Jan. 18, 1949. L. S. ICKIS 2,459,532

METHOD OF FOCUSING REFLECTOR-TYPE ELECTRIC DISCHARGE LAMPS

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Fig. 1.

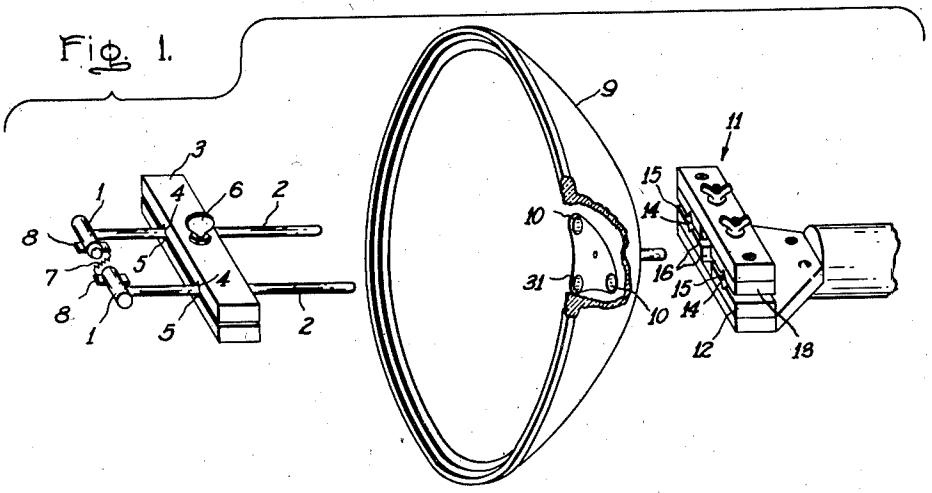


Fig. 2.

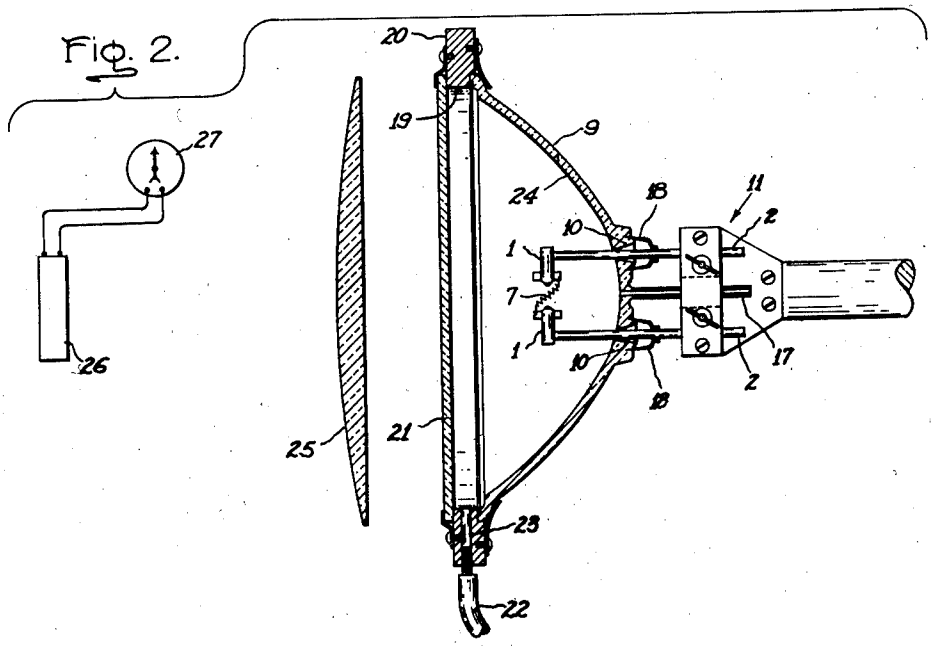


Fig. 3.



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Fig. 6.

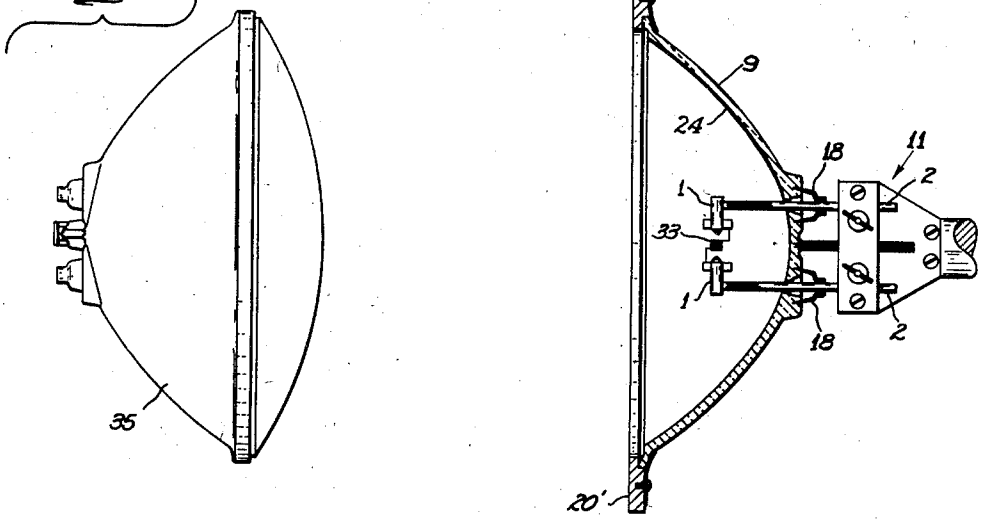


Fig. 5.

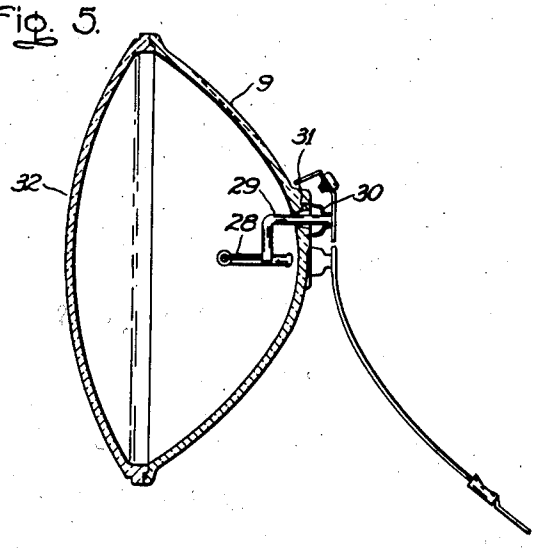
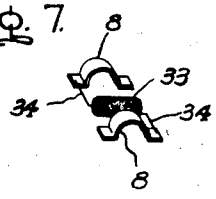


Fig. 7.



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METHOD OF FOCUSING REFLECTOR-TYPE ELECTRIC DISCHARGE LAMPS

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Application March 31, 1948, Serial No. 18,203

5 Claims. (Cl. 316—23)

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My invention relates to electric discharge lamps generally, and more particularly to electric discharge lamps provided with envelopes having a reflector surface incorporated therein.

An object of my invention is to provide methods of assembling and mounting the electrodes of an electric discharge lamp in definite predetermined relation to the focus of a reflecting portion of the lamp envelope. Another object is to provide methods for focusing reflector-type discharge lamps by optical methods which do not require the maintenance of a discharge between the electrodes during the focusing operation.

According to my invention the above objects may be attained by mounting a concentrated filament or other light source in the gap between the electrodes and in fixed relation thereto, adjusting the electrodes and light source relative to the reflector envelope with the light source illuminated so as to project a beam from the reflector and thereby locate its focal point, permanently affixing the electrodes to the envelope, and then removing the light source. Alternatively, I may mount a small light-sensitive member in fixed relation to the gap between the electrodes, direct a beam of light into the reflector envelope and employ the light-sensitive member to locate the focus of the reflector. In these ways I am able to accurately focus a reflector-type discharge lamp by optical means where it would be impractical to use the arc itself as a light source in the focusing operation. Further features and advantages of my invention will appear from the following detailed description of species thereof and from the drawing.

In the drawing Fig. 1 is a perspective view of the lamp parts and apparatus employed in the focusing operation; Fig. 2 is a somewhat diagrammatic plan view, partly in section, showing the relationship of the lamp parts and equipment during the focusing operation; Fig. 3 is a perspective view of a filament assembly which is used to find the focus of the reflector; Fig. 5 is an elevation, in section, of the completed lamp; Fig. 6 is a plan view, partly in section, of the lamp parts and associated equipment employed in a modified focusing method; and Fig. 7 is a perspective view of the focus-finding assembly shown in Fig. 6 and employing light-sensitive means as the focus-determining member.

Referring to Fig. 1, the electrodes 1, 1 carried by leads 2, 2 are first assembled in predetermined spaced relationship by clamping the leads 2, 2 in a suitable clamp 3. The two sections of the clamp 3 are provided with opposed V-shaped

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notches 4, 5 in which the leads 2, 2 are gripped to accurately space the electrodes 1, 1, the said electrodes being aligned in any suitable manner prior to firmly clamping the two sections of the clamp 3 together by the thumb screw 6. The filament 7, which may be an ordinary coiled tungsten lamp filament, is mounted in the gap between the electrodes 1, 1 to substantially duplicate the light source of an arc between the electrodes. As herein illustrated, the filament 7 is carried by a pair of spring clip members 8, 8 (Fig. 3) which are clipped onto the respective electrodes 1, 1.

The assembly of electrodes 1 and clamp 3 is then located generally with respect to the reflector section 9 of the lamp envelope by inserting the leads 2, 2 through apertures 10, 10 in the envelope 9 and into a second clamp 11. The said clamp 11 is provided with facings 12, 13 of insulating material on its lower and upper sections, the said facings being provided with opposed V-shaped notches 14, 15 in which the leads 2, 2 are clamped. The said facings 12, 13 are also provided with opposed notches 16 at the center thereof constituting an opening for accommodation of the exhaust tube 17 extending from the envelope 9. The envelope 9 is also provided with apertured metallic ferrules or thimbles 18, 18 sealed thereto around the openings 10, 10.

As shown in Fig. 2, the envelope 9 is clamped around an opening 19 in a plate-shaped support member 20 which is mounted on a suitable support. After the assembly of electrodes 1, 1 and clamp 3 has been inserted into the envelope 9 and clamped in the holder 11, the clamp 3 is removed and the mouth of the envelope 9 is closed by a glass disc 21 clamped to the front of the plate 20. The interior of the envelope 9 is then freed of air by flowing into it a suitable non-oxidizing gas, such as co-called "forming" gas which may consist of about 20 per cent hydrogen and 80 per cent nitrogen. The gas is introduced into the envelope from a conduit 22 through an opening 23 in the wall of the support member 20. The air is forced out through the exhaust tube 17 and a continuous flow of gas is preferably maintained during the focusing operation to prevent oxidation of the filament 7.

The filament 7 is then energized by connecting the leads 2, 2 to a suitable source of electrical energy. The assembly of holder 11, electrodes 1, 1 and filament 7 is then adjusted with respect to the envelope 9, and particularly its inner reflecting surface 24. During this adjustment the

filament 7 causes a beam of light to be projected from the reflecting surface 24 through a lens 25 toward a photoelectric cell 26. The said photoelectric cell 26 is connected to a galvanometer 27 which will give a maximum reading when the filament 7 is located at the focal point of the parabolic reflector 24. It will be understood that the plano-convex lens 25 has a focal length equal to its distance from the cell 26.

The holder 11 may be adjusted small amounts both laterally and vertically, as well as toward or away from the envelope 9, in order to bring the filament 7 into the exact focus of the reflector 24. When this has been done the electrodes 1, 1 are permanently mounted on the envelope 9 by brazing or soldering the leads 2, 2 to the ferrules 18. The envelope 9 may then be removed, and the filament assembly 7, 8 may be removed from the electrodes.

As shown in Fig. 5, the lamp herein illustrated includes a starting electrode 28 which is carried by a lead 29 secured to a third ferrule 30 sealed around the opening 31 on the envelope 9. The lamp is completed by sealing a lense section 32 to the reflector section 9, after which the envelope is exhausted and filled with a siutable gas such as argon, and the exhaust tube 17 tipped off.

It will be understood that instead of employing a photocell 26 as shown in Fig. 2, the beam projected from the reflector 24 may be intercepted on a screen and the pattern of the screen used to determine when the filament 7 is located at the focus of the reflector. An arrangemnt of this general nature is described in Patent 1,992,041, V. J. Roper et al., which is assigned to the assignee of the present invention.

In Fig. 6 I have illustrated a modified method wherein the filament 7 is replaced by a photoelectric cell 33, preferably a cylindrical cell of the blocking layer, dry type. As shown more particularly in Fig. 7, the cell 33 may be mounted, through its current-conducting wires 34, 34, on clips 8, 8 like those shown in connection with Figs. 1 and 2. In this case the envelope 9 is mounted on a suitable plate support member 20' similar to the plate 20 in Fig. 2. The electrodes and cell 33 are assembled in the clamp 3 (Fig. 1) and then mounted in the holder 11 in the same manner as described in connection with Figs. 1 and 2. However, in this case a beam of parallel rays of light is projected from a suitable light source 35 into the reflecting surface 24 of the envelope 9. Upon adjustment of the assembly of electrodes 1, 1 and photocell 33 with respect to the surface 24, the cell 33 will cause a variation in the deflection of a suitable meter or galvanometer connected to the leads 2, 2. When the maximum deflection is obtained on the said meter an indication is obtained of the location of the cell 33 at the focus of the reflector 24. The leads 2, 2 are then permanently secured to the ferrules 18, 18 as described in connection with Fig. 2.

It will be understood that various modifications may be made in the process within the scope of this invention. For instance, the process is applicable to reflectors 24 of other than parabolic shape. In that case, the light source 33 in the Fig. 6 modification is designed to direct light into reflector 24 at the same angularity to the light projection axis thereof as that desired of the light to be projected by said reflector 24 when the filament 7 and electrodes 1, 1 are in position. Moreover, instead of locating the filament 7 and electrodes 1, 1 directly in the focus of the reflector 24, they may be located in other desired relation thereto, such as a definite distance ahead of or behind the focal point. This may be indicated by a predetermined amount of spreading of the beam projected by the reflector 24 on a suitably marked screen.

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

1. The method of mounting a pair of electrodes in an electric lamp envelope having a reflector surface incorporated therein which comprises the steps of holding said electrodes in predetermined spaced relation, temporarily mounting a focus-determining member in fixed relation to the gap between said electrodes, adjusting said electrodes and focus-determining member as a unit relative to said reflector surface to obtain by reflection of light from said reflecting surface an indication of the presence of said focus-determining member at the focus of said reflector surface, sealing said electrodes to said envelope in their adjusted position and removing said focus-determining member.

2. The method of mounting a pair of electrodes in an electric lamp envelope having a reflector surface incorporated therein which comprises the steps of holding said electrodes in predetermined spaced relation, temporarily mounting a concentrated light source in predetermined fixed relation to said electrodes, energizing said light source and adjusting the said light source and said electrodes as a unit relative to said reflector surface, employing the pattern of the resultant beam projected from said reflector surface to indicate the presence of said light source at the desired relation to the focus of said reflector surface, sealing said electrodes to said envelope in their adjusted position and removing said light source.

3. The method of mounting a pair of electrodes in an electric lamp envelope having a reflector surface incorporated therein which comprises the steps of holding said electrodes in predetermined spaced relation, temporarily clamping a concentrated light source to said electrodes with said light source located in the gap between said electrodes and in fixed relation to said electrodes, energizing said light source and adjusting the said light source and said electrodes as a unit relative to said reflector surface, employing the pattern of the resultant beam projected from said reflector surface to indicate the presence of said light source at the desired relation to the focus of said reflector surface, sealing said electrodes to said envelope in their adjusted position and removing said light source.

4. The method of mounting a pair of electrodes in an electric lamp envelope having a reflector surface incorporated therein which comprises the steps of holding said electrodes in predetermined spaced relation, temporarily mounting a concentrated filament in the gap between said electrodes and in fixed relation to said electrodes, filling said envelope with a gas which is inert with respect to said filament, energizing said filament and adjusting the filament and said electrodes as a unit relative to said reflector surface, employing the pattern of the resultant beam projected from said reflector surface to indicate the presence of said filament at the desired relation to the focus of said reflector surface, sealing said electrodes to said envelope in their adjusted position and removing said filament.

5. The method of mounting a pair of electrodes

in an electric lamp envelope having a light-concentrating reflector surface incorporated therein which comprises the steps of holding said electrodes in predetermined spaced relation, temporarily mounting a small light-sensitive member on said electrodes and in the gap therebetween, directing light into said reflector surface at the same angularity to the light projection axis thereof as that desired of the light to be projected thereby when said electrodes are in position, adjusting the said electrodes and light-sensitive member as a unit relative to said reflector surface until the light falling on said light-sensitive

member is a maximum, sealing said electrodes to said envelope in their adjusted position and removing said light-sensitive member.

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