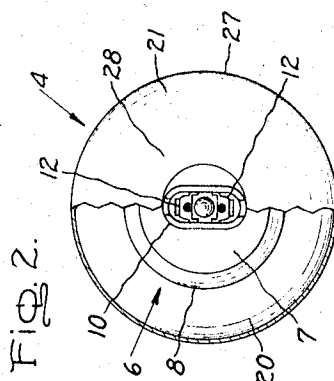
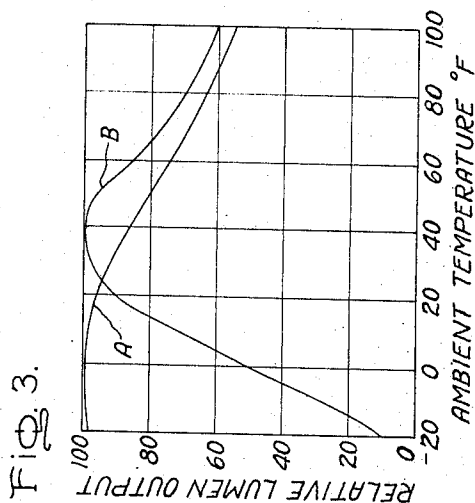
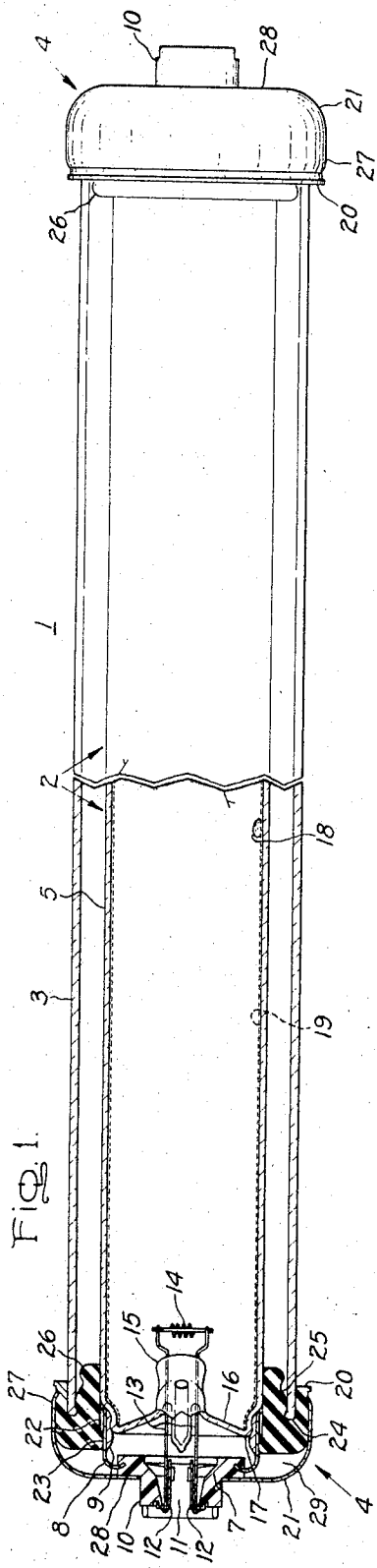


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JACKETED FLUORESCENT LAMP UTILIZING STANDARD
BASE PLUS SPACER AND WIND CAP
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JACKETED FLUORESCENT LAMP UTILIZING STANDARD BASE PLUS SPACER AND WIND CAP

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6 Claims

ABSTRACT OF THE DISCLOSURE

A jacketed fluorescent lamp assembly for operation at sub-zero temperatures in windy locations. A conventionally based fluorescent lamp is provided with a vitreous sleeve supported by an insulating spacer having a central bore through which the based end of the lamp projects. The spacer is covered by a thin metal end cap which has an apertured face portion engaging only the insulating plastic portion of the lamp base, and an annular skirted portion rolled down peripherally on the spacer. An air space between the end cap and the metal shell of the base assures good thermal insulation of the lamp end.

This invention relates to a jacketed elongated low pressure discharge lamp, typically a fluorescent envelope surrounded by a glass sleeve.

The common fluorescent lamp is designed to operate most efficiently in an ambient temperature of about 25° C. (77° F.). Its light output drops radically under low temperature conditions, particularly when subject to wind or drafts. The phosphor in a fluorescent lamp is energized by the 2537 Å. radiation produced by the discharge through mercury vapor, and such radiation is a maximum at a mercury vapor pressure of about 6 microns corresponding to an envelope temperature of about 40° C. By placing a light-transmitting jacket such as a glass sleeve around the lamp, the heat loss from the lamp is reduced and the light output is maintained at temperatures down to freezing. Such jacketed fluorescent lamps are commercially available and are widely used in exposed outdoor locations during the winter months and in freezer installations.

Commercially available jacketed fluorescent lamps often become hard to start and have a reduced light output when operated in sub-zero temperatures for extended periods of time. In such lamps the bases are partially exposed to the ambient temperature and mercury migrates to the ends of the lamp where it condenses due to the lower temperature where the glass envelope is cemented to the conventional metal base. The middle portion of the lamp experiences mercury starvation which causes the lumen output to fall, and the lamp becomes hard to start. While special fixtures provided with boots to surround and insulate the end of the jacketed lamp and prevent this effect are available, they have not found much favor.

An object of this invention is to provide an improved jacketed fluorescent lamp which will fit in conventional fixtures, thereby eliminating the need for special fixtures and allowing jacketed lamps to be used interchangeably with conventional lamps.

Another object of this invention is to provide an improved end cap for a jacketed lamp assembly which will maintain the ends of the lamp at a higher temperature than the mid-portion during the cooling of the lamp after a period of operation. This will cause the mercury to condense at the center of the lamp and make starting easier the next time.

In application Ser. No. 497,405, filed Oct. 18, 1965, now patent 3,358,167, by Bruce E. Shanks, entitled

"Jacketed Discharge Lamp" and assigned to the same assignee as the present invention, a solution proposed is to place an unbased discharge envelope within a glass sleeve with resilient spacers at each end interengaging the parts. The inleads from the envelope extend through the spacers and bases are attached to the ends of the sleeve surrounding and engaging the spacers. While technically a very good solution, this construction has proven difficult to manufacture and expensive in practice.

A further object of this invention is to provide an improved jacketed fluorescent lamp which can readily be manufactured using conventional lamp parts and following conventional lamp making techniques.

In accordance with the invention, a jacketed lamp assembly comprising a conventionally based double-ended discharge lamp is provided with a vitreous sleeve and a supporting end cap assembly at each end comprising an insulating spacer and a thin metal end cap which may be referred to as a wind cap. The spacer has a central bore to accommodate the end of the discharge lamp with the base and its electrical contacts extending through, and an annular groove to engage the sleeve spaced around the discharge envelope. The end cap is composed of an annular skirted portion which surrounds the spacer and an apertured face portion through which the insulating portion of the base carrying the electrical contacts protrude. The metal end cap engages only the insulating portion of the lamp base and the spacer; thus, heat is not conducted away from the end of the lamp by it. The end cap is preferably shaped to form a space between itself and the end of the lamp which may be left empty, or alternatively, filled with insulating material to improve the insulation of the end of the lamp.

The invention will be better understood from the following description of a preferred embodiment to be read in conjunction with the accompanying drawing, and the features believed to be novel will be more particularly pointed out in the appended claims.

In the drawing:

FIG. 1 is a foreshortened side view of a jacketed fluorescent lamp assembly embodying my invention with the left end of the lamp sectioned to illustrate the internal construction.

FIG. 2 is an end view of the lamp assembly with part of the end cap cut away.

FIG. 3 is a graphical representation of light output versus ambient temperature in the jacketed lamp of the invention and a prior art commercially available jacketed lamp.

Referring to FIGS. 1 and 2 of the drawing, a jacketed discharge lamp assembly 1 embodying the invention comprises a tubular fluorescent lamp 2, an elongated sleeve 3 and an end cap assembly 4. While the invention will be described with particular reference to a fluorescent discharge lamp, the discharge lamp could be other than fluorescent, for instance a germicidal lamp finding use in cold storage rooms for controlling or reducing mold formation on meat and foodstuffs. In such a case, the sleeve 3 would consist of quartz or an ultraviolet radiation-transmitting glass or other suitable material.

Assuming a fluorescent lamp assembly, sleeve 3 is preferably glass; however, in some applications a jacket is desired to shield against insects and to reduce breakage from flying objects thrown by vandals. In such case, the sleeve is preferably made of a high-impact strength non-yielding transparent plastic material such as acrylic or polycarbonate plastic rather than glass, and provision may also be made to circulate air through the space between the sleeve and the lamp to prevent excessive temperature rise under high ambient temperature conditions.

Fluorescent lamp 2 comprises a tubular sealed glass envelope 5 provided with bases 6 at each end. Base 6 com-

prises an apertured body member 7 of electrically insulating material and a skirt-like metal shell 8, suitably of aluminum, whose inner rim is embedded in the edge of the body member. The shell is secured to the end of the envelope by basing cement 9. Body member 7 may be of a commercial plastic molding compound such as those comprising phenol-furfural or phenolic resins. It has a hollow elongated embossment 10 extending across the center and projecting outwardly from the end of the lamp for engagement in a lamp holder (not shown) and defining a slot 11, as taught in U.S. Patent 2,922,137—Krupp et al. Slot 11 accommodates electrical contacts 12 to which inleads 13 are connected.

An arc discharge within the envelope 5 is sustained by cathode 14 mounted on stem press 15 forming part of flare 16 heat sealed to the end of the glass envelope 5 at a juncture forming a bead 17. Inleads 13 provide electrical connection to the cathode 14. The arc starts in the filling gas and vaporizes part of the mercury 18; changes in the energy levels of excited mercury atoms cause the production of radiation, mainly ultraviolet at 2537 Å. Fluorescent material 19 on the inside of envelope 5, when subjected to such radiation, fluoresces and emits visible light.

When the base of a prior art jacketed lamp is exposed to low temperature ambient conditions and/or winds, mercury condenses in the region of bead 17. Such mercury is effectively removed from the main stream of plasma within the envelope and the lamp experiences mercury starvation at the center. Light output is reduced and the lamp becomes increasingly hard to start.

In accordance with the invention, end cap assembly 4 comprising spacer 20 and end cap 21, resolves the mercury starvation problem. Spacer 20 is composed of a thermally insulating material, preferably rubber or resilient rubber-like material, and has a bore 22 to receive the end of lamp 2. Internal shoulder 23 formed in the outer end of bore 22 presses against the end of the envelope 5 approximately in line with bead 17 to insure a firm frictional engagement. Annular groove 24 in the inner face of the spacer accommodates the end of sleeve 3. One wall of the groove 25 tapers toward bore 22 and terminates in a knob-like portion 26 which facilitates initial positioning of the sleeve on the spacer. When the glass sleeve is pressed home into groove 24, the taper in wall 25 assures good frictional engagement and a secure assembly. Knob-like portion 26 also serves as a thermal reservoir, and its mass may be increased to provide additional insulation of the discharge envelope end. By varying the composition of the spacer, its specific heat and thermal conductivity can be altered to achieve the required insulation for given ambient conditions.

End cap 21 is made of thin sheet metal such as aluminum and comprises an annular skirted portion 27 and an apertured face portion 28. The skirted portion grips the periphery of spacer 20 and puts the spacer, sleeve, and envelope all in compression to assure a rigid assembly. Suitably this may be done by rolling down the edge of skirted portion 27 after assembly. Being made of glass, sleeve 3 is best able to withstand compressive strain as occurs here. The aperture in face portion 28 allows embossment 10 accommodating the base contacts to protrude through. The metal shell does not add materially to the length of the lamp and so does not interfere with the seating of the lamp in the conventional lamp holder. Face portion 28 of the end cap engages the outer face of body member 7 and seals off space 29 which may be left empty as shown or alternatively filled with insulating material. Thus metal shell 8 of the lamp base is completely sealed off from the ambient and there is no contact between it and end cap 21. The result is very effective insulation of the ends of the lamp.

Referring to FIG. 3, the curves illustrate results of tests on jacketed lamps in standard open fixtures with a wind of approximately 15 miles per hour blowing lengthwise of the lamps. Curve A represents the performance of a jacketed lamp assembly embodying the invention, and curve B, that of a prior art commercially available jacketed lamp. It will be observed that the lamp assembly of the invention produces its maximum lumen output at 0° F. and the curve is substantially flat from minus 20 F. to plus 20 F. By contrast, the prior art lamp is down to 10% at -20° F., 50% at 0° F., and does not attain its maximum until 40° F. is reached, the output curve being quite sharply peaked. The lamp of the invention, in addition to its much superior performance at low temperatures under windy conditions has at the same time excellent performance at higher temperatures, as evidenced by the small divergence of the curves above 60° F.

The improved jacketed fluorescent lamp assembly according to the invention is economical to manufacture because it utilizes a conventionally based lamp and adds a few simple parts to it without modifying the lamp or discharge envelope proper.

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

1. A jacketed lamp assembly comprising a double-ended discharge lamp including an elongated vitreous envelope having bases attached to its ends, each base comprising an electrically insulating body member carrying electrical contacts and an annular skirted metal shell joined thereto, said shell being attached to the end of said envelope, an elongated radiation transmitting sleeve surrounding said envelope, a thermally insulating spacer at each end of the lamp shaped as a ring having a central bore through which the based end of the envelope extends, the inner face of said spacer being provided with an annular groove accommodating the end of said sleeve, and a thin metal end cap at each end having a face portion in contact with the body portion of the base with an aperture therethrough giving access to the base contacts and a skirted portion gripping said spacer without contacting the base shell.

2. A jacketed lamp assembly as defined in claim 1 in which an air gap is provided between the inside of the face portion of said end cap and the metal base shell.

3. A jacketed lamp assembly as defined in claim 2 in which said spacer is made of resilient material and is compressed under the skirted portion of said end cap.

4. A jacketed lamp assembly as defined in claim 3 in which the peripheral edge of said skirted portion is rolled down on the peripheral edge of said spacer.

5. A jacketed lamp assembly as defined in claim 1 in which the body member of said base is provided with a hollow embossment in which the electrical contacts are accommodated and which projects through the aperture in the face portion of the end cap.

6. A jacketed lamp assembly as defined in claim 4 in which the body member of said base is provided with a hollow embossment in which the electrical contacts are accommodated and which projects through the aperture in the face portion of the end cap.

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