

July 8, 1958

S. C. PEEK, JR

2,842,698

INDUCTION LAMP

Filed March 30, 1956

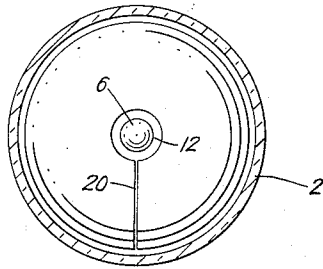


FIG. 1

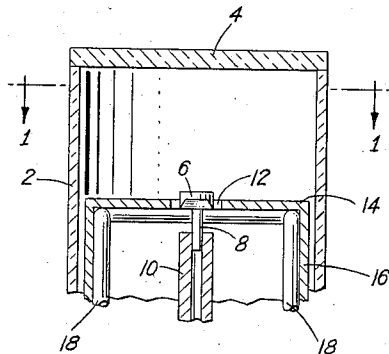


FIG. 2

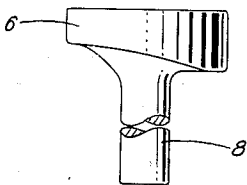


FIG. 3

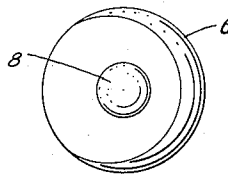


FIG. 4

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2,842,698

INDUCTION LAMP

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Application March 30, 1956, Serial No. 575,112

1 Claim. (Cl. 313—161)

This invention relates to induction lamps, i. e., to lamps in which a refractory body, called a target, is inductively heated to incandescence.

Inductive heating is usually effected by placing a coil around the refractory body and passing a high frequency current through the coil. A field concentrator is disposed between the target and the coil, the concentrator usually including an annular disc around the target but spaced from it. The disc has a radial slot to prevent circulation of currents in a complete ring around the target. The target is usually a circular cylinder centrally located inside the central circular opening of the concentrator disc.

Although such an arrangement gives a far more uniform light distribution than can be obtained from a coiled incandescent filament, the light output will nonetheless be smaller from the target area in the vicinity of the slot than it will be in other regions of the target. The brightness is about 20% less near the slot than it is on the diametrically opposite portion of the target. Such a variation is permissible for many purposes, but it is undesirable in the printing of motion picture film, for example.

This non-uniformity of brightness is of two general types. One is symmetrical non-uniformity due to the fact that most of the heating originates near the outer edge; this tends to make the center of the disc cooler than the outer edge. The second is asymmetrical non-uniformity which is caused by the presence of the slot in the concentrator. The portion of the disc next to the slot tends to be cooler than the portion remote from the slot. This latter kind of non-uniformity is undesirable for some applications such as some motion picture printers. For some applications the symmetrical non-uniformity is actually desirable since it tends to compensate the tendency of normal optical systems to produce a hot spot in the middle of the image of a uniform light source.

Diminution of asymmetrical non-uniformity may be obtained by narrowing the slot in the concentrator. The narrower the slot the better, for as it is narrowed the current distribution in the concentrator tends to be more symmetrical. However, the slot cannot be made so narrow that the radio frequency voltage causes an arc across the slot. Even though the narrow slot helps, still further improvement is desirable.

In accordance with the principles of this invention, further diminution of asymmetrical non-uniformity may be obtained by grinding the target so that it is thinner on the side nearest the slot. This causes the side nearest the slot to become hotter for two reasons; the thinner cross-section produces a higher resistance to the induced currents which in turn increases the heating, and the thinner

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cross-section conducts away less heat thus retaining more heat on the side cut away.

An induction lamp made in accordance with the principles of this invention is characterized by a symmetrical non-uniformity of less than 10% and an asymmetrical non-uniformity of less than 5%, thus providing a lamp very satisfactory for even the most critical applications.

In the accompanying drawings—

Figure 1 is a transverse sectional view of an induction lamp taken along the line 1—1 of Figure 2.

Figure 2 is a fragmentary sectional, elevational view on an enlarged scale of an induction lamp.

Figure 3 is a side elevational view on an enlarged scale of an induction lamp target made in accordance with the principles of this invention.

Figure 4 is a bottom view of the induction lamp target of Figure 3.

An induction lamp of the type with which the target of this invention may be employed is shown and described in detail in the co-pending application of S. C. Peek, Jr., Serial Number 520,718, filed July 8, 1955. The lamp comprises a glass envelope 2 having a flat glass disc 4 on an end thereof, through which light from a refractory target 6 may emerge when the target is heated inductively, such as by the passage of a high frequency current through a coil disposed about the envelope 2, for example. The target 6 is provided with a depending shank 8 which fits into a support tube 10 of refractory material, such as zirconia for example. The target 6 is disposed in a central aperture 12 formed in an annular metal disc 14 which constitutes the closed end of a cylindrical metal shell 16 mounted in the envelope 2 on supports 18. The annular metal disc 14 is provided with a narrow radial slot 20 to prevent the formation of a complete conductive turn in which current can flow by induction.

In the specific embodiment of the invention illustrated in the accompanying drawing, the annular metal disc 14 is about 2 inches in diameter and about 1/16 inch thick. The slot 20 is about 1/32 inch wide. The top surface of the target 6 is about 5/16 inch in diameter. The side nearest the slot 20 is ground down to about 1/16 inch thickness whereas the far side is about 1/8 inch thick. The shank 8 tapers down to about 3/32 inch in diameter. Tantalum carbide, zirconium carbide, niobium carbide and hafnium carbide are examples of target materials which may be employed satisfactorily.

Although specific dimensions of the specific embodiment of the target have been given in the description of the specific embodiment of the invention, it should be appreciated that variations may be made within the scope of the principles of the invention stated above.

What I claim is:

An induction lamp comprising a magnetic field concentrator having a narrow radial slot and a central opening formed therein, the radial slot extending from the outer edge of said concentrator to said opening; and a refractory target of non-uniform thickness disposed within said opening and spaced from the wall of said concentrator defining said opening, the said target being thinner in cross section at the side thereof adjacent to said slot.

References Cited in the file of this patent

UNITED STATES PATENTS

2,774,905 Hanson ----- Dec. 18, 1956