July 30, 1968 S. IANNELLI 3,395,301

TUBULAR GAS LAMP MOUNTED IN HOUSING BY ENCAPSULATION

Filed May 9, 1966

Fig. 1.

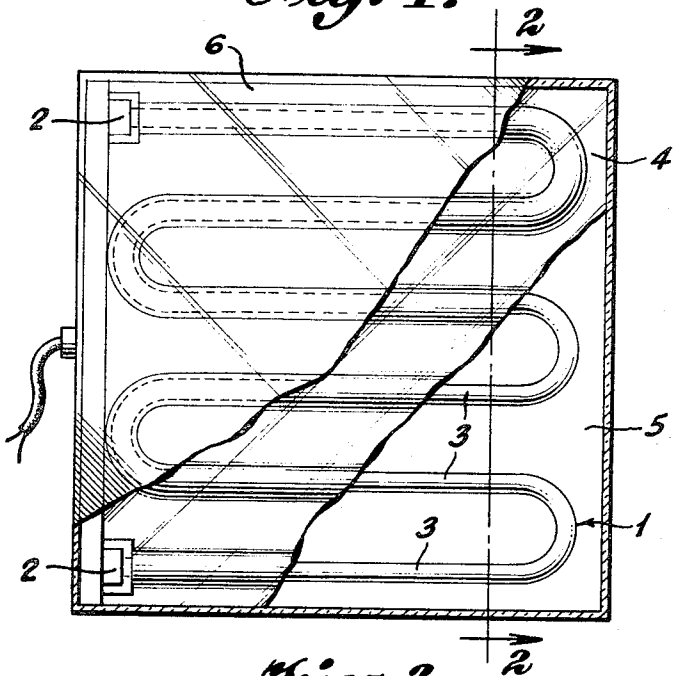


Fig. 2.

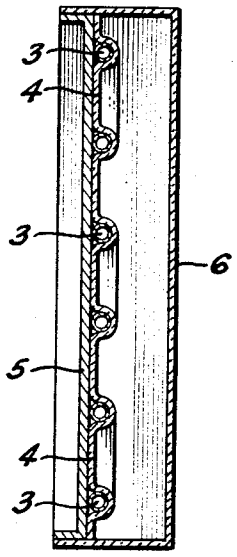


Fig. 3.

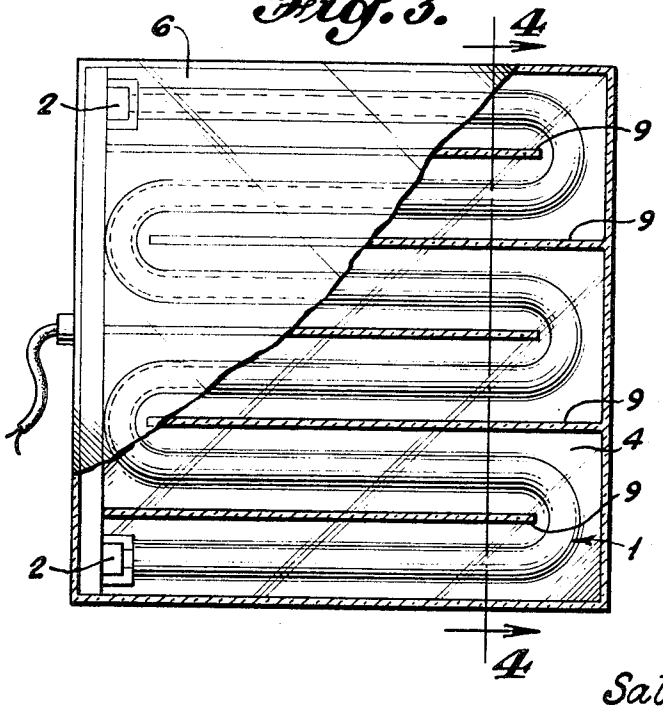
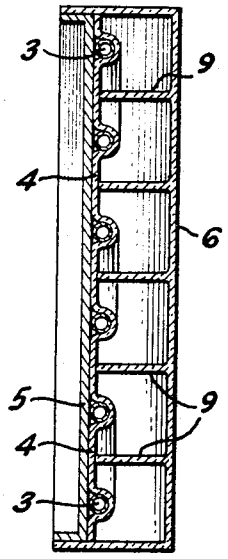


Fig. 4.



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TUBULAR GAS LAMP MOUNTED IN HOUSING BY ENCAPSULATION

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ABSTRACT OF THE DISCLOSURE

A fixture for a gas-filled tubular light element comprising a backing with a serpentine tubular light element held on said backing by a sheet of thermal plastic material vacuum formed on the tubular light element and having parts secured to one face of the backing so that each section of the light element is enclosed within a space formed by parts of the plastic material and the backing. An enclosure having an airtight space is provided so as to provide thermal insulation between the light element and the ambient.

This invention relates to fixtures for gas filled tubular lights and more specifically to fixtures for use primarily with the serpentine shaped light tubes referred to as light grids to provide rigid backing and thermal insulation to the tubular light when mounted within the fixture.

Fixtures for enclosing fluorescent tubes are well known in the art. These fixtures have served in the past merely as a receptacle and container for fluorescent light tubes. The prior art has disclosed no fixtures for encasing fluorescent grids or other shaped tubular lights or neon sign type tubing.

The fixtures that have been known to the prior art for receiving gas filled tubular light elements, such as fluorescent lights and the like have performed adequately under strictly regulated conditions, as, for example, at normal room temperatures. However, fixtures of this type provide no protection against the breakage to which serpentine tubular light elements are prone, due to the fragile nature of the strands of tubing thereof.

Shaped tubular light elements are more prone to breakage than normal tubular elements because a force applied thereto causes the shaped element to accordion and thereby causes breakage. This problem does not arise with standard straight tubular light elements.

In addition, the prior art light fixture has not recognized the problem encountered under low temperature conditions, namely, the problem that the gas in the tubes is reduced in volume, thereby lowering the gas pressure within the tubes. Accordingly, at such low temperatures, gas filled tubes display a drop in light output, are slow starting and short lived.

In accordance with the present invention, the problems of the prior art enumerated above have been overcome. Briefly, in this invention, a tubular gas filled light element, which may be of any shape, is placed on a rigid backing material covered with a shrinkable plastic. The plastic is then shrunk to encase the tube and secure it to the rigid backing material. The backing material with the plastic provide a rigidity to the tubular element which prevents same from breaking due to pressure applied which may cause the element to accordion. The tubular element and at least a portion of the backing are then enclosed in a thermal insulator which is light permeable. This thermal insulating device may take the form of a light permeable enclosure having from a partial to a total vacuum therein to insulate the tubular element from the external atmosphere. Materials such as glass and plastics may be used as the light permeable member.

Instead of a heat shrinkable material, the tube may be encased by a heat flowable material while in a mold, the heat flowable material hardening upon cooling. Such materials could be glass or many well-known plastics.

It is therefore an object of this invention to provide a fixture for minimizing the breakage of gas filled tubular light elements, especially shaped tubular light elements.

It is a further object of this invention to provide a fixture for a gas filled tubular light element which will provide high light output and long life under reduced temperature conditions.

It is a still further object of this invention to provide a fixture for decreasing the start up time of a gas filled tubular light element under low temperature conditions.

The above objects and still further objects of this invention will become apparent to those skilled in the art in view of the following disclosure of preferred embodiment thereof, which is provided by way of example and not by way of limitation, wherein:

FIG. 1 is an elevational partially cut away view of a serpentine gas filled tubular light element in the fixture of the present invention;

FIG. 2 is a view taken along the line 2—2 of FIG. 1;

FIG. 3 is an elevational partially cut away view of a second embodiment of the invention;

FIG. 4 is a view taken along the line 4—4 of FIG. 3.

Referring now to FIGS. 1 and 2, there is shown a typical light grid comprised of a serpentine shaped gas filled tubular light element **1** having contact elements **2** for insertion into the required receptacle (not shown). The light element **1** is composed of a plurality of strands of tubing **3**. The tube is gas filled, the gas being any one of the well known gases such as neon or any of the well known mixtures such as argon and mercury, neon and mercury, or any light or ray producing gas or combinations of gas and earth or metallic substances such as mercury, sodium, etc.

The tubular light element is then encased in a plastic material **4**. This encapsulation can be provided by vacuum forming, dipping or spraying or molding. In the preferred embodiment of FIGS. 1 and 2, vacuum forming is set forth. Here, the tubular element **1** is encased in a shrinkable plastic element.

The shrinkable plastic element is then shrunk over the tubular light element **1** in a well known manner such as heating or the like and the plastic encapsulated tubular light element is then secured to a rigid backing or base member **5**. The securing of the plastic encapsulated tubular light element to the backing **5** is provided by heating and bonding the plastic pieces together or by cementing or any other such technique which is well known in the art.

The above described structure so secures the tubular light element that it resists any pressure tending to twist or accordion the strands **3** of the element **1**.

The plastic encased tubular light structure and at least a portion of the backing **5** are then enclosed in a thermal insulation chamber. This chamber is comprised of an enclosure **6** which is secured to the backing **5** in substantially air tight relationship in any well known manner to provide a substantially air tight area within the enclosure **6**. A further enclosure may be optionally provided at the rear of the backing **5** to provide additional thermal insulation. The enclosures are sufficiently strengthened to prevent collapsing thereof due to the total or partial vacuum existing within these enclosures. The strengthening of the enclosure **6** may be by proper shaping and thickness thereof or by the addition of supports (not shown). The thermal insulator positioned about the tubular element **1** retains a large portion of the heat supplied by the tubular element while in operation and thereby provides a higher temperature atmosphere to the tubular element

than is provided by the external atmosphere. This higher temperature provides higher gas pressure within the tubular element and results in a light element having higher light output and longer life than provided under cold external conditions by prior art devices. Also, since the thermal insulation about the tubular element retains the heat provided by the element, a subsequent starting up of the tubular element will normally be under higher temperature conditions than are provided in the external atmosphere and thereby allow a quicker start up.

The serpentine tubular light element as shown in FIGS. 1 and 2 is sufficiently secure that it can be handled quite roughly without breakage. The secured element is therefore much more easily adapted to mass production techniques, thereby reducing costs.

Elements of the type described hereinabove may be used in signs, lighting and photographic equipment and other equipment using area types of lighting, as well as X-ray viewing screens, silk screen photography and the like.

Referring now to FIGS. 3 and 4, there is shown a second embodiment of the invention which is identical to the embodiment of FIGS. 1 and 2, but, in addition, includes wall members **9** which form a labyrinth through which the element **1** passes. The wall members **9** provide additional insulation and reduce heat movement within the fixture and may be formed as an integral part of the enclosure **6**.

A further method of providing an encapsulated tubular light element in accordance with the present invention relates to a molding or casting process wherein a mold is provided with recessed portions in the configuration of and larger than the tubular element **1**. The tubular element is placed in the recessed portion of the mold, which is heated, and a liquid thermo plastic material is then poured or injected into the mold around the tubular element. After the mold is filled with the plastic and cooled, the plastic will set and provide a plastic casing **4** as set forth in the embodiments hereinabove. An enclosure **6** is then provided as discussed supra.

It is possible to make a sandwich type structure by placing several of the above devices one atop the other, the backing being of transparent material in all but the topmost or bottommost member of the sandwich. In this manner, light grids of different colors can be placed in each layer of the sandwich to provide a variety of lighting results.

Though the invention has been described with respect to a specific preferred embodiment thereof, many variations and modifications thereof will immediately become apparent to those skilled in the art. It is, therefore, the intention that the appended claims be interpreted as broadly as possible in view of the prior art to encompass all such variations and modifications.

What is claimed is:

1. A fixture for a gas-filled tubular light element comprising a backing, a tubular light element disposed on said backing, a sheet of plastic material contacting the light element and partially encapsulating the same and having parts secured to the backing on opposite sides of the light element so that the light element is enclosed within the space formed between the plastic material and backing, said plastic material being spaced from the light element and backing on both sides of the part of the light element that is nearest to the backing.

2. The fixture of claim **1** wherein the backing is plastic and the light element contacts the backing.

3. The fixture of claim **1** wherein the tubular light element is serpentine and has a number of sections and the plastic material covers all light element sections, and said parts of plastic material being secured to the backing at locations between the light element sections.

4. The fixture of claim **1** including enclosure means forming with the backing a thermal insulator that houses the light element sections.

5. The fixture of claim **4** wherein said enclosure means defines an air-tight space in communication with the forward side of the plastic material.

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