Jan. 3, 1939. C. BIRDSEYE 2,142,104

ELECTRIC LAMP

Filed July 29, 1935 2 Sheets-Sheet 1

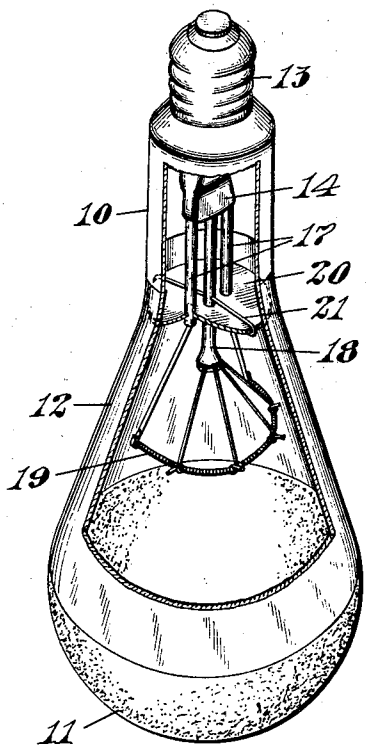

Fig. 1.

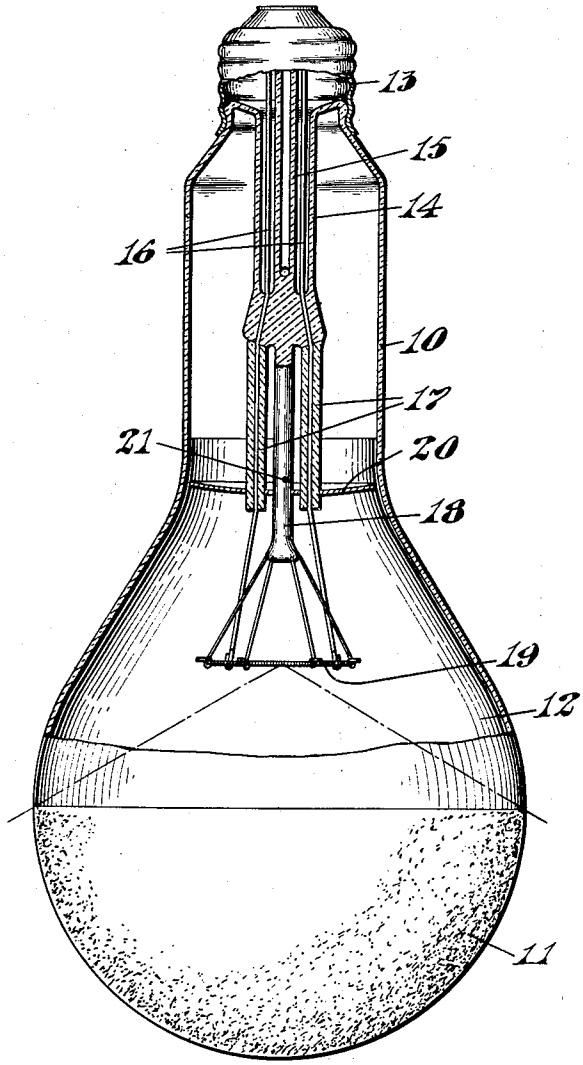

Fig. 2.

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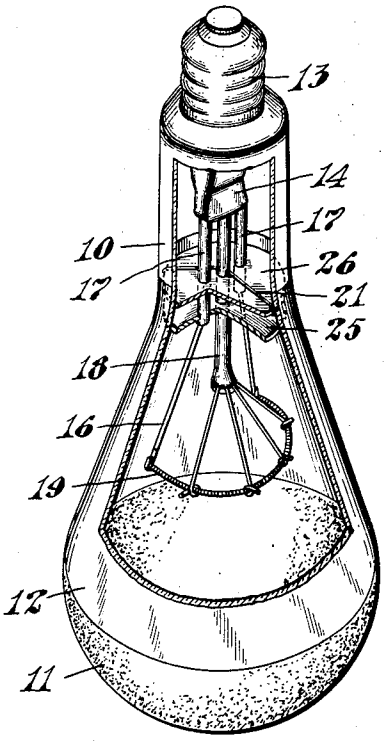

Fig:3.

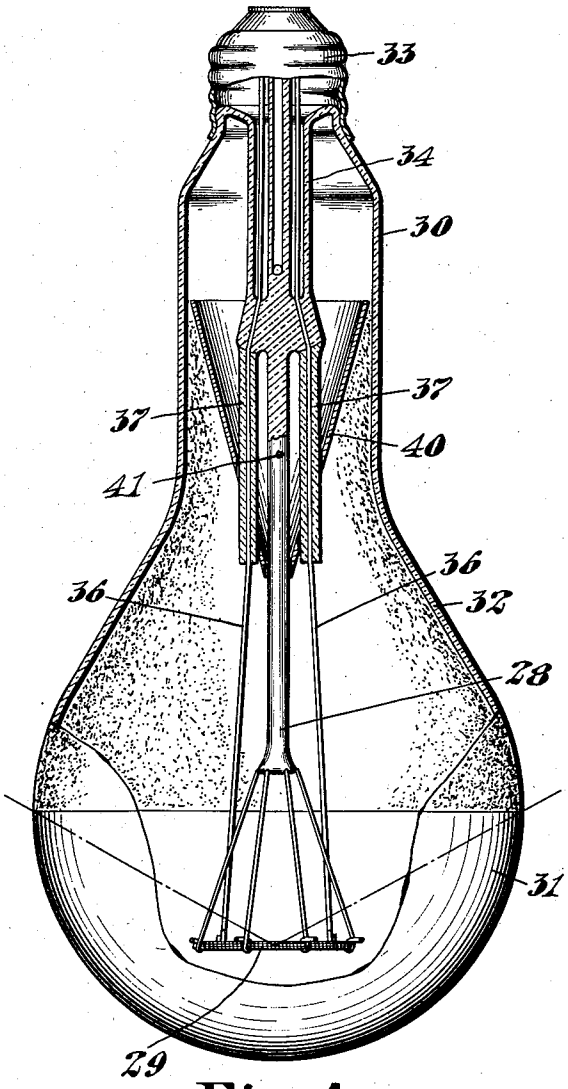

Fig:4.

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Patented Jan. 3, 1939 2,142,104

UNITED STATES PATENT OFFICE

2,142,104

ELECTRIC LAMP

Clarence Birdseye, Gloucester, Mass., assignor, by mesne assignments, to Birdseye Electric Company, a corporation of Delaware

Application July 29, 1935, Serial No. 33,694

6 Claims. (Cl. 176—34)

The present invention consists in an electric lamp of improved efficiency and a wider field of use than electric lamps heretofore known. It is proposed to restrict the luminous field or beam of the lamp within predetermined limits where it can be utilized to the best advantage and convenience and to concentrate substantially all the light energy of the lamp within that field. For example, it is proposed to deflect the light beams which have hitherto been lost in the neck of the lamp and cause them to reinforce the useful beam and in general to reflect the light rays leaving the filament within certain selected zones so that they shall emerge from the lamp only in its concentrated and useful field.

As herein shown the field or beam of the lamp is defined in part by a peripheral reflecting zone within which the filament is located and which serves to restrict the direct rays leaving the lamp to those in the desired field, cutting off those rays which would otherwise cause glare outside this field. While I prefer to utilize silver deposit inside the bulb, in certain aspects the invention is not limited in respect to the character of the reflecting surface employed. A reflecting surface located within the bulb, however, is frequently more efficient than an outside reflector and is more securely protected from mechanical injury, so that it is advisable to employ a reflector of this character where conditions permit. The zone of the reflecting surface is so shaped and located as not to cut off any direct rays leaving the lamp at the desired angle and so that it will trap substantially no rays by internal reflection within the bulb, but will direct practically all rays into the intended useful luminous field of the lamp. My invention is applicable to bulbs intended for both direct and indirect lighting and in both cases it is desirable to limit the reflecting zone substantially at the line of maximum bulb diameter. In providing a bulb for direct lighting, the reflecting zone may extend from the line of maximum bulb diameter to a line in the neck of the bulb, while in a lamp intended for indirect lighting the reflecting zone may extend from the line of maximum bulb diameter over the entire end of the bulb.

In accordance with the present invention, it is proposed to locate the filament within the boundary of the reflecting surface so that practically all rays emanating from the filament will eventually leave the bulb in the desired predetermined angle. This might be 60° to the vertical, that is to say, the luminous field of the lamp may comprise a 120° cone. On the other hand in a lamp intended for indirect lighting, the filament may be located below the boundary line of the reflecting zone so that the luminous field of the lamp takes the shape of an inverted cone.

I have found that by locating a reflecting disk between the filament and the seal of the lamp a noticeable increase in efficiency may be derived. In one aspect, my invention consists in a novel construction for supporting a reflector disk within the electric lamp in the desired position and in such a manner that the disk may be accurately and reliably retained in place by manufacturing procedure which is advantageous from a commercial standpoint and which requires no unusual amount of skill on the part of the operator. In providing a reflecting disk of the desired character serious problems of insulation are encountered; and in another aspect my invention consists in a structure in accordance with which the lead-in wires are insulated from each other and from the reflecting disk and carried through the latter on their way to the filament in such a manner as to obviate the danger of short circuiting. As herein shown the desired results are secured by providing separate insulating tubes extending in spaced parallel relation from the press of the stem and passing through separate perforations provided for that purpose in the reflecting disk. For the purpose of added rigidity and strength the insulating tubes may be fused into the stem press.

Another advantage which may be derived from a reflecting disk of the character above described is that it acts to some extent to seal off the neck of the bulb, or a portion thereof, and so protect the stem, and particularly the press of the stem, from overheating and consequent damage.

Another feature of the invention consists in a bulb of oversized dimensions employed in combination with one or more of the features above described. The manufacture of electric bulbs has been for many years standardized in respect to bulb sizes. That is, there is a bulb of standard size for a lamp consuming 200 watts of energy, and a larger size for a lamp consuming 300 watts of energy. By employing an oversized bulb, I secure an increased volume of space about the filament which space tends to reduce the heating effect of the filament upon the glass both by reason of increased distance therefrom and because of the increased space for convection currents in gas filled lamps. Moreover, in an oversized bulb the objectionable tungsten deposit is appreciably diluted and the heat radiating surface of the bulb and incidental cooling effect is increased. This expedient therefore, tends to prevent overheating and damage to the material of the reflecting zone, to the glass of the bulb, and to the stem. Another advantage incident to the use of an oversized bulb is that it permits reclaiming of bulbs by cutting off the neck above the metallic cap, since in using a commercial oversized bulb the length of the neck may, without loss of lamp efficiency, be appreciably reduced in constructing an improved lamp of my invention.

This and other features of the invention will

be best understood and appreciated from the following description of certain preferred embodiments thereof, selected for purposes of illustration and shown in the accompanying drawings, in which,—

Fig. 1 is a view in perspective of a lamp embodying my invention, portions of the bulb being broken away,

Fig. 2 is a view in side elevation partly in section, and on an enlarged scale, of the lamp shown in Fig. 1,

Fig. 3 is a view similar to Fig. 1 but showing a modified construction, and

Fig. 4 is a view in side elevation, partly in section, of a lamp designed for indirect illumination.

Referring first to Figs. 1 and 2, which illustrate a lamp designed for direct illumination, the glass bulb may be conventional in shape, including a cylindrical neck part 10 which merges into an enlarged globular portion. The bulb is provided with the usual sealed-in stem 14 containing an exhaust tube 15 and the lead-in wires 16. It may also be provided with a threaded brass base 13 of the usual construction.

The bulb herein shown is provided with the peripheral reflecting surface 12 which extends from a point somewhat within the neck 10 to substantially the line of maximum bulb diameter. The reflecting surface is preferably secured by depositing metallic silver upon the inside of the bulb within the area, although the present invention is not limited to a reflecting surface of any specific characteristics. The end portion 11 of the bulb may be frosted, the frosted portion and the silvered portion being separated by a common line of division so that all the light passing from the bulb may be diffused by the frosted surface and shadow effects due to the action of the reflecting surface are obviated.

The stem 14 has a flattened press at its inner end and merges into the filament supporting arbor 18. Arranged at opposite sides of the arbor are insulating tubes 17 disposed in spaced parallel relation thereto and herein shown as welded or fused to the end of the stem, although they may be of other insulating material than glass if desired and may be associated with the stem or press in any other convenient manner. The filament 19 may be supported beyond the end of the arbor 18 by anchor wires in the usual manner and is connected at its ends to lead-in wires 16 which pass through the stem and through the insulating tubes 17 on their way to complete the circuit with the filament, or the arbor may be omitted and a metallic filament support substituted for it.

The light center of the filament 19 as shown in Fig. 2 is located above the lower limiting line of the reflecting surface by a distance which permits the passage of rays leaving the filament at a downwardly inclined angle of about 60° to the vertical. Rays which would otherwise pass from the lamp in a more nearly horizontal direction are arrested by the reflecting surface and reflected downwardly so that they emerge from the frosted surface 11 of the bulb and reinforce or intensify the luminous field of the lamp. As already noted, it is desirable to terminate the reflecting zone at the line of maximum bulb diameter to avoid losing any rays by total internal reflection. It will be understood that the relative location of the filament and the reflecting surface may be varied in accordance with the use to which it is desired to put the lamp. For example, by making a portion of the bulb and the reflector parabolic in shape the light of the lamp may be concentrated in a cylindrical beam and an effective searchlight lamp thus provided.

In order to deflect rays which would otherwise pass up into the neck of the bulb and become lost it is proposed to employ a reflecting member of suitable shape which, as shown in Fig. 2, may take the form of a disk 20 having a reflecting surface upon the face toward the filament 19. The disk is designed to fill substantially the whole cross-sectional area of the neck with only slight clearance to facilitate insertion of the disk and permit expansion when heated. As herein shown, the disk is located slightly below the upper line of the reflecting zone and is made slightly convex downwardly for the purpose of reflecting the light rays received from the filament out through the bottom of the bulb, and preferably without tendency to bombard the filament with reflected light and heat rays. The reflecting disk may, however, be of any contour desired. In Fig. 3 for example, it is shown as concave downwardly; but in any case its function is to render effective those rays which would otherwise be lost in the neck of the bulb and also to act as a shield for the body of the stem, both by cutting off direct heat rays and by sealing the neck portion of the bulb against the circulation of heated gases.

A preferred manner of mounting the reflecting disk 20 is shown in Figs. 1 and 2. The disk is provided with three separate perforations for the passage of the arbor 18 and the two insulated tubes 17. In constructing the lamp, the disk 20 is threaded upon the arbor 18 before the anchor wire button is welded in place. It is permanently held in place above or within the ends of the insulating tubes 17 by a connection with the arbor 18 which comprises a pair of wires 21 inserted on their inner ends in offset relation in the arbor 18 and clenched at their outer ends over the rim of the disk.

The disk 20 may be of any suitable light reflecting material such as silver, aluminum or porcelain, or it may be of other material and provided with a light reflecting surface upon its lower face. For example, it may be a mica disk with a silver deposit in such areas as to offset the danger of short-circuiting the lead-in wires.

The filament 19 herein shown may be of 200 watt capacity and the bulb preferably of large size for such a filament. For example, the bulb may be of the standard size regularly employed with a filament of 300 watt capacity. The employment of an oversized bulb is important in the respects already touched on. In the first place it affords increased distances between the filament and the glass of the bulb, and increased volume of space about the filament. This is of particular importance in a lamp having a peripheral reflecting surface of the character herein disclosed since it tends to prevent damage to the reflecting surface, even though the latter has a tendency to increase the temperature at which the whole lamp is operated. The oversized bulb offsets this in a favorable degree by increasing the heat radiating surface of the bulb; and as a further result the stem is not subjected to dangerous overheating.

In some cases however, it may be found advisable to supplement the shielding function of the reflecting member by providing a supplementary disk of a heat insulating material. Such construction is shown in Fig. 3 where a perforated disk 26 of mica or similar material is shown as

located above a reflecting disk 25 and secured in spaced relation thereto by anchor wires embedded in the arbor 18. As also suggested in this figure the reflector disk 25 may be concave toward the filament, having a parabolic or other curvature by which the reflected rays are caused to travel outwardly in a defined beam.

In Fig. 4 I have illustrated my invention as embodied in a lamp designed for indirect illumination. In this case the neck of the bulb 30 may be unsilvered and the reflecting surface 31 is substantially hemispherical, covering the lower end of the bulb and terminating at its upper edge in a plane transverse to the axis of the bulb, preferably coinciding with the line of maximum bulb diameter. The intermediate portion 32 of the bulb may be frosted in order to diffuse the light emitted by the lamp and eliminate any shadow effect which might otherwise be caused by the action of the reflector. Where bulbs are to be used in diffusing fixtures it may be unnecessary to frost any areas thereof. As previously explained the reflecting surface is preferably formed by a silver deposit inside the bulb, but my invention is not limited to this or to any specific reflecting material.

The lamp is provided with the usual base 33 and the sealed-in stem 34 through which the lead-in wires 36 are introduced into the lamp through the press. The arbor 28 is in this case extended to support the filament 29 at a point below the upper edge of the reflecting surface 31. The filament may occupy any desired predetermined position, such for example, that those rays emitted at 60° or more to the axis of the lamp, as shown by the dot and dash line in Fig. 4, pass directly from the bulb without reflection, and those emitted from the filament the angles below this limit are intercepted and reflected into the same useful zone of the luminous field.

In the neck of the lamp shown in Fig. 4 is placed a reflecting member, herein shown as comprising a conical reflector 40 which at its base substantially fills the cross-section of the neck of the bulb and is perforated at its apex to permit the passage of the arbor 28. A pair of insulating tubes 37, preferably fused to the press of the stem, extend downwardly and through perforations provided for that purpose near the apex of the reflector 40. Except for the three perforations mentioned, the reflector 40 substantially fills the entire neck of the bulb and acts to reflect outwardly and upwardly those light rays which would otherwise be lost into the neck of the bulb. The tubes 37 serve to insulate the lead-in wires 36 and prevent short-circuiting by the reflector. The reflector may be secured in position in any convenient manner, but as herein shown, is fastened to the arbor 28 by anchor wires, which are embedded therein on their inner ends, and may be clenched upon the surface of the reflector at their outer ends. It will be understood that any suitable insulating device may be employed for conducting the lead-in wires safely through the reflector.

The filament 29 herein shown may be of any conventional construction, but preferably is of concentrated form and of high intrinsic brilliancy, and may comprise a single or multiple coil of incandescent wire upon a core. Under certain conditions the stem construction may be changed, as by shortening the arbor and correspondingly lengthening the hooks or filament supports so that the stem itself or the button at the end thereof will not be softened by the excessive heat reflected from the silver upon the walls of the bulb.

In the case of the lamp of Fig. 4, as in those already described, it will be noted that the reflector is positioned about the lead-in wires, above and beyond the seal press of the stem so that it is effective as a heat shield for this portion of the stem.

Having thus described my invention what I claim as new and desire to secure by Letters Patent of the United States is:

1. In an electric lamp including a bulb having a stem and a filament supported thereby, a reflector disk located between the filament and the stem seal, and a shield spaced from the rear face of the reflector disk both the reflector disk and the shield being supported in position upon said stem.

2. An electric lamp comprising a bulb having a neck of reduced diameter, a stem mounted therein and having projecting therefrom a filament-supporting arbor and a pair of spaced tubes, lead-wires disposed within said tubes, a filament supported within the bulb by said arbor, a metallic reflecting member located within the neck of the bulb and perforated for the passage of said arbor and tubes, and oppositely extending arms set in said arbor and clenched over the rim of the reflecting member to hold it in place in the lamp.

3. An electric lamp comprising a bulb with a neck of reduced diameter, a filament, elongated filament-supporting and insulating members disposed in the neck, and a reflecting member having anchor wires attached thereto and secured to one of said members.

4. An electric lamp for indirect lighting comprising a bulb having a globular portion and a neck portion and having a reflecting zone extending from the tip of said bulb substantially to the line of maximum diameter of said globular portion, the remainder of said globular portion and said neck portion being translucent; a stem within said bulb, a filament supported by said stem substantially within the boundary of said reflecting zone, and a conical reflector substantially filling the cross-section of said neck portion and so located and of such shape as to shield said stem and to reflect rays from said filament directly out through said translucent portion.

5. A gas filled incandescent lamp having a base and a pear-shaped bulb containing a coiled tungsten filament and being substantially one size greater than the standard sized bulb for the filament employed and having a material portion of the bulb coated upon its interior with a reflecting surface, and the remainder of the bulb free from such reflecting surface, the filament being disposed substantially in the focus of the coated portion of the bulb, and a reflecting member located in the bulb between the filament and the base of the lamp.

6. A gas filled incandescent lamp having a base and a pear-shaped bulb containing a coiled tungsten filament and having a portion of its surface coated upon its interior with metallic silver, said portion having a radius of curvature substantially the same as the radius of curvature of the next size larger pear-shaped bulb for the same filament, the filaments being disposed substantially in the focus of the coated portion of the bulb, and a reflecting disk located in the bulb between the filament and the base of the lamp.

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