

Description

The present invention relates to an ornamental lighting device for radiating condensed light which propagates through an optical cable. Lighting devices of this type are known.

A lighting device which is usable as a screen for example is disclosed in the US—A—4 141 058 document. In that document, a light diffusing device is disclosed for obtaining a surface uniform in brightness by using a luminous flux, narrow in the radiating angle, comprising a flat, smooth, transparent base plate having a favourable transparency and including a luminous flux incident area defined on one side surface. The luminous flux incident area is used as a connecting part with the end portion of a light guide or a containing section for a light source. The other side surface serves as a displaying surface for such display medium as of words or signs, or as a luminous surface for introducing lights of a uniform brightness into a plurality of light guides.

Also, the applicant of the present invention has proposed in various forms a system in which sunlight or any artificial light is condensed by a lens or the like into an optical cable to propagate therethrough to a desired location. The condensed sunlight or artificial light is desirable in constructing ornamental lighting devices which should preferably be free from generation of heat.

It is the object of the present invention to provide an ornamental lighting device which is capable of illuminating the ambience without generating heat, and which comprises general improvements over prior art ornamental devices.

This object is solved by an ornamental lighting device having the features of claim 1.

Preferred embodiments are disclosed in the depending claims.

The features and advantages of the present invention will also become apparent from the following detailed description taken with the accompanying drawings.

Figure 1 is a perspective view of an ornamental lighting device embodying the present invention;

Figure 2 is a perspective view of a modification to the lighting device shown in Figure 1;

Figure 3A is a front view of a second embodiment of the present invention;

Figure 3B is a section taken along line X—X of Figure 3A; and

Figure 4 is a front view of a third embodiment of the present invention.

While the ornamental lighting device of the present invention is susceptible of numerous physical embodiment, depending upon the environment and requirements of use, substantial numbers of the herein shown and described embodiments have been made, tested and used, and all have performed in an eminently satisfactory manner.

Referring to Figure 1 of the drawing, an ornamental lighting device embodying the present invention is shown and generally designated by the reference numeral 10. The lighting device 10,

in the form of a screen, comprises a pedestal 12 on top of which a pair of parallel light transmitting panels 14 and 16 are securely mounted. A pair of parallel upper retainer members 18 and 20 and a pair of parallel lower retainer members 22 and 24 are rigidly mounted on the facing inner surfaces of the light transmitting panels 14 and 16 in order to retain optical fibers as will be described.

An optical cable, or fiber optic cable, 26 extends from a light source (not shown) into an optical coupling 28 which is rigidly mounted in the pedestal 12. A plurality of optical fibers 30₁, 30₂, ..., 30_n extend out from the other end of the optical coupling 28 to form an array along the length of the pedestal 12. The upper retainers 18 and 20 and the lower retainers 22 and 24 are configured and arranged to support the optical fibers 30₁—30_n at spaced parallel locations along the length of the pedestal 12. The light source may supply either the sunlight or any artificial light insofar as the light is condensed light.

In the construction shown in Figure 1, the light propagating through the fiber optic cable 26 is distributed by the optical coupling 28 into the parallel array of optical fibers 30₁—30_n. While propagating through each of the optical fibers 30₁—30_n, the light is radiated from the peripheral wall of the optical fiber to illuminate the ambience through the light transmitting panels 14 and 16.

Mirrors may be mounted on those ends of the optical fibers 30₁—30_n which are remote from the optical coupling 28, so that the light may be more effectively radiated from the opposite surfaces of the lighting device, or luminous screen, 10. For additionally effective radiation of the light, a light transmitting material whose refractive index is larger than that of the optical fibers may be deposited on the surfaces of the optical fibers or, alternatively, recesses or grooves may be formed in the surfaces of the optical fibers. Such configurations of light conducting elements have been proposed in various forms by the applicant.

In the illustrative embodiment shown in Figure 1, a plurality of luminous screens may be arranged side by side as represented by the screen 10 and a second screen 10'. In this case, the pedestal 12 of the screen 10 is formed with a duct 32 therethroughout in order to allow the condensed light to reach the adjacent screen 10' as well.

While the optical fibers 30₁—30_n in the illustrative embodiment extend substantially vertically in parallel with each other, they may be arranged to extend substantially horizontally in between the light transmitting panel 14 and 16. If desired, each optical fiber may be bent at several points between the panels 14 and 16. It should be noted that passing the fiber optic cable 26 through the pedestal 12 is not essential in accordance with the present invention.

A modification to the lighting device shown in Figure 1 is shown in Figure 2. In Figure 2, structural elements common or similar to those shown in Figure 1 are designated by like reference numerals and details thereof will not be described

for simplicity. As shown, the modified lighting device, or screen, 34 has a generally curved configuration, that is, the light transmitting panels 14 and 16 are curved while sandwiching correspondingly curved optical fibers 30₁—30_n therebetween.

Referring to Figures 3A and 3B, another embodiment of the present invention is shown. The lighting device or screen, generally 40, has a pedestal 42 on which a pair of generally circular panels 44 and 46 made of a light transmitting material are mounted in parallel with each other. A cruciform retainer member 48 is rigidly mounted on the inner surface of the panel 44, and a cruciform retainer member 50 on the inner surface of the panel 46. A plurality of optical fibers 52₁—52_n are so interconnected and configured in between the panels 44 and 46 as to define a generally spiral light conduction path. The spiral optical fiber member is firmly fixed in position by the coactive retainer member 48 and 50.

Still another embodiment of the present invention is shown in Figure 4. The lighting device generally designated by the reference numeral 60 is constructed to emit light from one of opposite surfaces thereof. The screen 60 having such a construction may find application as a halo. A pedestal 62 supports a pair of light transmitting panels 64 and 66 (only 64 is visible). A plurality of optical fibers 68₁—68_n are held between the opposite panels 64 and 66 and retained by retainer members 70a—70g and retainer members 72a—72g (only 70a—70g are shown), which are mounted on the panels 64 and 66 respectively. As shown, the optical fibers 68₁—68_n are shaped in substantially oblong loops each of which is substantially symmetrical with respect to a vertical which passes through the pedestal 62.

In the screen configuration shown in Figure 4, the panel 66 at the back of the screen 60 may be provided with a mirror surface in order to reflect part of the light which issues from the optical fibers toward the back of the screen.

It will be needless to mention that the configurations of the light transmitting panels shown and described are only illustrative and may be replaced with any other desired one.

In summary, it will be seen that the present invention provides an ornamental lighting device which effectively illuminates the ambience without generating undesirable heat.

Various modifications will become possible for those skilled in the art after receiving the teachings of the present disclosure without departing from the scope thereof. For example, the mirror surface discussed in conjunction with the embodiment of Figure 4 is similarly applicable to the other embodiments and may even be provided with a suitable pattern thereon. To omit the fiber retainer members in any of the embodiments described, one or both of the light transmitting panels may be formed with grooves for receiving the optical fibers therein. However, in the case where the optical fibers are individually recessed for light radiation as previously men-

tioned, the grooves in the panels will cause the light to leak when engaged by the recessed optical fiber walls. Such leakage may be eliminated by designing the refractive index of the panels smaller than that of the optical fibers.

Claims

1. An ornamental lighting device for radiating condensed light which propagates through a fibre optic cable, characterized by
a pedestal (12; 42; 62);
at least one optical fibre (30₁—30_n; 52₁—52_n; 68₁—68_n) supported by said pedestal and optically coupled with the fibre optic cable to be supplied with the condensed light;
retainer means (18, 20, 22, 24; 48, 50; 70a—70g; 72a—72g) for retaining said optical fibre; and
a pair of light transmitting panels (14, 16; 44, 46; 64, 66) mounted on the pedestal to hold the optical fibre(s) therebetween.
2. An ornamental lighting device as claimed in claim 1 characterized in that said optical fibre has a spiral form (52₁—52_n).
3. An ornamental lighting device as claimed in claim 2 in which the retainer means comprises a pair of generally cruciform retainer members (48, 50).
4. An ornamental lighting device as claimed in claim 1, characterized in that it comprises a plurality of optical fibres (30₁—30_n) which are supported by said pedestal (12), retained by said retainer means substantially parallel to each other and at a predetermined spacing from each other and held parallel between said pair of light transmitting panels.
5. An ornamental lighting device as claimed in claim 4, characterized in that the pedestal (12; 42; 62) is formed with a duct (32) therein, the fibre optic cable being optically coupled with the optical fibres through said duct.
6. An ornamental lighting device as claimed in claim 5, characterized in that the duct extends throughout the pedestal (12; 42; 62), another fibre optic cable (32) being passed through said duct to distribute light to another ornamental lighting device.
7. An ornamental lighting device as claimed in claim 5, characterized in that the retainer means comprises at least two retainer members (18, 20) mounted on inner surfaces of the facing light transmitting panels (14, 18).
8. An ornamental lighting device as claimed in claim 5, characterized in that the retainer means comprises guide grooves formed in an inner surface of at least one of the light transmitting panels, the optical fibres being individually received in said guide grooves.
9. An ornamental lighting device as claimed in claim 5, characterized in that an inner surface of one of the facing light transmitting panels (66) is a mirror surface.
10. An ornamental lighting device as claimed in claim 5, characterized in that each of the optical fibres is provided with light diffusing means for

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Still another embodiment of the present invention is shown in Figure 4. The lighting device generally designated by the reference numeral 60 is constructed to emit light from one of opposite surfaces thereof. The screen 60 having such a construction may find application as a halo. A pedestal 62 supports a pair of light transmitting panels 64 and 66 (only 64 is visible). A plurality of optical fibers 68₁—68_n are held between the opposite panels 64 and 66 and retained by retainer members 70a—70g and retainer members 72a—72g (only 70a—70g are shown), which are mounted on the panels 64 and 66 respectively. As shown, the optical fibers 68₁—68_n are shaped in substantially oblong loops each of which is substantially symmetrical with respect to a vertical which passes through the pedestal 62.

In the screen configuration shown in Figure 4, the panel 66 at the back of the screen 60 may be provided with a mirror surface in order to reflect part of the light which issues from the optical fibers toward the back of the screen.

It will be needless to mention that the configurations of the light transmitting panels shown and described are only illustrative and may be replaced with any other desired one.

In summary, it will be seen that the present invention provides an ornamental lighting device which effectively illuminates the ambience without generating undesirable heat.

Various modifications will become possible for those skilled in the art after receiving the teachings of the present disclosure without departing from the scope thereof. For example, the mirror surface discussed in conjunction with the embodiment of Figure 4 is similarly applicable to the other embodiments and may even be provided with a suitable pattern thereon. To omit the fiber retainer members in any of the embodiments described, one or both of the light transmitting panels may be formed with grooves for receiving the optical fibers therein. However, in the case where the optical fibers are individually recessed for light radiation as previously men-

tioned, the grooves in the panels will cause the light to leak when engaged by the recessed optical fiber walls. Such leakage may be eliminated by designing the refractive index of the panels smaller than that of the optical fibers.

Claims

1. An ornamental lighting device for radiating condensed light which propagates through a fibre optic cable, characterized by

a pedestal (12; 42; 62);

at least one optical fibre (30₁—30_n; 52₁—52_n; 68₁—68_n) supported by said pedestal and optically coupled with the fibre optic cable to be supplied with the condensed light;

retainer means (18, 20, 22, 24; 48, 50; 70a—70g; 72a—72g) for retaining said optical fibre; and

a pair of light transmitting panels (14, 16; 44, 46; 64, 66) mounted on the pedestal to hold the optical fibre(s) therebetween.

2. An ornamental lighting device as claimed in claim 1 characterized in that said optical fibre has a spiral form (52₁—52_n).

3. An ornamental lighting device as claimed in claim 2 in which the retainer means comprises a pair of generally cruciform retainer members (48, 50).

4. An ornamental lighting device as claimed in claim 1, characterized in that it comprises a plurality of optical fibres (30₁—30_n) which are supported by said pedestal (12), retained by said retainer means substantially parallel to each other and at a predetermined spacing from each other and held parallel between said pair of light transmitting panels.

5. An ornamental lighting device as claimed in claim 4, characterized in that the pedestal (12; 42; 62) is formed with a duct (32) therein, the fibre optic cable being optically coupled with the optical fibres through said duct.

6. An ornamental lighting device as claimed in claim 5, characterized in that the duct extends throughout the pedestal (12; 42; 62), another fibre optic cable (32) being passed through said duct to distribute light to another ornamental lighting device.

7. An ornamental lighting device as claimed in claim 5, characterized in that the retainer means comprises at least two retainer members (18, 20) mounted on inner surfaces of the facing light transmitting panels (14, 18).

8. An ornamental lighting device as claimed in claim 5, characterized in that the retainer means comprises guide grooves formed in an inner surface of at least one of the light transmitting panels, the optical fibres being individually received in said guide grooves.

9. An ornamental lighting device as claimed in claim 5, characterized in that an inner surface of one of the facing light transmitting panels (66) is a mirror surface.

10. An ornamental lighting device as claimed in claim 5, characterized in that each of the optical fibres is provided with light diffusing means for





diffusing light which propagates through the optical fibre.

11. An ornamental lighting device as claimed in claim 10, characterized in that the light diffusing means comprises a light diffusing material deposited on the optical fibre and having a refractive index which is larger than the refractive index of the optical fibre.

12. An ornamental lighting device as claimed in claim 10, characterized in that the light diffusing means comprises grooves formed in a surface of the optical fibre.

13. An ornamental lighting device as claimed in claim 4, modified in that said optical fibres are substantially disposed in oblong loops each of which is substantially symmetrical with respect to a vertical which passes through the pedestal.

Patentansprüche

1. Dekorative Lichtquelle, die gesammeltes Licht abstrahlt, das durch ein faseroptisches Kabel hindurchtritt, gekennzeichnet durch einen Fuß (12; 42; 62);

wenigstens eine optische Faser (30₁—30_n; 52₁—52_n; 68₁—68_n), die durch den Fuß gehalten wird und die optisch mit dem faseroptischen Kabel gekoppelt ist, um über dieses Kabel mit Sammellicht versorgt zu werden;

eine Halteeinrichtung (18, 20, 22, 24; 48, 50; 70a bis 70g; 72a—72g) zum Halten der optischen Faser; und durch ein Paar Lichtübertragender Wände (14, 16; 44, 46; 64, 66), die auf dem Fuß befestigt sind, um die optische (n) Faser (n) dazwischen zu halten.

2. Lichtquelle nach Anspruch 1, dadurch gekennzeichnet, daß die optische Faser eine Spiralform hat (52₁—52_n).

3. Vorrichtung nach Anspruch 2, wobei die Halteeinrichtung ein Paar im wesentlichen kreuzförmiger Halteelemente (48, 50) aufweist.

4. Lichtquelle nach Anspruch 1, dadurch gekennzeichnet, daß sie mehrere optische Fasern (30₁—30_n) aufweist, die von dem Fuß (12) gehalten werden und die von der Halteeinrichtung im wesentlichen parallel zueinander angenommen sind und in einem bestimmten Abstand zueinander liegen und parallel zwischen dem lichtübertragenden Wandpaar angeordnet sind.

5. Lichtquelle nach Anspruch 4, dadurch gekennzeichnet, daß in dem Fuß (12; 42; 62) ein Kanal (32) ausgebildet ist, wobei das faseroptische Kabel optisch mit den optischen Fasern durch diesen Kanal verbunden ist.

6. Lichtquelle nach Anspruch 5, dadurch gekennzeichnet, daß sich der Kanal durch den Fuß (12; 42; 62) hindurch erstreckt, und daß ein weiteres faseroptisches Kabel (32) durch den Kanal hindurch geführt ist, um Licht an eine weitere dekorative Lichtquelle zu bringen.

7. Lichtquelle nach Anspruch 5, dadurch gekennzeichnet, daß die Halteeinrichtung wenigstens zwei Halteelemente (18, 20) umfaßt, die auf den aufeinander zuweisenden Innenflächen der

Lichtübertragenden Wände (14, 18) angeordnet sind.

8. Lichtquelle nach Anspruch 5, dadurch gekennzeichnet, daß die Halteeinrichtung Führungsrillen an der Innenfläche wenigstens einer lichtübertragenden Wand aufweisen, wobei die optischen Fasern einzeln in den Führungsrillen aufgenommen sind.

9. Lichtquelle nach Anspruch 5, dadurch gekennzeichnet, daß eine der aufeinander zuweisenden lichtübertragenden Wandflächen (66) eine Spiegelfläche ist.

10. Lichtquelle nach Anspruch 5, dadurch gekennzeichnet, daß jede optische Faser mit einer Lichtverteilungseinrichtung versehen ist, um Licht abzugeben, das durch die optische Faser hindurchtritt.

11. Lichtquelle nach Anspruch 10, dadurch gekennzeichnet, daß die lichtverteilende Einrichtung ein Lichtdiffusormaterial umfaßt, das auf der optischen Faser aufgebracht ist und dessen Brechungsindex größer als der Brechungsindex der optischen Faser ist.

12. Lichtquelle nach Anspruch 10, dadurch gekennzeichnet, daß der Lichtdiffusor Rillen aufweist, die in einer Fläche der optischen Faser ausgebildet sind.

13. Lichtquelle nach Anspruch 4, die dadurch abgewandelt ist, daß die optischen Fasern in im wesentlichen länglichen Schleifen zueinander angeordnet sind, wobei jede Schleife im wesentlichen symmetrisch bezüglich einer Vertikalen verläuft, die durch den Fuß hindurchtritt.

Revendications

1. Un dispositif d'éclairage ornemental pour rayonner de la lumière condensée qui se propage dans un câble optique à fibres, caractérisé par:

— un socle (12; 42; 62);

— au moins une fibre optique (30₁—30_n; 52₁—52_n; 68₁—68_n) supportée par ledit socle et couplée optiquement avec le câble optique à fibres de manière à recevoir la lumière condensée;

— des moyens de retenue (18, 20, 22, 24; 48, 50; 70a—70g; 72a—72g) pour retenir ladite fibre optique; et

— une paire de panneaux de transmission de lumière (14, 16; 44, 46; 64, 66) montés sur le socle de façon à maintenir entre eux la(les) fibre(s) optique(s).

2. Un dispositif d'éclairage ornemental tel que revendiqué dans la revendication 1, caractérisé en ce que ladite fibre optique a une forme spirale (52₁—52_n).

3. Un dispositif d'éclairage ornemental tel que revendiqué dans la revendication 2, dans lequel les moyens de retenue comprennent une paire d'éléments de retenue (48, 50) ayant dans l'ensemble une forme de croix.

4. Un dispositif d'éclairage ornemental tel que revendiqué dans la revendication 1, caractérisé en ce qu'il comprend une pluralité de fibres optiques (30₁—30_n) qui sont supportées par ledit socle (12).



en étant retenues par lesdits moyens de retenue sensiblement parallèlement entre elles et avec un espacement prédéterminé l'une de l'autre et en étant maintenues parallèlement entre les panneaux de transmission de lumière de ladite paire.

5. Un dispositif d'éclairage ornemental tel que revendiqué dans la revendication 4, caractérisé en ce que le socle (12; 42; 62) est réalisé avec un conduit interne (32), le câble optique à fibres étant couplé optiquement avec les fibres optiques par l'intermédiaire dudit conduit.

6. Un dispositif d'éclairage ornemental tel que revendiqué dans la revendication 5, caractérisé en ce que le conduit s'étend au travers du socle (12; 42; 62), un autre câble optique à fibres (32) étant passé au travers dudit conduit pour distribuer de la lumière à un autre dispositif d'éclairage ornemental.

7. Un dispositif d'éclairage ornemental tel que revendiqué dans la revendication 5, caractérisé en ce que les moyens de retenue comprennent au moins deux éléments de retenue (18, 20) montés sur les surfaces intérieures des panneaux de transmission de lumière (14, 18) placés en regard l'un de l'autre.

8. Un dispositif d'éclairage ornemental tel que revendiqué dans la revendication 5, caractérisé en ce que les moyens de retenue comprennent des rainures de guidage formées dans une surface intérieure d'au moins un des panneaux de transmission de lumière, les fibres optiques étant

reçues individuellement dans lesdites rainures de guidage.

9. Un dispositif d'éclairage ornemental tel que revendiqué dans la revendication 5, caractérisé en ce qu'une surface intérieure d'un des panneaux de transmission de lumière (66) placés en regard l'un de l'autre ait une surface réfléchissante.

10. Un dispositif d'éclairage ornemental tel que revendiqué dans la revendication 5, caractérisé en ce que chacune des fibres optiques est pourvue de moyens de diffusion de lumière pour diffuser de la lumière qui se propage dans la fibre optique.

11. Un dispositif d'éclairage ornemental tel que revendiqué dans la revendication 10, caractérisé en ce que les moyens de diffusion de lumière comprennent un matériau de diffusion de lumière qui est déposé sur la fibre optique et qui a un indice de réfraction qui est plus grand que l'indice de réfraction de la fibre optique.

12. Un dispositif d'éclairage ornemental tel que revendiqué dans la revendication 10, caractérisé en ce que les moyens de diffusion de lumière comprennent des rainures formées dans une surface de la fibre optique.

13. Un dispositif d'éclairage ornemental tel que revendiqué dans la revendication 4, modifié par le fait que lesdites fibres optiques sont disposées sensiblement sous la forme de boucles oblongues, chacune d'elles étant sensiblement symétrique par rapport à une verticale qui passe au travers du socle.



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