April 19, 1960 L. G. LEIGHTON 2,933,632

INCANDESCENT LAMP WITH BLACKENING COLLECTOR SCREEN

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Fig. 1.

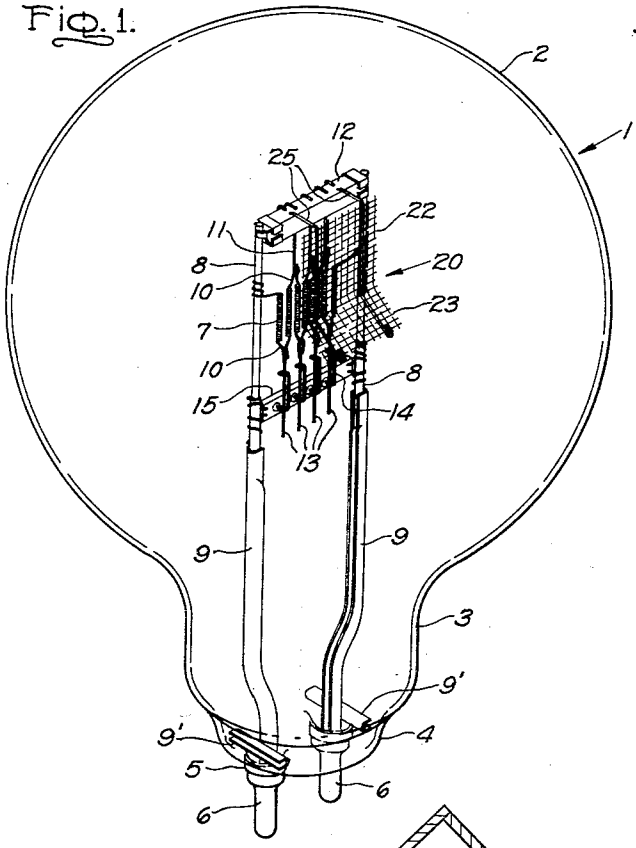


Fig. 2.

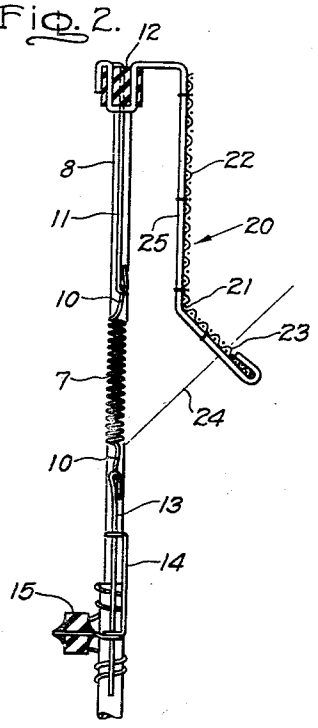
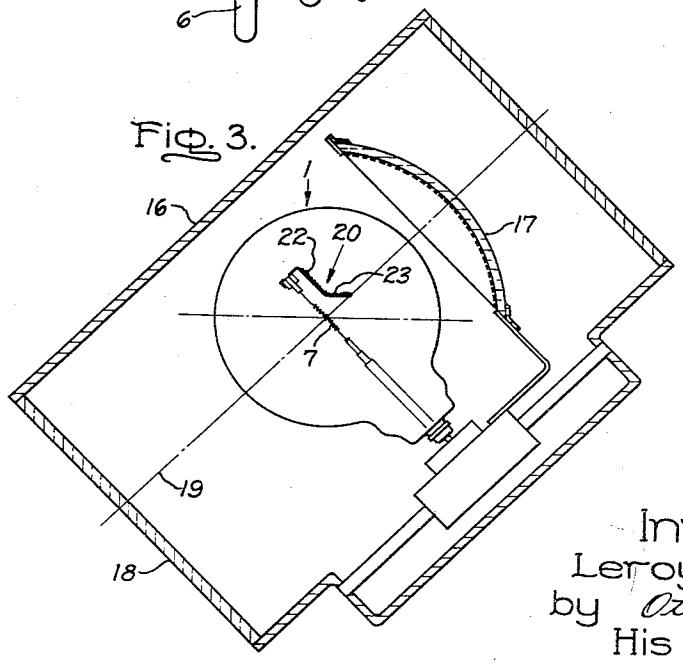


Fig. 3.



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INCANDESCENT LAMP WITH BLACKENING COLLECTOR SCREEN

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2 Claims. (Cl. 313—222)

My invention relates generally to electric incandescent lamps and more particularly to a novel arrangement of screen means for materially minimizing the formation on the enclosing bulb or envelope of dark deposits of tungsten vaporized from the filament.

The present invention is especially concerned with certain types of gas filled high wattage projection lamps, for example 5 and 10 kw. lamps, such as those employed in motion picture studio spotlights. The filaments of such lamps are operated at especially high temperatures for high efficiency and desirable high color temperature for photographic purposes. However, operation at such high temperatures accelerates vaporization of the tungsten filament, the vaporized particles being carried by the hot gas stream of convection currents to form a light-absorbing deposit on the bulb wall. The hot gas stream impinging on the bulb also causes severe blistering or bulging of the bulb wall in spite of the use of bulbs of hard borosilicate glass of high softening point and of as large a size as is practicable.

It is accordingly an object of my invention to provide means for materially minimizing the bulb blackening and blistering in such lamps. It is a further object to minimize bulb blackening and blistering by provision of a novel arrangement of screen means which is especially effective in normal operation of the lamp in positions at an angle to the vertical, and which will intercept a minimum of useful illumination.

In accordance with one aspect of my invention, the above objects are achieved by the provision of a flat screen of angular form arranged with its apex adjacent to the upper margin of the conventional planar type filament which is located between a pair of lead-in conductors and substantially in the plane passing through said conductors, one leg of the screen extending upwardly beyond the filament and in a plane parallel to and adjacent the said plane of the conductors, the other leg extending downwardly away from the filament at an acute angle to the said plane. The angular or lower leg of the screen preferably is at an angle of approximately 45° to the plane of the lead-in conductors and filament, so as to lie directly above the filament when the lamp is inclined at a 45° angle to the vertical, and the parallel or upper leg is effectively above the filament and in the path of rising gas currents in positions of the lamp closer to the vertical.

Further features and advantages of my invention will appear from the following detailed description of a species thereof and from the drawing wherein:

Fig. 1 is a perspective view of a lamp comprising my invention;

Fig. 2 is a fragmentary side view showing the screen and its relationship to the filament; and

Fig. 3 is a somewhat diagrammatic side view of the lamp in operative position in a spotlight unit.

Referring to Fig. 1, the lamp 1 illustrated therein is of the high wattage bipost type disclosed generally in Patents 2,069,638 and 1,967,852 and comprises a bulb

or envelope 2, preferably of a hard borosilicate glass of relatively high softening point, and having a neck portion 3 to which is sealed a pressed glass cup-shaped base portion 4 having a pair of depending tubular bosses 5 to which are fused the edges of hollow copper terminal posts 6. The bulb 2 is filled with an inert gas, for example nitrogen at a pressure of about 350 mm.

The bulb 2 contains a tungsten filament 7 of the planar type comprising a plurality of coiled segments arranged in parallel side-by-side relation in or adjacent to a single plane. The filament is located between a pair of parallel lead-in conductors 8 having lower portions 9 of channel-shaped cross section which are secured at their lower ends to the interior of respective terminal posts 6 and which may be provided with transverse braces 9' welded thereto and extending across the inner surface of the bottom of base member 4. The ends of the filament 7 are connected to respective conductors 8.

The segments of filament 7 are serially connected at their upper and lower ends by bight or loop portions 10. The upper bight portions are supported by loops at the lower ends of support wires 11 having their upper ends anchored in an upper bridge member 12 of ceramic material and which extends between, and is suitably fixed to the upper ends of, lead-in conductors 8. The bight portions 10 at the lower ends of the filament segments are connected to loops in the upper ends of rigid support wires 13 which are held against lateral movement but are permitted to slide rectilinearly in loops at the upper and lower ends of guide wires 14 which are anchored at their lower ends in a ceramic lower bridge 15 which extends between the conductors 8 and is suitably anchored thereto. The sliding engagement of supports 13 with guides 14 permits expansion of the filament coils when heated.

As thus far described, the construction of the lamp is conventional, and in normal use it is mounted in a spotlight represented somewhat diagrammatically in Fig. 3 by a housing 16 which also contains a rear mirror or reflector 17 of spherical contour and a Fresnel lens 18 at the front thereof through which the beam is projected. As indicated in Fig. 3, the spotlight is usually aimed with its longitudinal axis 19 at an angle of about 45° whereby the lamp is also tilted at a 45° angle. During operation, the hot gas stream rising from the filament 7 carries particles of vaporized tungsten upward to be deposited on the wall of the bulb. Also, the localized heating of the bulb wall above the filament softens it sufficiently to cause the bulb wall to bulge out under the influence of the internal gas pressure; the degree of such deformation is frequently sufficient so that it actually contacts internal portions of the spotlight structure such as the reflector 17. The blackening and blistering of the bulb render it useless at a period substantially in advance of normal burn-out of the filament 7.

In accordance with the present invention, excessive blackening and blistering of the bulb is prevented by the provision of a collector screen 20 which may be woven of fine wire, for example 6 mil tungsten wire at a mesh of approximately 20 per inch. The screen 20 is of flat angular form with its apex 21 (Fig. 2) adjacent to and preferably slightly above the upper margin of the filament 7. The upper leg portion 22 of the screen extends upwardly beyond the filament 7 in a plane adjacent to and parallel to the plane including the lead-in conductors 8 and filament 7. The lower leg portion 23 extends downwardly away from the filament 7 at an acute angle, preferably about 45°, to the said plane through conductors 8 and filament 7. The screen portion 23 extends downwardly at least sufficiently far enough that its lower edge is at, but preferably only slightly beyond, a plane (indicated at 24 in Fig. 2) passing through the lower margin of the filament 7 at an angle of about 45° to the plane

through the conductors 8 and filament 7. Thus, the screen fully covers the vertical projection of the filament when the lamp is tilted to 45° as in Fig. 3, without unduly absorbing light directed from the filament to the reflector 17.

The screen 20 is preferably supported by a pair of wires 25 which are suitably anchored at their upper ends in the bridge 12 and which extend downwardly to points adjacent the upper margin of the filament 7 and then outwardly to support the screen 20 as aforesaid. The screen 20 may be secured to the support wires 25 in any suitable manner, for example by staples or tie wires. The screen 20 has a width approximating, and preferably somewhat greater than, that of the filament 7.

The configuration and position of the screen 20 places it close to and above the filament 7 in the normal operating positions of the lamp as illustrated in Fig. 3, and as is necessary for successful operation. Thus, for example, a flat screen mounted to extend at a 45° angle directly from the bridge 12 is ineffective because it is too far away from the filament. With a screen as disclosed herein, the hot gas stream arising from the filament during operation diffuses through the screen to prevent excessive blackening and blistering of the bulb. As will be seen in Fig. 3, the angular portion 23 of the screen is directly above the filament 7 when the lamp is tilted at a 45° angle so as to be fully effective, and the parallel portion 22 of the screen is effective at smaller angles of the lamp from the vertical. At the same time, the screen intercepts a minimum of useful illumination. For example, tests have indicated an over-all improvement in useful illumination from the combination of lamp and projector unit, of about 10–15% and a marked decrease in the degree of bulb distortion, with consequent substantial improvement in useful life of the lamp.

While the screen 20, as herein illustrated, is electrically isolated, it may be connected internally to one of the lead-in conductors 8 or it may be connected through an independent lead-in conductor to a positive high voltage, for example some 300 to 1000 volts, to assist in even more completely collecting the vaporized tungsten particles.

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

1. An incandescent lamp comprising a sealed glass envelope, a pair of lead-in conductors extending into said envelope in generally parallel relationship, a planar type filament located between said conductors substantially in the plane passing through said conductors, and a foraminous blackening collector screen of flat angular form supported in said envelope with its apex adjacent to the upper margin of the filament, one leg portion of the screen extending upwardly beyond the filament in a plane parallel to and adjacent the plane of the lead-in conductors and the other leg portion of the screen extending downwardly away from the filament at an acute angle to the said plane through said conductors, said screen having a width at least approximating that of the filament.

2. An incandescent lamp comprising a sealed glass envelope, a pair of lead-in conductors extending into said envelope in generally parallel relationship, an insulating bridge member extending between the upper ends of said conductors, a planar type filament located between said conductors substantially in the plane passing through said conductors, and a foraminous blackening collector screen of flat angular form supported in said envelope with its apex adjacent to the upper margin of the filament, one leg portion of the screen extending upwardly beyond the filament in a plane parallel to and adjacent the plane of the lead-in conductors and the other leg portion of the screen extending downwardly away from the filament at an acute angle of approximately 45 degrees to the said plane through said conductors and with its lower edge terminating a short distance beyond a plane passing through the lower margin of the filament at an angle of approximately 45 degrees to the said plane through said conductors, said screen having a width at least approximating that of the filament, and means supporting said screen from said bridge member.

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