus assuring their complete fusion and sealing together and, therefore, the formation of a good strain-free seal between the glass parts which is not apt to crack.

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

Fig. 1 is a side elevation, partly in section, of a light projection device provided with a glass envelope according to the invention; Fig. 2 is a fragmentary front elevation of the glass reflector section of the device shown in Fig. 1 prior to the sealing of the cover glass section thereonto; Fig. 3 is a fragmentary sectional view of the glass reflector and cover sections in their assembled position prior to the sealing together thereof; Fig. 4 is a view similar to Fig. 3 showing the glass sections after they have been sealed together; and Fig. 5 is a fragmentary perspective view illustrating more clearly the construction of the interfitting keys and keyways on the glass envelope sections and the manner in which they co-operate to lock the glass sections together during the sealing operation.

Referring to the drawing, the light projection device according to my invention comprises a sealed bulb or envelope 10 consisting of a preformed pressed glass concave reflector section 11 of heat-resisting glass such as "Pyrex," and a cover glass or lens section 12, also of heat-resisting pressed glass, sealed together at their peripheries by fusion. The interior surface 13 of the reflector section 11 is of any suitable light-concentrating shape, preferably that of a paraboloid, and is covered with a reflecting metallic coating 14, preferably aluminum, so as to form a reflecting surface. Mounted within the envelope 10, in definite optical arrangement to the focal point of the reflecting surface thereof, is an electric energy translation element or filament 15, preferably in the form of a linear coil of suitable metallic refractory material, such as tungsten. While I have shown only one such filament mounted within the bulb 10, it will be obvious that, if desired, two or more such filaments may be disposed within the bulb, each of which may be in definite relation to the focal point of the reflector.

The filament 15 is firmly supported in place within the bulb by, and electrically connected at its ends to, a pair of relatively heavy rigid leading-in wires 16, 17 which extend through openings 18 in the reflector section 11 adjacent the apex thereof to closed metal cups or thimbles 19, to which thimbles the said leading-in wires are rigidly secured and electrically connected. The metal thimbles 19 have knife-edged skirt portions which are fused to, and sunk and embedded in the thickness of the glass surrounding the openings 18. At their closed outer ends, the metal cups or thimbles are connected to a suitable base or terminal structure 20, 20, such as that described and claimed in co-pending U. S. application Serial No. 402,121, filed July 12, 1941, by C. A. Cotman and D. K. Wright, now Patent No. 2,272,512, issued February 10, 1942. The bulb or envelope 10 is evacuated and filled with a suit-

able gaseous medium by means of an exhaust tube 21 located at the apex of the reflector section 11, the said tube afterwards being tipped off, as shown in Fig. 1.

The glass reflector and cover sections 11 and 12, which are sealed together to form the bulb or envelope 10, are formed with circular rim portions 22 and 23, respectively, having flat annular sealing surfaces 24, 25 the planes of which are accurately located perpendicularly to the axis of the cover glass section 12, respectively. As is evident from the drawing, the sealing surface 24 is spaced outwardly an appreciable distance from the periphery of the interior paraboloidal surface 13 of the reflector section 11 so that the heat necessary to completely fuse the sealing surfaces 24, 25 together along and through their entire contact area or zone will not affect or alter the shape of the said paraboloidal inner surface 13, or vaporize or otherwise impair the reflecting coating 14 on said surface. Furthermore, the sealing surfaces 24 and 25 may be made of relatively small width or radial extent, such as, for instance, one-eighth to three-sixteenths inch or thereabouts, so that the heat necessary to completely fuse said surfaces together can be localized and the seal thus formed completely in a very short time, before sufficient heat is conducted by the adjacent glass to the inner paraboloidal surface 13 of the reflector section 11 to adversely affect the shape thereof or the reflecting coating 14 thereon.

In sealing the two glass sections 11 and 12 together, the reflector section 11 is mounted face up in a rotatable holder (not shown) on the sealing machine and the cover glass section 12 placed on top the reflector section so as to rest thereon by reason of its own weight, with the sealing surfaces 24, 25 in opposed relation. The so assembled glass sections are then rotated through sharp-pointed sealing fires which are directed at the opposed sealing surfaces, whereupon the glass at such surfaces becomes fused and seals together so as to unite the two glass bodies by a fused glass seal.

To prevent the cover glass 12 from slipping off or shifting laterally of the reflector section 11 during the sealing operation, and also to properly locate and lock the said cover glass section in a predetermined angular or rotative position relative to the reflector section where the cover glass is in the form of a lens having flutes and prisms or other light refracting media thereon for the purpose of redirecting the light rays passing therethrough into a beam of a definite pattern, suitable interlocking and positioning means must be provided on the glass sections.

In accordance with the invention, the said interlocking positioning means comprises a plurality of matched protuberances or keys 26 and depressions or keyways 27 formed on and located at the outermost edges of the sealing surfaces 24, 25 at spaced points therearound. While two or more sets of such interfitting keys and keyways 26 and 27 may be used, I prefer to employ four of the same, spaced 90° apart around the annular extent of the sealing surfaces. The keys and keyways 26 and 27 are preferably arranged with all the keys or projections on one of the glass sections and all the co-operating keyways or recesses in the other glass section. Preferably, however, the keyways 27 are all formed in the sealing surface 24 on the reflector section 11. Such an arrangement is of especial utility in connection with the vaporization of the re-

flecting material on the reflector section 11 which must be performed in a vacuum, inasmuch as such an arrangement facilitates the formation of an air-tight seal between the said sealing surface and the holder for the reflector section on the vaporization apparatus. If desired, however, some of the keys 26 may be provided on one of the glass sections 11, 12 and some on the other of said sections, the co-operating keyways 27, of course, being similarly located so as to co-operate with the keys.

The keys and keyways 26 and 27 are preferably made of rectangular configuration with the length thereof extending longitudinally of the sealing surfaces 24, 25, as shown in Figs. 2 and 5. To facilitate the complete fusion and sealing together of the glass at and interiorly of the said keys and keyways, the same are made of relatively small size and very little height or depth. Thus, in practice, I have found it satisfactory to form the keys and keyways about one-quarter inch long and one-eighth inch wide or so, with a height of only about one thirty-second inch. The small size of the keys 26 renders the same more easily fused than in the case of larger sized keys, and therefore better assures the complete fusion and sealing of the glass, at and adjacent the keys and keyways.

In assembling the two glass sections 11 and 12 together for sealing, the cover glass or lens section 12 is rested on top the reflector section 11 with the projections or keys 26 fitting into the co-operating recesses or keyways 27 so as to position and lock the cover glass in place on the reflector section, as shown in Fig. 3. To insure against the occurrence of voids between the keys and keyways in the finished seal, and therefore insure the formation of an effective seal, it is preferable to make the projections or keys 26 of slightly greater height or depth than that of the co-operating recesses or keyways 27. Such construction assures the presence of sufficient glass at each key 26 to entirely fill the space formed by the co-operating recess or key way 27 and so eliminate the formation of voids or openings at such points. While the greater height of the keys 26 has the effect of initially spacing the sealing surfaces 24, 25 a slight distance apart at the start of the sealing operation, as shown at 28 in Fig. 3, it does not actually interfere in any way with the formation of the seal between the said sealing surfaces since the keys, due to their relatively small size, melt down very soon after the start of sealing, thus allowing the cover glass or lens section 12 to drop down and the sealing surfaces 24, 25 to come into abutting interengagement in a relatively short period of time following the start of the sealing operation. The sealing together of the interengaging sealing surfaces 24, 25 can then progress without interference.

Where the cover glass section 12 is in the form of a lens having flutes and prisms or other light refracting media thereon for the purpose of redirecting the light rays into a beam of definite pattern, it is further necessary to provide suitable means for positioning and locking the cover glass in a predetermined rotative or angular position on the reflector section. For this purpose, one set of interfitting keys and keyways 26, 27 may be made of different configuration from the others, for example, of slightly greater length than the others, so that the lens will fit in place on the reflector section in only one rotative position, thus properly orienting the lens with re-

spect to the reflector section. Other forms of key and keyway constructions, however, may be employed to accomplish the same object. Thus, one set of interfitting keys and keyways may be made of circular shape; or the spacing of one set may be different from that of the others; or the arrangement of one set of keys and keyways on the two glass sections may be reversed from that of the other sets so that one key is on one of the glass sections and all the remaining keys are on the other of said sections.

With the glass sections 11, 12 in proper assembled relation, they are rotated through sharp-pointed sealing fires which are directed at the junction between the sealing surfaces 24, 25 of the glass sections. The glass at such sealing surfaces gradually softens and fuses so as to seal the two sections 11, 12 together. While the glass is still in a plastic condition, compressed air or other gas is introduced into the sealed envelope 10 through the exhaust tube 21 to "blow up" or raise the cover glass or lens 12 a slight amount so as to stretch or work the glass at the seal. Such a stretching of the glass at the seal prevents the occurrence of sharp corners or crevices at the inner side or edge of the seal, a condition which would render the resulting seal weak and liable to cracking. As shown in Fig. 4, the final seal actually obtained is characterized by a rounded inner surface 29 which is conducive to a strong and strain-free seal.

Because of their location at the outer edges of the sealing surfaces, where they are directly exposed to the sealing fires, the interlocking positioning keys and keyways are heated to a maximum temperature since, obviously, the glass at the outer edges of the sealing surfaces is heated to a higher degree than the glass at the inner edges thereof. Such a condition thus better assures the thorough and complete sealing together of the glass at the interlock as well as the prevention of sharp corners or crevices at the inner side or edge of the sealing surfaces which would result in a weak and unreliable seal.

To enable the sealing of the two glass sections 11, 12 in the shortest possible time, the sealing surfaces 24, 25 may be reduced in width along those portions of the annular extent thereof intermediate the interlocking keys and keyways 26, 27, as shown at 30 in Figs. 2 and 5. Thus, the reduced width portions of the sealing surfaces may be of the order of one-eighth inch or thereabouts in width while the portions at the keys and keyways, including the said keys and keyways themselves, may be of the order of three-sixteenths inch or so in width. With such a construction, the reduced width portions of the sealing surfaces fuse and seal together before the portions at the interlocking positioning keys and keyways 26, 27. As a consequence, heat is conducted from the reduced width portions of the sealing surfaces to the interlocking portions thereof to thereby hasten the fusion and sealing together of the glass at such points, thus further tending to shorten the time required for sealing the two glass sections together. If desired, however, the sealing surfaces 24, 25 may, of course, be made of substantially uniform width at all points therearound.

In pressing the glass sections 11 and 12, there is apt to be a certain amount of "shrinkage," i. e., loss due to cracking of the glass, etc. To minimize such shrinkage during the manufacture of the glass sections, it may be desirable to so locate the recesses or keyways 27 in the reflector sec-

tion 11 as to lie opposite the rear mounting lugs 31 extending from the rear surface of the rim 22 on said section, as shown in Fig. 3 and at the left side of Fig. 2. In this way, the thickness of the glass forming the rim 22 is maintained at a maximum at such recessed points, thus tending to minimize cracking of the glass thereat.

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

1. In combination, a pair of glass bodies arranged to be sealed together to form a glass envelope, said glass bodies being provided with co-operating rim portions having flattened continuous sealing surfaces for abutting interengagement, and matched protuberances and depressions on said sealing surfaces contiguous with the outermost edges thereof for locking said glass bodies against lateral displacement relative to one another, said protuberances and depressions being short in length and narrower than the width of the sealing surfaces.

2. In combination, a pair of glass bodies arranged to be sealed together to form a glass envelope, said glass bodies being provided with co-operating rim portions having flattened continuous sealing surfaces for abutting interengagement, and a plurality of sets of matched protuberances and depressions on said sealing surfaces contiguous with the outermost edges thereof for locking said glass bodies against lateral displacement relative to one another, said sets of protuberances and depressions being located at spaced points around the said sealing surfaces and extending only part way across the width of said sealing surfaces at such points.

3. In combination, a pair of glass bodies arranged to be sealed together to form a glass envelope, said glass bodies being provided with co-operating rim portions having flattened continuous sealing surfaces for abutting interengagement, and a plurality of sets of matched protuberances and depressions on said sealing surfaces at the outermost edges thereof for locking said glass bodies against lateral displacement relative to one another, said sets of protuberances and depressions being located at spaced points around the said sealing surfaces, the transverse extent of substantially all those

portions of the sealing surfaces intermediate the spaced sets of protuberances and depressions being of reduced width from that immediately adjacent the protuberances and depressions.

4. In combination, a pair of glass bodies arranged to be sealed together to form a glass envelope, said glass bodies being provided with co-operating rim portions having flattened continuous sealing surfaces for abutting interengagement, and matched protuberances and depressions on said sealing surfaces at the outermost edges thereof for locking said glass bodies against lateral displacement relative to one another, said protuberances being of slightly greater height than the depth of said depressions.

5. In combination, a glass reflector section and a cover glass section arranged to be sealed together to form an electric lamp enclosure and each having optical surfaces designed to co-act to produce a definite light distribution, said glass sections each being provided with co-operating annular rim portions having flattened annular sealing surfaces for abutting interengagement, and a plurality of co-operating keys and keyways provided on said sealing surfaces contiguous with the outermost edges thereof for locking said glass sections in predetermined optical relationship with respect to one another, said keys and keyways being short in length and narrower than the width of said sealing surfaces.

6. An electric lamp enclosure comprising a glass reflector section and a cover glass section provided with co-operating annular rim portions, each of said sections having optical surfaces designated to co-act to produce a definite light distribution, said rim portions being formed at their outer peripheries with oppositely disposed annular sealing surfaces, and matched protuberances and depressions on said sealing surfaces contiguous with the outermost edges thereof for determining the optical relationship of said glass sections in assembled position, said protuberances and depressions being short in length and narrower than the width of the sealing surfaces.

DANIEL K. WRIGHT.

CERTIFICATE OF CORRECTION.

Patent No. 2,324,972.

July 20, 1943.

DANIEL K. WRIGHT.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 4, second column, line 36, claim 6, for the word "designated" read --designed--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 2nd day of November, A. D. 1943.

(Seal)

Henry Van Arsdale,
Acting Commissioner of Patents.