Jan. 17, 1939. C. BIRDSEYE 2,144,400

REFLECTING ELECTRIC LAMP

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Fig. 1.

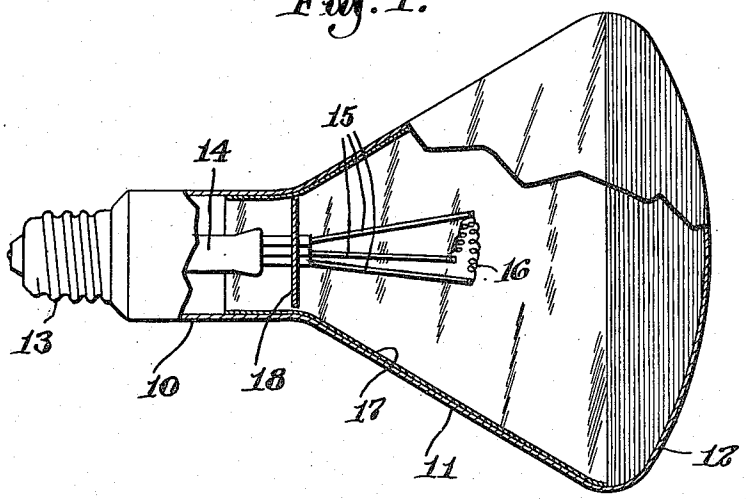
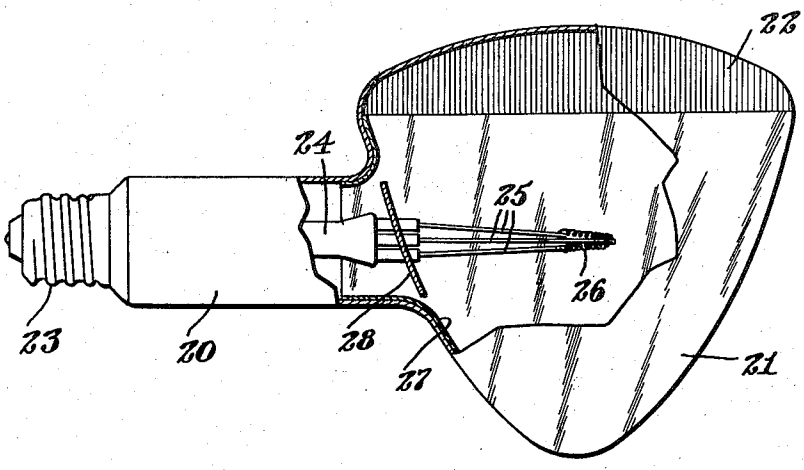


Fig. 2



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REFLECTING ELECTRIC LAMP

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3 Claims. (Cl. 176—34)

This invention relates to devices for directing radiant energy in the form of light rays or non-luminous rays into definite working areas. An important field of use of the invention is in connection with incandescent lamps having some part of the bulb arranged to act as an efficient reflector for the purpose of directing and conserving the light for useful work in selected areas.

More particularly the invention is concerned with lamps designed for special purposes, and with respect to which not only is the direction of the rays of importance, but also the quality of light. For example, in stage lighting where colored effects are desired, this is often accomplished by placing standard lamp bulbs behind suitable color screens, usually made of gelatine. The color of the light shining on the stage may be changed by the operator of a key-board, each key controlling a single lamp or a series of a given color. In large installations many lamps, each with its screen and external reflector, are employed. Gelatine screens are relatively cheap, but their life is short and the labor cost of replacing them perhaps once a week is high. Permanent color screens of glass are heavy and expensive, and must be replaced frequently because of breakage. Color screens produced by coating the bulb surface are often inefficient transmitters of light, and the temperature of such coatings during the periods of use is high enough to cause rapid destruction of most colors and binders. Bulbs made entirely of colored glass are satisfactory within limits for the purpose, except for their first cost, which is generally very high, since the colored glass is a relatively expensive material.

I have found that I can reduce the cost and upkeep of such an installation for producing colored light effects, and at the same time eliminate the need of external reflectors, thus further reducing cost and the space required for the installation, and secure these desirable results with an appreciable increase in lighting efficiency. This I achieve by employing a composite bulb having part of its surface made into a highly efficient reflector, and preferably of such shape and disposition relative to the light source within the bulb that all reflected rays pass directly out of the lamp through the transmitting area of the bulb, after not more than a single reflection, and by using in combination with such a reflecting portion of the bulb a transmitting portion which is made of colored glass, or in some other way is different in chemical composition and in light transmitting properties from the rest of the bulb. Thus the transmitting portion of the bulb becomes in effect a window with certain characteristics that are different from the rest of the bulb, and may be of colored glass for the specific case discussed above, but also may be any other glass or material having specific optical properties different from those of the rest of the bulb, and which will in part determine the wave length of the transmitted light.

Such a window of selected glass may be sealed or fused into a bulb in a symmetrical position in its bulbous portion on a line with the main axis or with the axis of the reflecting portion of the bulb. Its size, in this position, may approximate the maximum diameter of the bulb, although it need not necessarily be hemispherical in shape, since a flatter curve would be equally satisfactory and would require less of the selected or colored glass. The rest of the bulb may preferably be silvered over either the inside or outside surface of plain glass, so that all of the light from the source would either be transmitted through the colored window directly as direct light, or after a single reflection from the silvered surface. If the colored window in a bulb of this shape were of smaller size than the maximum diameter of the bulb, and if the rest of the bulb were silvered, or otherwise made into a highly efficient reflecting surface, it is obvious that some of the reflected light would be trapped within the silvered surface, and would be reflected several times before leaving the bulb. This would result in a measurable decrease in lighting efficiency, and colored windows smaller than the maximum diameter of the bulb would be employed only when the efficiency was of secondary importance and when the cut-off angle was the determining consideration.

Symmetrical lamps of other shapes than the standard shape may be readily constructed in this way, but in all such cases the diameter of the window is preferably that of the maximum bulb diameter in order to obtain highest efficiency; and in general, substantially the rest of the bulb may be utilized as an efficient reflector. The reflector, besides directing most of the light from the source through the window, also serves to hood the light source and thereby mask the uncolored parts of the bulb.

A window of dissimilar material may alternatively be located in the side walls of a bulb, although a less efficient result will be secured because of trapped rays and multiple reflection, unless either the window covers approximately half the area of a bulb symmetrical about its main axis, or unless an asymmetrical bulb is

used which has been designed to have such shape and provided with a reflecting surface such that all of the light leaves the bulb through the window either as direct light or after a single reflection. Such a bulb with a colored window occupying a part of the side wall, and with a sloping neck reflector, and with the rest of the bulb surface serving as a reflector to reflect light directly out through the colored window is an efficient lamp for stage lighting effects.

In this same manner a quartz window may be sealed into a glass bulb for transmitting ultraviolet light rays, for example. In general I wish to include within the scope of this invention all lamp bulbs having windows of different transmitting properties than the rest of the bulb, and used with reflecting surfaces integral with the bulb to reflect light out through the window.

It may be desired in some cases to produce a diffused light from such window-bulbs and this may be obtained by frosting the transmitting portion of the bulb, or by frosting the glass under the reflecting deposit, or in some other way producing a diffusing reflecting surface, as explained in the co-pending application Serial No. 47,581.

These and other features of the invention will be best understood and appreciated from the following description of two preferred embodiments thereof selected for purposes of illustration and shown in the accompanying drawing, in which,—

Fig. 1 is a view in elevation, partly in section, of a lamp of symmetrical shape, and

Fig. 2 is a similar view of a lamp shaped to direct a beam at right angles to its major axis.

The lamp shown in Fig. 1 has a composite bulb in which is included a cylindrical neck portion 10, a flaring or conical portion 11 and a curved or rounded end portion 12. The neck and body portions 10 and 11 may comprise any glass commonly used in commercial bulbs while the end portion 12 is herein shown as being red glass fused into the body of the bulb.

The lamp includes the usual metallic base 13 and mount 14 through which project lead-in wires 15 for a coiled coil filament 16. A desirable type of filament is that disclosed in the pending application of Charles Spaeth, Ser. No. 15,605, consisting in a wire helix having a core of tungsten or the like therein and being wound with its core in a secondary helix. As herein shown the filament is arranged in substantially V-shaped design disposed transversely to the major axis of the bulb.

The bulb is provided upon a predetermined portion of its surface with an interior reflecting coating 17 and for this purpose metallic silver may be satisfactorily employed. In the illustrated lamp the reflecting coating 17 extends from the line of maximum bulb diameter to a line in the neck of the bulb and it is supplemented by a reflecting disk 18 surrounding and insulated from the lead-in wires just beyond the inner end of the mount 14.

In the lamp of Fig. 1 the light rays emanating from the filament 16 pass either directly out through the red glass end portion 12 or they are reflected by the coating 17 or the disk 18 and pass out as reflected light through the portion 12. The coating 17, further, acts to hood the light of the lamp in all directions except where it is wanted, with the result that substantially all the light energy of the lamp is conserved and directed into a single restricted beam of red light.

The lamp of Fig. 2 is similar in construction to that already described but of somewhat different shape. Its composite bulb has a cylindrical neck 20 and conical portion 21 disposed with its axis at right angles to the axis of the neck, and both made of clear glass of any commercial type. The bowl portion 21 may be circular or oval in cross section (in a plane perpendicular to the plane of the paper) and a curved or rounded face 22 of red glass is fused, as before, into the body of the bulb.

The lamp is provided with the usual base 23, and sealed-in mount 24 from which project lead-in and supporting wires 25. In this case the coiled coil filament 26 is supported in a plane substantially perpendicular to the axis of the portion 21 instead of perpendicular to the principal axis of the lamp.

The inner end of the neck 20 and the entire inner surface of the bowl portion 21 are provided with a coating of metallic silver 27 or other efficient reflecting material and this is supplemented by a reflecting disk 28 surrounding the lead-in wires and supporting wires 25 and so disposed as to constitute in effect a continuation of the surface of the bowl portions 21. On account of the particular shape of the reflecting surface, which, as shown may be substantially parabolic, all rays emanating from the filament are collected into a single concentrated beam and directed outwardly through the red glass portion 22 of the bulb.

While I have illustrated only lamps having red glass window portions it will be understood that I contemplate the employment of any desired material in this portion of the lamp. For example, different colors may be secured by introducing metallic or metalloid ingredients into the glass composition, or quartz or other light filtering material may be used. These may require other adjustments in the base materials forming the glass in order to equalize the coefficient of expansion of the fused portions of the bulb.

It will be seen that by the present invention I provide a compact and efficient unit which may be installed in small space or manipulated conveniently by the user and which is useful in a broad field of lighting, therapeutic treatment and radiant energy application of all sorts.

The lamp of Fig. 1 is the subject matter of my divisional application Serial No. 242,615, filed November 26, 1938, which contains also generic claims.

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

1. An electric lamp comprising a clear glass bulb having a neck, a parabolic portion disposed with its axis at right angles to the axis of said neck and having a metallic reflecting coating thereon, a flattened outwardly convex portion of colored glass fused into the dissimilar glass of the bulb as an integral part thereof and located opposite to said parabolic portion, a support projecting out of the neck, and a filament located thereby substantially at the focus of the reflecting surface.

2. An electric lamp comprising a clear glass bulb having a neck merging into a substantially conical portion disposed with its axis at right angles to the neck and having a metallic reflecting surface extending substantially to its line of maximum diameter, a window of colored glass

fused into the dissimilar glass of said conical portion and presenting an outwardly convex curved transmitting portion of a diameter equal to the maximum diameter of the bulb, and a filament supported in a plane at substantially right angles to the axis of the conical portion of the bulb.

3. An electric incandescent lamp comprising a bulb having a neck merging into an enlarged substantially parabolic portion disposed with its axis at an angle to the neck and flaring to a line of maximum diameter located in a plane beyond the neck, the interior walls of said parabolic portion having a metallic reflecting coating thereon, a substantially circular window of material having different optical properties from the glass of the bulb closing the larger end of said parabolic portion, a coiled tungsten filament supported in the neck of the bulb and centered in said parabolic portion, and a neck reflector disposed substantially in the general contour of the bulb.

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