

June 27, 1961

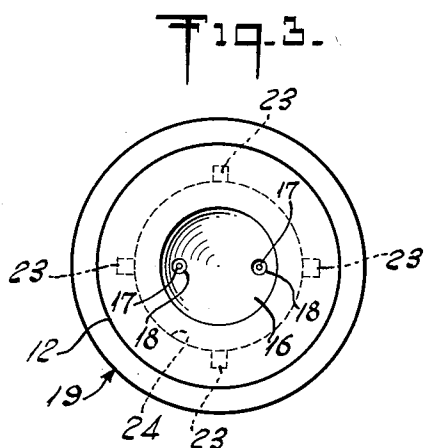
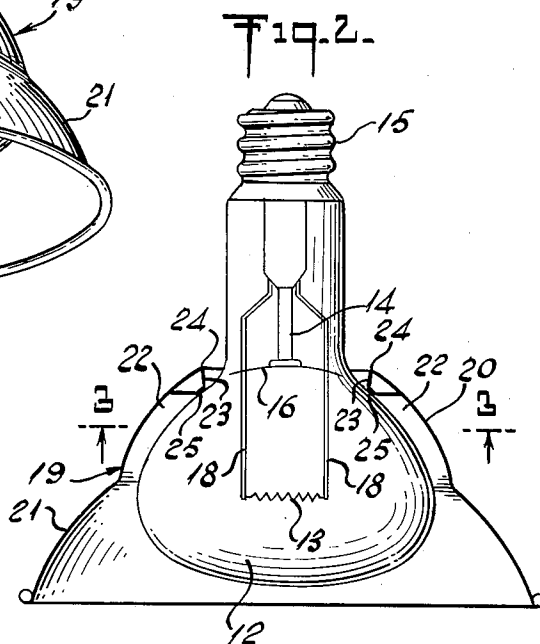
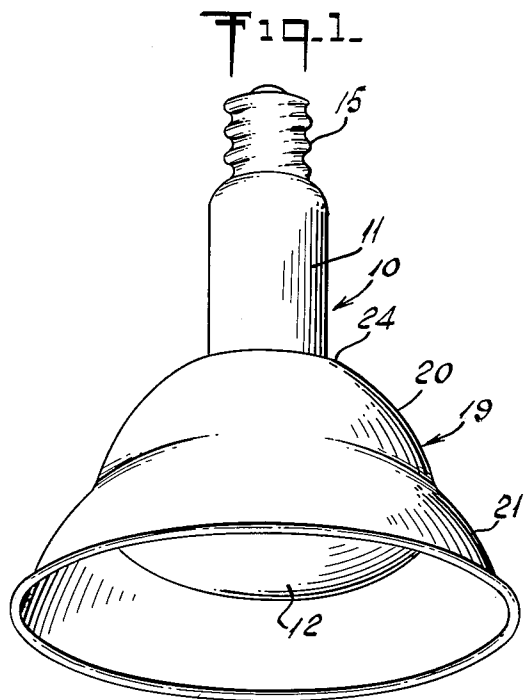
M. LIBERMAN ET AL

2,990,494

ELECTRIC LAMP

Filed July 10, 1959

3 Sheets-Sheet 1



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3 Sheets-Sheet 2

Fig. 4.

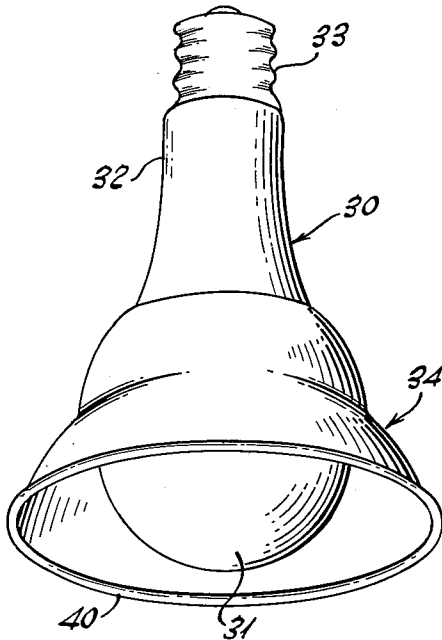


Fig. 5.

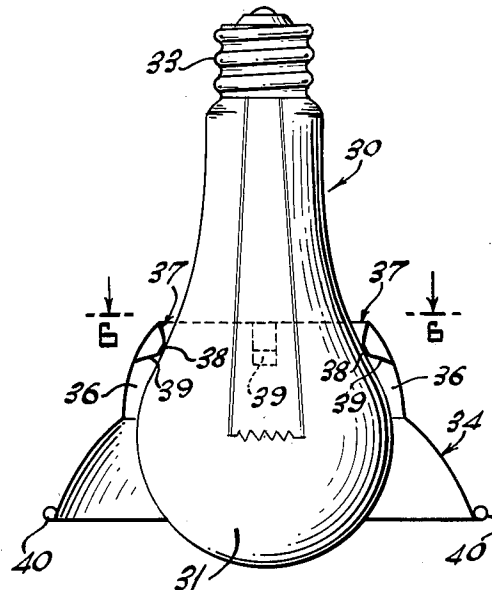


Fig. 6.

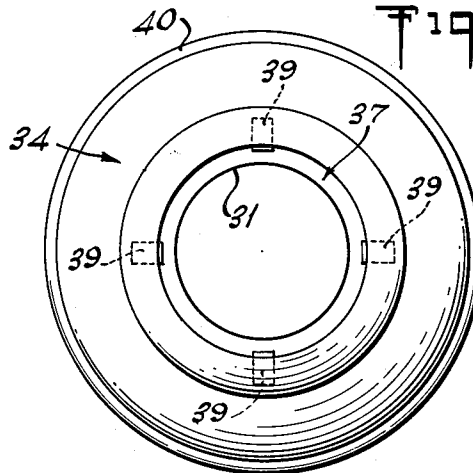


Fig. 7.

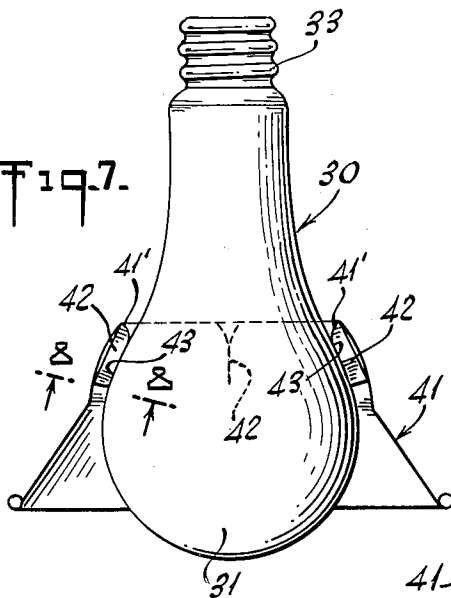
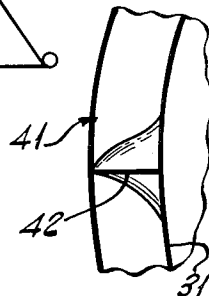


Fig. 8.



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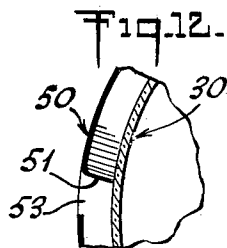
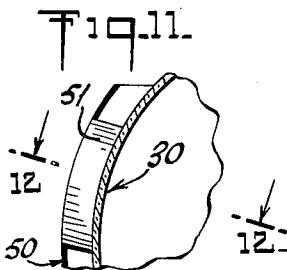
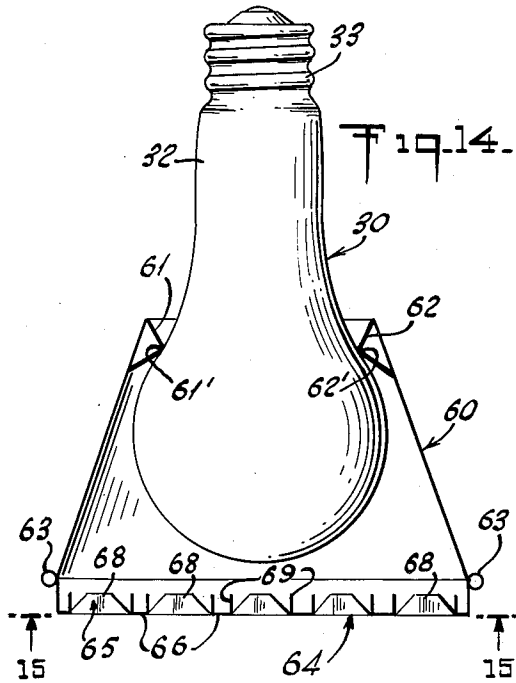
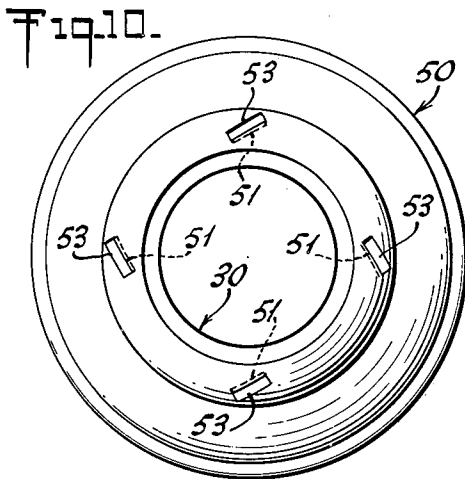
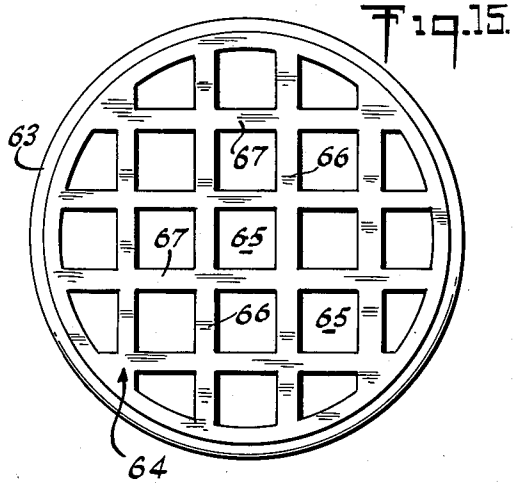
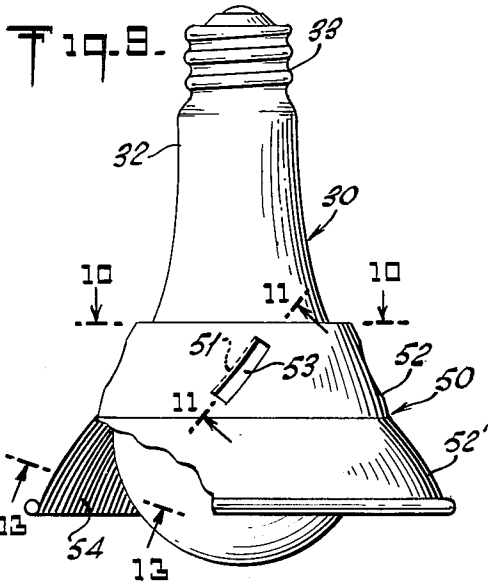
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3 Sheets-Sheet 3



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2,990,494

ELECTRIC LAMP

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Filed July 10, 1959, Ser. No. 826,353

15 Claims. (Cl. 313-113)

This invention relates to electric lamps and more specifically to an improved electric lamp having high light-projecting efficiency and improved operating characteristics.

Numerous structures have been proposed, particularly for use with incandescent lamps for concentrating the light emitted by the filament or other type of light source into beams of the desired configuration. Many types of high and low voltage lamps utilize reflecting surfaces contained within the lamp itself for focussing the light into a beam. The internal reflector is presently utilized in connection with incandescent lamps of the type used for residential and commercial lighting and, while it is in a protected position within the lamp, the utilization of a reflector in this way greatly increases lamp cost and the added thickness of the envelope required to afford the desired envelope strength substantially increases its weight and places added strain on the lamp base as well as supporting the socket structure. Moreover, the utilization of an internal reflector restricts the variety of beam configurations that can be obtained in view of structural limitations and the prohibitive cost for the fabrication of special lamps. With standard internal reflector lamps the cost is at least two to three times the cost of comparable standard lamps without reflectors. It has also been observed that internal reflector lamps operate at considerably higher temperatures than lamps without internal reflectors and the light emitted for a given power input is less than that obtained from a base lamp.

External reflectors utilized with conventional lamps have been found unsatisfactory because of the difficulty in mounting the reflector on the lamp and maintaining the temperature of the confined lamp at a level that will not adversely affect lamp life and subject the lamp to thermal shock. Furthermore, known external reflectors do not afford means for accurately controlling focus and the wide tolerance in lamp manufacture would require complicated and costly devices requiring experienced personnel for their adjustment.

This invention avoids the difficulties encountered with prior devices for concentrating and directing the light emitted by a light source and, in the case of incandescent lamps, minimizes thermal shock during heating and cooling cycles, affords long lamp life, enables the manufacture of completed light projectors at a cost considerably below prior types of lamps using internal and external reflecting devices and provides a lamp and reflector properly and accurately coordinated one with the other.

Another advantage of the invention resides in the provision of a reflector lamp characterized by its light weight (approximately one half the weight of known reflector lamps), durability, improved efficiency and exceedingly low cost. The substantial weight reduction over known reflector lamps greatly reduces lamp and socket damage occasioned by vibration and contributes materially to the life of the lamp.

A further object of the invention resides in a novel and improved electric lamp and integral reflector wherein the reflector closely follows temperature changes of the lamp and permits the lamp envelope temperature to stabilize at substantially the same rate as conventional lamps without reflectors.

Another object of the invention resides in the provision of a novel and improved lamp having coordinated

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internal and external reflectors to maximize useful light output and at the same time provide a durable, efficient lamp having long life.

A still further object of the invention resides in the provision of an improved reflector type lamp embodying an improved mode of attachment to the lamp envelope and affording a resulting structure having a long dependable life.

The above and other objects and advantages of the invention will become more apparent from the following description and accompanying drawings forming part of this application.

In the drawings:

FIG. 1 is a perspective view of a lamp and integral reflector in accordance with the invention;

FIG. 2 is a cross sectional view of the reflector shown in FIG. 1;

FIG. 3 is a cross sectional view of FIG. 2 taken along the line 3-3 thereof;

FIG. 4 is a perspective view of another embodiment of an electric lamp in accordance with the invention;

FIG. 5 is an elevational view of the lamp shown in FIG. 4 with parts in section to illustrate the arrangement and cooperation of the elements;

FIG. 6 is a cross sectional view of FIG. 5 taken along the line 6-6 thereof;

FIG. 7 is a side elevational view of a modified embodiment of the invention with parts broken away;

FIG. 8 is a cross sectional view of FIG. 7 taken along the line 8-8 thereof;

FIG. 9 is a side elevational view of another embodiment of the invention with a portion broken away to illustrate the arrangement and cooperation of the elements;

FIG. 10 is a cross sectional view of FIG. 9 taken along the line 10-10 thereof;

FIG. 11 is a cross sectional view of FIG. 9 taken along the line 11-11 thereof;

FIG. 12 is a cross sectional view of FIG. 11 taken along the line 12-12 thereof;

FIG. 13 is a greatly magnified cross sectional view of FIG. 9 taken along the line 13-13 thereof;

FIG. 14 is a side elevational view of still another embodiment of the invention with the elements broken away to illustrate their arrangement and cooperation; and

FIG. 15 is a front view of the embodiment shown in FIG. 14 taken in the direction of arrows 15-15 thereof.

The lamp in accordance with the invention embodies a new and improved combination of elements which affords a highly efficient light source with negligible increase in weight or cost over conventional light sources as, for instance, conventional incandescent lamps. Reflectors, both internal and external, have been used and, in the case of external reflectors, known practices have dictated the utilization of relatively heavy material in order to maintain reflector configurations and afford a strong, self-supporting structure when attached to the lamp. Because of the substantial cost of prior lamp-carried reflectors, the reflector was transferred to a new lamp when replacement was necessary, with the result that the efficiency of the reflector after several lamp changes was materially reduced by reason of oxidation and the accumulation of dirt and other foreign matter. Furthermore, such reflectors have been found to affect adversely the operating characteristics of the lamp itself, and cause the lamp envelope to become detached from the base.

It has been found that materially improved incandescent lamp operating characteristics contributing to increased lamp life and efficiency can be obtained by the utilization of an integral external reflector formed of

thin, heat conductive and light reflecting material. The thinness of the material, as will be pointed out, constitutes a significant factor in lamp operation and optimum results have been obtained by utilizing material thicknesses just sufficient to afford a self-supporting, durable structure. In maintaining relatively thin reflector walls, in the permanent attachment of the reflector to a conventional lamp will provide a resultant structure of negligibly increased weight so that little, if any, added strain is placed on the base or socket portions of the unit. Further lamp efficiency has been attained with the invention by coordinating a small internal reflector with the external reflector, thus reducing light loss and minimizing base temperature while retaining the advantages of the novel and improved external reflector in accordance with the invention.

In addition to the undesirable effect produced by prior reflectors on the operating characteristics of a lamp and the undesirable mechanical stress placed on a lamp by known lamp-carrier reflectors, it has been found that thermal shock during heating and cooling of a lamp frequently causes lamp burnout long before its normal life cycle. This difficulty is overcome by the provision of a lamp with an external integral reflector in accordance with the invention since the temperature of the reflector body follows closely temperature changes of the envelope during the heating and cooling cycles of the lamp, and under these conditions the reflector can be fixedly and permanently secured to the lamp to form a unitary structure without the danger of envelope damage. Moreover, the attachment of the lamp and the reflector one to the other may be accomplished in any desired manner and with the attaching points at any desired position relative to the lamp. Actual tests have indicated that the attachment of a reflector in accordance with the invention to envelope portions even in the vicinity of the heated filament will not adversely affect or cause damage to the lamp envelope.

For example, it has been found that the surface temperature of a lamp with an integral reflector in accordance with the invention will attain a state of equilibrium substantially as rapidly as the surface of a bare lamp. With heavier lamp-carried reflectors of the character generally used in connection with lamps, equilibrium of the surface of the glass envelope was not attained until after thirty minutes.

The utilization of an exceedingly thin reflector has still another advantage in that its temperature stabilizes at substantially the same rate as the surface of the integrated lamp and stabilizes at a lower temperature than heavier reflectors. The increased temperature of the heavier prior reflectors also produces a significantly higher lamp surface temperature so that the delay in temperature stabilization with prior relatively heavy reflectors subjects the lamp to greater thermal shock and adversely affects its life. Moreover, when such heavy reflectors are attached to the hotter portions of a lamp, envelope breakage is so high that the resultant composite is wholly impractical. With thin reflectors integrally secured to the lamp in accordance with the invention, rated lamp life is assured and life tests actually show that the preponderance of the lamps with integral reflectors exceed the normal life span of a comparable bare lamp.

By way of comparison of the invention with known lamps having internal reflectors and a rating of approximately 2000 hours, the lamp and integral reflector in accordance with the invention when operated with slightly reduced voltage, as for instance a 130 volt lamp operating at 120 volts, substantially twice the light output is obtained with a longevity or life approaching that of the long life internal reflector lamp. Since the lamp in accordance with the invention may embody standard lamp construction with a reflector integrally secured thereto, the cost is drastically reduced so that the cost

per lumen of light output is well below 50% of the cost encountered with commercial long-life internal reflector lamps.

Referring now to the drawings, an improved electric lamp in accordance with the invention is illustrated in FIGS. 1 to 3, inclusive. In these figures the lamp generally denoted by the numeral 10 has an elongated cylindrical neck portion 11 and an enlarged portion 12 surrounding the filament 13. The stem 14 of the lamp which is secured to the portion of the envelope extending within the base 15 carries a circular reflector 16 which is positioned in the vicinity of the joiners of the lamp portions 11 and 12. The reflector is preferably carried at the end of the stem and may be provided with suitable openings 17 through which the filament support wires 18 may pass.

The enlarged portion 12 of the lamp 10 carries a reflector generally denoted by the numeral 19 and it may have any desired configuration. For instance, the upper portion 20 may have a spherical configuration while the lower portion 21 may be in the form of a parabola. The diameter of the reflector, and particularly the spherical portion thereof, is coordinated with the lamp 10 so that when the reflector is properly positioned relative to the lamp it will be substantially uniformly spaced therefrom to provide an air passage 22 as may be observed more clearly in FIG. 2. In this way, and with the lamp positioned as illustrated in FIGS. 1 and 2, air can flow readily between the reflector and the lamp and emerge upwardly along the neck part 11 thereof.

It has been found that improved operating characteristics of the lamp 10 is obtained by fabricating the reflector 19 of an exceedingly thin material having a relatively high heat conductivity. For instance, a metal such as aluminum produces excellent results when the thickness does not exceed .020" and is preferably of the order of .005" to .010". With the thin reflector it has been found that while the lamp temperature is slightly increased beyond the temperature of a bare lamp, the lamp nevertheless will become temperature stabilized in approximately the same time as in the case of a bare lamp, and tests comparing a reflector in accordance with the invention with prior known reflectors have indicated the attainment of increased lamp life. Furthermore, the utilization of exceedingly thin reflectors disposed externally of the lamp affords a lumen output greater than that obtainable by known internal reflector lamps and at a materially reduced cost per lumen of light output.

The utilization of an exceedingly thin reflector 19 affords still further advantages, namely, a reduction in weight of the completed assembly which considerably reduces the strain placed on the attachment of the lamp to the base 15 as well as the stresses imposed for supporting the sockets. It has also been found with the utilization of an exceedingly thin reflector of the character described above, that it may be integrally secured to the lamp without danger of stressing the lamp envelope during the heating and cooling cycles. While the attachment may be accomplished in any desired manner, one procedure involves the formation of supporting members 23 integrally joined to the upper edge 24 of the reflector and formed in the shape of a V having a flattened apex 25. The formation of the supports 23 of which there may be three or more, uniformly spaced about the peripheral edge 24 of the reflector is such as to provide the required spacing between the reflector and the lamp and at the same time position the reflector relative to the filament 13 to produce a spotlight or floodlight, as may be desired. The flattened portions 25 of the supports are permanently cemented to the surface of the lamp by a thin layer of a suitable cement as, for instance an epoxy cement, which has been found to be highly effective in securing metals such as aluminum to glass.

In the formation of the reflector 19 it is desirable to position the upper edge 24 of the reflector so that the

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distance between it and the glass envelope of the lamp does not exceed the average width of the air passages 22. In this way, and with an internal reflector 16 only slightly smaller than the internal diameter of the neck 11 minimum light will escape between the two reflectors and thus substantially all of the light emitted by the filament 13 will be reflected outwardly from the reflector. The utilization of the reflector 19 within the lamp minimizes the reflection of light back into the neck 11 and thus will result in maintaining a lower base temperature. This advantage, together with the fact that a completed lamp in accordance with the invention is substantially less than half the weight of a conventional internal reflector type lamp, affords a highly improved lamp and greatly simplifies the problems encountered in securing bases to lamps, with subsequent reduction in cost.

FIGS. 4 to 6 illustrate a modified form of the invention utilizing a conventional lamp denoted by the numeral 30 and having an enlarged spherical portion 31 tapering upwardly into a gently tapered neck 32 and terminating in a threaded base 33. A reflector 34 of any desired configuration is secured to the spherical portion 31 of the lamp 30 by cement or other suitable means. The reflector, as in the previous embodiment of the invention may have any desired configuration and is preferably formed of aluminum or other similar material having high heat conductivity and a thickness not exceeding .020" and preferably of the order of .005" to .010".

FIGURE 5 illustrates the structure of FIGURE 4 with the lamp 30 in side elevation and the reflector 34 sectioned to show its relationship and mode of attachment to the lamp. The reflector is slightly larger than the lamp to form a peripheral air channel 36 surrounding the lamp and provide for the free flow of air between the reflector and the lamp. The reflector is secured to the lamp by three or more supports 37 which have flattened surfaces 38 bearing against the lamp envelope. The lower end 39 of each support 37 is bent outwardly toward the reflector to form resilient means for attaching the reflector to the lamp. Attachment of the reflector to the lamp is preferably accomplished by using a thin layer of an appropriate cement, as for instance, an epoxy cement, which will firmly adhere to the flattened portion 38 of the support to the glass envelope and form a permanent and integral bond. Even with the reflector material being as thin as .005", and with the supports 37 being formed of the same material, the reflector will remain in proper alignment relative to the lamp and form a rugged, dependable structure. In order to lend additional rigidity to the reflector and guard against accidental distortion, the peripheral rim 40 is rolled.

In the operation of the improved lamps as described above, the temperature of the reflector-lamp will remain at a lower level than the temperature of prior known reflector-lamps of similar wattage. Since at least a portion of the neck of the lamp is exposed in each case base temperatures are retained in the same general order as the base temperature of a conventional lamp. These operating advantages are gained through the utilization of reflectors not exceeding .020" in thickness and preferably of the order of .005" to .010". The improved attachment of the reflector to the lamp thus forming an integral unit, greatly reduces the cost of the reflector type lamps and provides one that will afford more than twice the useful light obtained from known lamps with internal reflectors having the same wattage rating. The cost of the improved lamp in accordance with the invention is also only a fraction of the cost of known lamps having internal reflectors, with the result that the cost per lumen of useful light is drastically reduced.

Another advantage of the lamps as described above is that the reflector can be anodized in any desired color and used with tinted or clear lamps to obtain a wide variety of color effects without the need for filters or

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other similar devices which materially reduce light output. Furthermore, while the reflector may be attached to the lamp in any desired manner through the improved mode of attachment as illustrated and described in connection with FIGS. 1 to 6, thermal shock at the point of attachment is negligible and in actual tests, lamps in accordance with the invention did not fail by reason of cracks in the envelope and in most instances lamp life well in excess of the normal rated lamp life was obtained. In certain cases it is desirable to provide reflector supports extending upwardly from the reflector for attachment to the lamp neck. Such supports, however, should not restrict air flow between the reflector and the lamp.

A further form of the invention is illustrated in FIGS. 7 and 8. In this embodiment the reflector denoted herein by the numeral 41 is secured to the lamp 30 to form an integral unit by the utilization of elongated tabs 42 disposed at spaced intervals about the periphery of the reflector 41. Each tab 42 is secured to the upper edge 41' of the reflector 41 and extends downwardly within the reflector. The lower end 42' of each tab is twisted and disposed at right angles to the line of attachment of the tab to the edge 41' of the reflector 41. In this way, the tabs 42 form edgewise spacers and the edge 43 of each tab 42 is cemented to the surface of the lamp 30. Thus, the tabs 42 function in the nature of fins and carry heat from the envelope of the lamp so that thermal shock during heating and cooling of the lamp is minimized. It will be observed in this embodiment of the invention that the configuration of the integral reflector 41 differs from that shown in FIGS. 1 to 6. The configuration of the reflector can be modified as may be desired to obtain particular types of lighting effects, it being important, however, to utilize a thin material spaced from the lamp to achieve the important advantages and results enumerated above.

Still another embodiment of the invention is shown in FIGS. 9 through 12. In this embodiment the reflector denoted here by the numeral 50 is integrally secured to the lamp 30 by a plurality of tabs 51 formed from the upper section 52 of the reflector. The reflector section 52 is curved in substantially the same manner as the corresponding portions of the reflectors shown in FIGS. 1 to 6 and the tabs 51 are formed by punching them from this reflector portion and bending them inwardly generally at an angle of 90 degrees to leave a plurality of openings 53. By inclining the tabs 51 in the manner illustrated in the drawings, additional rigidity is secured and the edge of each tab 51 will closely follow the surface of the lamp 30.

The inner edge of each tab 51 is cemented to the lamp surface and the tab thereby acts as a fin to keep the area of contact with the lamp at a temperature consistent with the temperature of the surrounding portions of the lamp envelope. Moreover, the provision of openings 53 provide added space for the escape of air and thereby improve the circulation with negligible loss of light.

In many cases it is desirable to scatter the light being reflected from the internal surface of the reflector 30 and for this purpose at least the lower portion 52' of the reflector 50 is provided with a plurality of finely disposed ribs or serrations 54 which are actually formed in the material of which the reflector is formed. A greatly enlarged fragmentary section of the configuration is shown in FIG. 13. It will be observed that the ribs are actually swaged, etched or otherwise formed in the inner surface of the reflector and are not generally detectable on the outer surface thereof.

In certain cases it may be desirable to provide the lamp in accordance with the invention with an ornamental grill overlying the front of the reflector and one arrangement of elements for the attainment of this end is illustrated in FIGURES 14 and 15. For illustrative purposes the bulb 30, in these figures, is provided with a generally conical reflector 60 having inwardly formed tabs 61 and 62 having their surfaces 61' and 62' cemented

to the lamp envelope, as illustrated and described in connection with previous embodiments of the invention. The forward rolled edges 63 of the reflector 60 extends slightly beyond the end of the lamp 30 and an air permeable grill 64 is secured in any suitable manner to this edge. The grill 64 also may be formed in any desired manner and for purposes of illustration the grill has a plurality of rectangular openings 65 with the intervening opening defining elements 66 and 67 being stiffened by inwardly formed tabs 68 and 69 punched from the grill material to form the openings 65. The grill 64 is preferably made of a material of substantially the same thickness as that of the reflector 60, though the thickness of the grill material is not critical, as it is spaced from the lamp and will have relatively little influence on the temperature of the lamp itself. A grill 64 of the type illustrated in the drawings or other ornamental configuration may be utilized with the reflectors shown in FIGURES 1 through 9. If desired the grill may be formed of glass or plastic materials provided, however, suitable provision is made for the flow of air about the lamp.

It is evident from the foregoing description that the utilization of very thin reflectors of the order of .005" to .010" afford a number of important advantages resulting in material savings to the user and at the same time providing a vastly improved and more dependable, versatile and efficient light source. With the cooperation of an internal reflector with the external reflector maximum useful light is obtained while retaining the important advantages of the external reflector in accordance with the invention.

While only certain embodiments of the invention have been illustrated and described, it is apparent that other modifications, alterations and changes may be made without departing from the true scope and spirit thereof and defined by the appended claims.

What is claimed is:

1. An electric lamp comprising a bulb having a sealed glass envelope and a filament within said envelope, said bulb attaining a normal temperature when operated in an unenclosed condition, and an exterior reflector of thin material surrounding said bulb envelope, said reflector being in substantially unrestricted spaced relationship to said envelope and forming throughout its extent an annular air passage between said reflector and said envelope with at least part of the reflector being in closely spaced relationship to said envelope, at least part of the radiant heat energy emitted by said filament and envelope being intercepted and reflected by said reflector to raise the temperature of said envelope above said normal temperature and above the temperature of the reflector, the temperatures of the envelope and reflector reaching stability substantially simultaneously and at a rate approximating the rate of stabilization of said bulb when operated in said unenclosed condition.

2. An electric lamp comprising a sealed glass envelope, a filament within said envelope and an exterior reflector of thin sheet material having a thickness not exceeding .020", said reflector being carried by said envelope and positioned in substantially unrestricted spaced relationship therewith to form an annular air passage throughout its extent, at least an effective portion of the reflector being in closely spaced relationship to said envelope, and said reflector, upon energization of said filament, being heated substantially wholly by radiant energy emitted by said filament and envelope.

3. An electric lamp including, in combination, a sealed glass envelope, a filament supported within said envelope, and a thin sheet metal reflector having a thickness not exceeding .010 inch, said reflector being mounted on, permanently secured to and enclosing a portion of the exterior of said envelope to form therewith a unitary structure, said reflector further being spaced outwardly from the envelope surface to establish an open substantially unrestricted air passage between said surface and

said reflector body, said reflector being heated during operation of said filament substantially wholly by radiant energy emitted by said envelope.

4. An electric lamp comprising a bulb having a sealed glass envelope and a filament within said envelope, said bulb attaining a normal temperature when operated in an unenclosed condition, and an exterior reflector of thin material cemented in fixed focal relationship to said bulb envelope, said reflector being in substantially unrestricted spaced relationship to said envelope, and forming throughout its extent an annular air passage between said reflector and said envelope with at least part of the reflector being in closely spaced relationship to said envelope, at least part of the radiant heat energy emitted by said filament and envelope being intercepted and reflected by said reflector to raise the temperature of said envelope above said normal temperature, and above the temperature of the reflector; the temperatures of the envelope and reflector reaching stability substantially simultaneously and at a rate approximating the rate of stabilization of said bulb when operated in said unenclosed condition.

5. An electric lamp comprising a sealed glass envelope, a filament within said envelope and an exterior reflector of thin sheet material having a thickness not exceeding .020" said reflector being cemented to said envelope and positioned in substantially unrestricted spaced relationship therewith to form an annular air passage throughout its extent, at least an effective portion of the reflector being in closely spaced relationship to said envelope, and said reflector, upon energization of said filament, being heated substantially wholly by radiant energy emitted by said filament and envelope.

6. An electric lamp including, in combination, a sealed glass envelope, a filament supported within said envelope, and a thin sheet metal reflector having a thickness not exceeding .010 inch, said reflector being mounted on, permanently cemented to an enclosing a portion of the exterior of said envelope to form therewith a unitary structure, said reflector further being spaced outwardly from the envelope surface to establish an open substantially unrestricted air passage between said surface and said reflector body, said reflector being heated during operation of said filament substantially wholly by radiant energy emitted by said envelope.

7. An electric lamp comprising a bulb having a sealed glass envelope and a filament within said envelope, said bulb attaining a normal temperature when operated in an unenclosed condition, an exterior reflector of thin material surrounding said bulb envelope, and relatively thin supports secured at one end to the reflector and at the other end to said envelope, said reflector being in substantially unrestricted spaced relationship to said envelope and forming throughout its extent an annular air passage between said reflector and said envelope with at least part of the reflector being in closely spaced relationship to said envelope, at least part of the radiant heat energy emitted by said filament and envelope being intercepted and reflected by said reflector to raise the temperature of said envelope above said normal temperature and above the temperature of the reflector, the temperature of the envelope and reflector reaching stability substantially simultaneously and at a rate approximating the rate of stabilization of said bulb when operated in said unenclosed condition.

8. An electric lamp according to claim 7 wherein each of said supports is integrally formed with said reflector and its other end is cemented to the bulb envelope.

9. An electric lamp according to claim 7 wherein each of said supports comprises a fin-like member carried by said reflector and having an elongated edge cemented to said lamp.

10. An electric lamp comprising a bulb having a sealed glass envelope including interconnected neck and bulbous portions and a base secured to the neck, and a filament within said envelope, said bulb attaining a normal tem-

perature when operated in an unenclosed condition, an exterior reflector of thin material carried by said bulb envelope and extending from a point spaced from said base forwardly about said bulbous portion, said reflector being in substantially unrestricted spaced relationship to said envelope and forming throughout its extent an annular air passage between said reflector and said envelope with at least part of the reflector being in closely spaced relationship to said envelope, at least part of the radiant heat energy emitted by said filament and envelope being intercepted and reflected by said reflector to raise the temperature of said envelope above said normal temperature and above the temperature of the reflector, the temperatures of the envelope and reflector reaching stability substantially simultaneously and at a rate approximating the rate of stabilization of said bulb when operated in said unenclosed condition.

11. An electric lamp according to claim 10 including an internal reflector within said envelope and disposed in approximate alignment with the end of the reflector nearest said base.

12. An electric lamp comprising a sealed glass envelope having a bulbous portion, a filament within said envelope, an exterior reflector of thin sheet material surrounding a portion of said envelope and extending forwardly about at least the major part of said bulbous portion, at least three thin resilient supports carried by said reflector and extending inwardly into contact with said envelope, means fixedly securing the inner envelope-contacting ends of said supports to said envelope, said reflector having a thickness not exceeding .020 inch and positioned in substantially unrestricted spaced relationship therewith to form an annular air passage throughout its extent, at least an effective portion of the reflector being in closely spaced relationship to said envelope, the said reflector, upon energization of said filament, being heated substantially wholly by radiant energy emitted by said filament and envelope.

13. An electric lamp according to claim 11 wherein

said reflector further includes an air permeable, light transmitting closure carried by the forward end of said reflector.

14. An electric lamp including, in combination, a sealed glass envelope, a filament supported within said envelope, and a thin sheet metal reflector having a thickness not exceeding .010 inch, spaced resilient supports carried by said reflector and extending inwardly into contacting relationship with said envelope, said envelope contacting portions of said supports being permanently cemented to said envelope, said reflector enclosing at least a portion of the exterior of said envelope with said filament being disposed within the space defined by said reflector, said reflector further being spaced outwardly from the envelope surface to establish an open substantially unrestricted air passage between said surface and said reflector body, the latter being heated during operation of said filament substantially wholly by radiant energy emitted by said envelope.

15. An electric lamp according to claim 12 wherein said envelope includes a base part, a neck extending from said base and terminating in a bulbous portion, at least part of reflector closely surrounds said bulbous portion with at least part of the neck exposed and said reflector further includes a forwardly extending flared portion.

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	1,609,220	Sweet -----	Nov. 30, 1926
35	2,088,544	Braselton -----	July 27, 1937
	2,163,272	Deschere -----	June 20, 1939
	2,257,366	Bates et al. -----	Sept. 30, 1941

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40	800,350	Great Britain -----	Aug. 27, 1958
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