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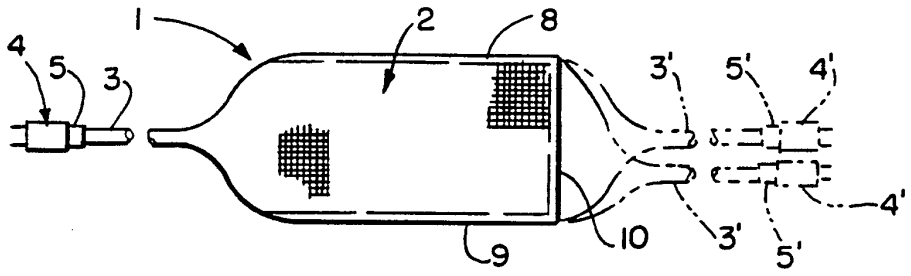

(57) Abstract

Fiber optic light emitting panel assemblies (1) include one or more light emitting layer (1′) which are sealed along the side edges and/or an end edge to hold the fill threads (7) in position and keep the light emitting portions (2) from fraying at the edges. A thin film, sheet or coating (42′, 44′) may be applied to one or both sides of the light emitting portions of the panel assemblies (1). At one or both ends of the light emitting portions (2) is a light cable (3) which may be formed by randomly distributing the optical fibers (6) which comprise the light cable into a plurality of discrete bundles each including fibers extending from different locations across substantially the entire width of the light emitting portions (2) bringing the discrete bundles together to form a single bundle of all of the fibers in each light cable (3), and applying a connector assembly (5, 5′) to the cut ends of all of the fibers in each light cable (3).

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FIBER OPTIC LIGHT EMITTING PANEL ASSEMBLIES AND METHODS OF MAKING SUCH PANEL ASSEMBLIES

FIELD OF THE INVENTION

This invention relates generally to improvements in light emitting panel assemblies made of woven optical fibers and to methods of making such panel assemblies.

BACKGROUND OF THE INVENTION

It is generally known to make light emitting panel assemblies from one or more layers of woven optical fiber strands. Light is caused to be emitted from the light emitting portion of the panel assemblies by disrupting the surface of the optical fibers in the light emitting portion as by scratching or otherwise deforming or bending the optical fibers at a plurality of discrete locations along the length of the fibers such that the angle of bend approximately exceeds the angle of internal reflection. The percentage of light emitted from each bend is proportional to the bend radius and arc length. By controlling the weave spacing and pattern of the woven optical fibers in the light emitting portion, one can control the desired light output pattern therefrom.

Woven fiber optic light emitting panel assemblies generally of this type are disclosed in U.S. Patents 4,885,663; 4,907,132 and 5,042,900, assigned to the same assignee as the present application, which are incorporated herein by reference.

SUMMARY OF THE INVENTION

The present invention relates to certain improvements in such fiber optic light emitting panel assemblies and to the methods of making same.

In accordance with one aspect of the invention, the light emitting portions of the panel assemblies are sealed along one or more edges to hold the fill threads in position and keep the light emitting portions from fraying at the sealed edge or edges. In one form of the invention, the side edges are heat sealed. Alternatively, the side edges may be sealed by applying an adhesive to the side edges or by taping the side edges. In lieu of or in addition to sealing

the side edges, one or both end edges of the light emitting portions may be similarly sealed.

In accordance with another aspect of the invention, a plurality of smaller panel assemblies may be made from a single larger panel assembly by sealing the larger light emitting portion along one or more spaced apart longitudinal areas or strips intermediate the side edges, and then slitting the larger light emitting portion intermediate the width of the intermediate sealed areas to separate the larger light emitting portion and associated light cable fibers into a plurality of individual smaller light emitting panel assemblies.

In accordance with another aspect of the invention, the light emitting portions of the panel assemblies may comprise a plurality of individually formed layers of woven optical fibers joined together along one or more edges to maintain the weave spacing in such layers staggered in relation to each other to provide for more uniform light output from the light emitting portions.

In accordance with another aspect of the invention, one or more light cables may be provided at one or both ends of the light emitting portion of each panel assembly. Preferably the light cables are formed during the continuous manufacture of a plurality of panel assemblies by interrupting the weaving process between light emitting portions while continuing to advance the optical fibers to form non-woven optical fiber lengths which comprise the light cable portions. Predetermined optical fibers within each light cable length may be separated into different groups or layers of fibers and the layers mechanically maintained separated from each other so that when the continuously made panel assemblies are cut apart and the separate layers of fibers which comprise the light cables are bundled together, the optical fibers will be randomly distributed within the bundle. A connector assembly is then attached to a remote end of each bundle of optical fibers which comprise each light cable to maintain the

desired distribution of the optical fibers in each light cable and provide an interface between the light cable and a remote light source.

In accordance with another aspect of the invention, a thin film, sheet or coating may be applied to one or both sides of sealed or non-sealed light emitting portions of the panel assemblies. In one form of the invention, the film or sheet covering comprises a tube or sleeve surrounding the light emitting portion. One or both ends of the tube may be joined to one or both end edges of the light emitting portion as desired. Also, one or more light cables may be connected to one or both ends of the light emitting portion for transmitting light to the light emitting portion from one or more remote light sources. In another form of the invention, the film or sheet covering comprises a pocket having an opening along one side edge only for insertion of the light emitting portion into the pocket. This film or sheet covering or coating over one or both sides of the light emitting portion may comprise a clear or translucent film, a prismatic or polarizer film, or a diffuser for diffusing or directing the light emitted from the light emitting portion. Alternatively, the film or sheet covering or coating over one side of the light emitting portion may comprise a reflector for reflecting light emitted from one side of the light emitting portion back through the light emitting portion such that light is emitted from only one side of the light emitting portion.

These and other objects, advantages, features and aspects of the present invention will become apparent as the following description proceeds.

To the accomplishment of the foregoing and related ends, the invention, then, comprises the features hereinafter fully described and particularly pointed out in the claims, the following description and the annexed drawings setting forth in detail certain illustrative embodiments of the invention, these being indicative, however, of but several of the various ways in which the principles of the invention may be employed.

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