United States Patent [19]

Win

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[54] **GUARD FOR ILLUMINATION TUBES**

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[52] **U.S. Cl.** ..... **313/110,** 240/11.4 R, 240/51.11 R, 240/92, 240/102 A, 313/242, 313/258, 313/356

[51] **Int. Cl.** **F21v 15/04**

[58] **Field of Search** ..... 313/110, 43, 258, 241, 313/242, 356, 352; 240/11.4 R, 92 R, 51.11 R, 102 R, 102 A

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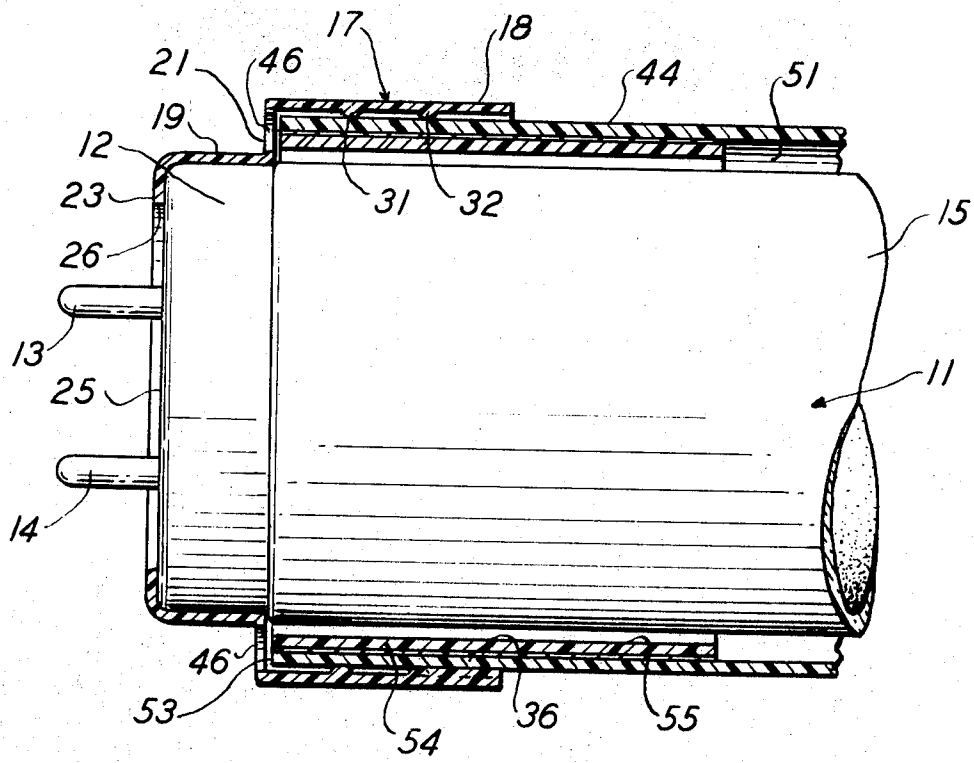
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[57] **ABSTRACT**

A nonfrangible elongate tube or guard of light-transmitting qualities surrounds a conventional fluorescent lamp. At either end of the fluorescent lamp tight-fitting end caps with guard-receiving flanges secure the guard to the fluorescent lamp. Cylindrical heat shields of a transparent material intervene between the high heat output end pieces of the fluorescent lamps and the guard to deter heat deterioration. Gas passages in end cap and between lamp and shield are such that gas escaping from a fractured fluorescent lamp exhausts without fracturing and guard which thus retains glass particles from the broken fluorescent lamp.

5 Claims, 5 Drawing Figures



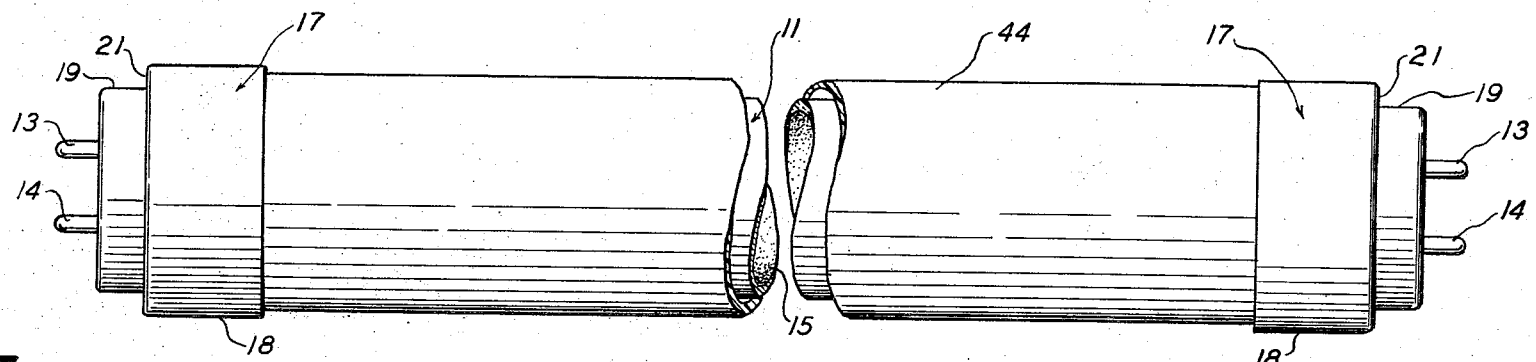


FIG. 1

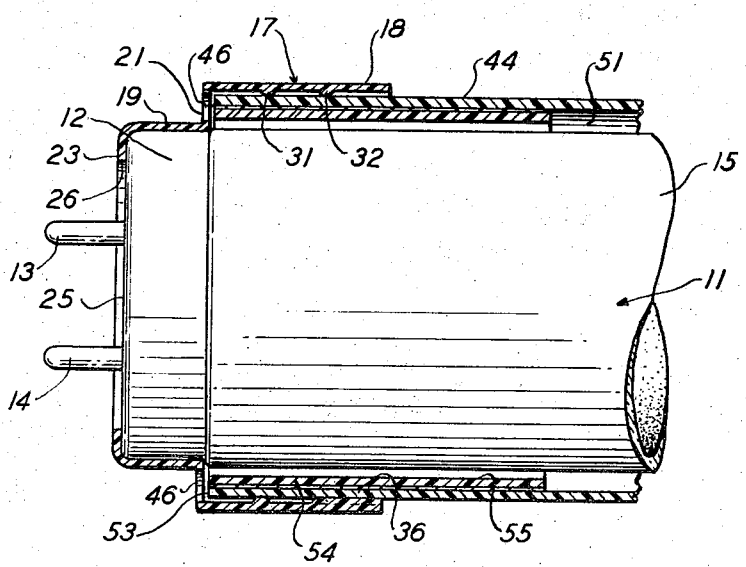


FIG. 2

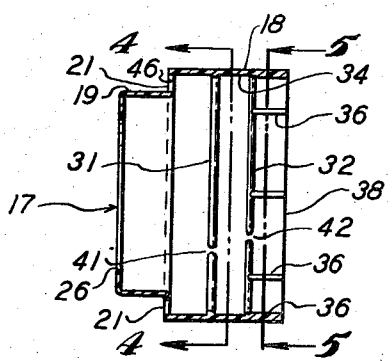


FIG. 3

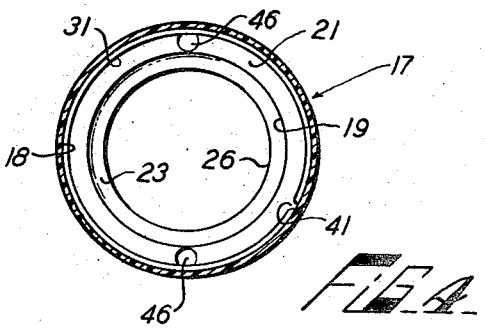


FIG. 4

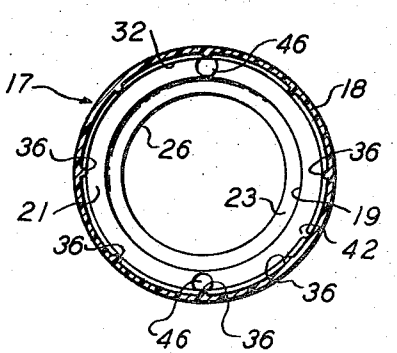


FIG. 5

GUARD FOR ILLUMINATION TUBES

BACKGROUND OF THE INVENTION

The invention relates to apparatus for protecting elongate tubular lamps such as incandescent and fluorescent lamps from casual impact and for retaining the lamp fragments should the fluorescent or incandescent elongate lamp be broken.

An effective tube guard must overcome several problems. The first is to afford a surrounding guard about the elongate lamp which prevents the spread of fragments from a broken lamp. Another problem is caused by the pressure differential between the lamp interior and ambient atmosphere. In previous apparatus for this purpose, pressure differential when a lamp breaks has been sufficient to fracture the surrounding tube guard and thus fail to localize the resulting fragments. Lamp implosion or explosion requires gas relief means.

The materials from which conventional tube guards are made must meet several requirements. The first is that light transmission be of high quality. Secondly, the tube guard material must resist deterioration due to the heat and ultra-violet transmission from the surrounded lamp. Thirdly, the tube guards should be of a material which affords some impact protection to the elongate lamp.

Polycarbonate materials of the type known commercially as "Lexan" are well suited to guard purposes. These materials are resistant to heat up to 275° F, have excellent light transmission qualities and also are effective against lower range impact loads. However, these materials have two drawbacks when used as lamp surrounds. The first is cost. They are relatively expensive materials. Secondly, because of the ultra-violet emission, Lexan and like materials tend to yellow and thus inhibit the emitted light level and also impart an unpleasant color spectrum to the lamp emission.

Another material adapted to use as a surround or tube guard are the acrylics, like the acrylic producted by Rohm and Haas under the trade designation "DR-61." While the DR-61 acrylic has good impact and color transmission qualities, and does not yellow with age or from ultra-violet, it has a low heat resistance and begins to deteriorate above 175° F. Its cost is relatively low compared to that of polycarbonates of the Lexan type.

By utilizing a unique end cap and heat shield arrangement the instant invention uses the inherent characteristics of the named materials in an apparatus which affords a tube guard assembly which is relatively inexpensive and resists heat deterioration, affords harmless gas escape and transmits substantially all the light emitted by the elongate lamp.

SUMMARY OF THE INVENTION

The invention contemplates a guard for an elongate frangible gas-filled lamp which comprises an elongate gastight outer tube adapted to surround the lamp envelope and is held in place by an end cap having means for supporting the tube spaced from the lamp envelope such that the envelope and tube define a void therebetween. Gas ports communicate between the void and the ambient atmosphere. A heat barrier intervenes in the void between the envelope and the tube at the points of highest heat emission from the lamp. Preferably the tube guard assembly comprises a nonyellowing gastight tube and heat resistant barriers between the tube and the lamp which have a higher heat resistance than the tube and do not interfere with gas passage from the void through the end cap. The end cap preferably makes a gas-tight fit with the end pieces of the elongate lamp and has means gripping the guard tube to hold it in place in spaced relationship to the elongate lamp.

These and other advantages of the invention are apparent from the following detailed description and drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a fragmentary view of a tube guard apparatus in accordance with the invention and showing the protected elongate lamp fragmentarily;

FIG. 2 is a fragmentary sectional elevation taken at an end of the assembly;

FIG. 3 is a sectional elevation of an end cap in accordance with the invention;

FIG. 4 is a transverse sectional elevation taken along line 4—4 of FIG. 3; and

FIG. 5 is a transverse sectional elevation taken along line 5—5 of FIG. 3.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The Figures show an elongate lamp, such as a gas-filled fluorescent lamp **11**, with lamp end pieces **12** having electrical connectors **13, 14** extending therefrom. The lamp comprises the end pieces and a cylindrical, or substantially cylindrical, glass envelope **15** which is fluorescent coated on the inside and contains a gas under pressure. To each end of the fluorescent lamp an end cap **17**, which may be an integral molded piece, is secured. The end cap comprises a tube cylinder **18** and a lesser lamp cylinder **19.** Each cylinder is hollow. A transverse annular wall **21** connects the two cylinders. A second wall **23** remote from the tube cylinder **18** is an end stop that impinges upon circular face **25** of the lamp end piece. An opening defined by a circular wall **26** in the lesser web of each end cap affords passage to the electrical connectors **13** and **14** of the lamp end pieces.

As can be seen from FIG. **3,** each end cap has a pair of spaced annular beads **31, 32** of which bead **31** is closer to the lamp cylinder **19.** The beads protrude from an inner surface **34** of the tube cylinder **18.** The beads are spaced axially of the end cap, like the tube and lamp cylinders. A plurality of axial beads **36** protrude inwardly from the inner periphery of the tube cylinder. Beads **36** extend from the inboard face **38** of the end cap to the annular bead **32** cap tube cylinder. Each of the annular beads **31, 32** is discontinuous, being interrupted by notches **41, 42** respectively, to afford pressure relief channel at the exterior of a guard tube **44,** held in the end cap tube cylinders at each end of the lamp.

FIGS. **3–5** show the annular wall **21** of the end cap to have circular gas ports **46.** While the gas ports are shown as circular, their configuration depends upon manufacturing practices, since it is desirable to mold the end cap as an integral piece from a strong plastic material such as polypropylene.

Turning now to FIG. **2,** the end cap **17,** which is duplicated at each end of the fluorescent lamp, is engaged in gastight fashion about the end piece **12** of the lamp **11** such that second annular wall **23** and lamp cylinder

19 grip the end piece. Annular wall 21 extends outwardly from the lamp cylinder and supports tube cylinder 18 at a spaced interval from the envelope 15 of the fluorescent lamp. The guard tube 44, which is preferably a cylindrical hollow tube of an acrylic such as Rohm and Haas' DR-61, extends substantially the length of the glas envelope 15 of the fluorescent tube, being held by annular beads 31, 32 and axial beads 36 adjacent annular wall 21 of the end cap. The guard tube is also initially gripped by the axial beads 36 at spaced intervals about its periphery. The tube thus supported at an interval from envelope 15 defines with the envelope a void 51 which is in communication with the gas ports 46 of the end cap, through notches 41, 42 and across end 53 of guard 44.

The acrylic DR-61 does not yellow with age or from ultraviolet and it resists low range impacts. However, its heat resistance, as previously stated, is low and therefore polycarbonate heat barriers of a higher heat-resistant quality are provided between the fluorescent lamp and the light-transmitting tube at the points of highest heat output of the lamp. In the case of fluorescent lamps, the highest heat is in the area of the lamp end pieces. Therefore, short cylindrical shields or barriers 54 are fixed to the inner periphery of the guard tube at its extremities. The plastics of the heat barriers and the guard tube are chemically compatible such that an adhesive like ethylene dichloride may be used in a thin layer 55 to bond the heat barriers to each end of the tube. The combined thickness of a barrier and the tube is less than the difference between inner diameter of the tube cylinder of the end cap and the outer diameter of the envelope such that a gas passage is afforded between the interior of the heat barriers and the envelope of the lamp.

The guard tube apparatus of the invention is assembled on the fluorescent lamp before the lamp is placed in the light fixture. One end cap is placed securely on one end piece of the lamp and the guard tube with its heat barriers in place is then passed over the fluorescent lamp envelope and engaged with the attached end cap. The second end cap is then placed over the second end piece of the fluorescent lamp to engage the other end of the guard tube. The lamp is then ready to install in the light fixture, since the electrical prongs 13, 14 extend beyond the end caps.

By combining a guard tube and heat barriers of differing characteristics with a uniquely designed end piece, the invention affords a guard for elongate lamps that contains particles and controls gas emission in the case of lamp breakage, that continuously transmits light from the lamp efficiently and guards against casual breakage of the lamp. The embodiment shown is exemplary only and materials specified are intended only to illustrate the characteristics of the desired materials.

Other variations within the scope of the invention will occur to those skilled in this particular art. It is therefore desired that the invention be measured by the appended claims rather than by the illustrative embodiment and description disclosed herein.

I claim:

1. A guard for an elongate frangible gas-filled light envelope and comprising an elongate gas-impermeable tube adapted to surround the light envelope, an end cap at each extreme of the tube for supporting the envelope spaced from the tube to define a void therebetween: each end cap having a hollow tube cylinder, a lesser hollow envelope cylinder, a first transverse wall joining the two cylinders coaxially, a second transverse wall on the envelope cylinder having an annular edge defining an orifice, a first discontinuous circumferential bead extending inwardly from the wall of the tube cylinder and adapted to engage the tube, and a gas port in the first transverse wall opening to atmosphere; and a heat barrier intervening in the void between the envelope and the tube at the extremes of the envelope.

2. An end cap for supporting an elongate guard tube about a frangible gas-filled lamp envelope and comprising a first cylindrical portion adapted to grip the tube, a second cylindrical portion of lesser diameter adapted to grip the envelope at its extreme end in sealing relationship, a transverse annular wall joining the two portions, a second transverse annular wall on the second portion remote from the first, a circumferential discontinuous bead extending inwardly from the wall of the first cylindrical portion establishing gas flow from the first portion to atmosphere, and means for securing the end cap to the envelope and to the tube.

3. A guard in accordance with claim 1 further comprising a second circumferential bead between the first bead and the first transverse wall engaging the elongate tube at its end.

4. A guard in accordance with claim 1 further comprising a plurality of axially extending beads on the inner wall of the tube cylinder each adapted to engage the tube.

5. A guard in accordance with claim 3 further comprising a notch in each circumferential bead, said notches defining a gas port communicating between the void and ambient atmosphere.

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