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 [73] Assignee **Poly-Optics, Inc.**

[54] **ORNAMENTAL ILLUMINATION DEVICE AND ADAPTER**
10 Claims, 10 Drawing Figs.

[52] U.S. Cl. **240/10 P,**
240/10 T, 350/96 B
 [51] Int. Cl. **F21p 1/02,**
F21l 15/08
 [50] Field of Search **240/10 P,**
10 T; 350/96 B, 96

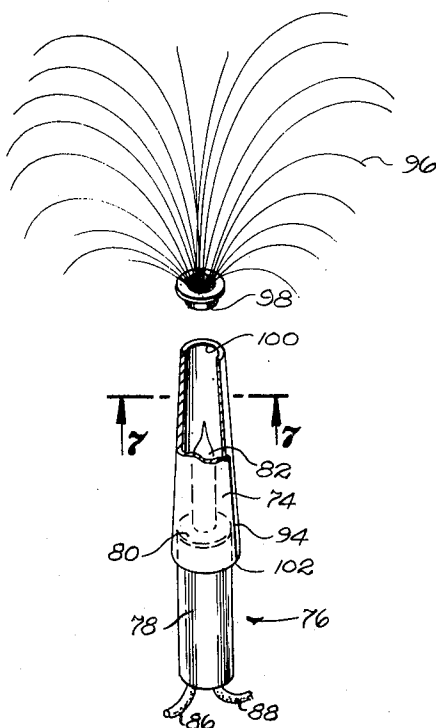
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ABSTRACT: An adapter is provided whereby a spray of optical fibers can be readily connected or disposed in proximity to a light source. On one embodiment a plurality of optical fiber sprays are connected for illumination by the light bulbs on a string of light bulbs which may then be used for decorating a Christmas tree or the like.



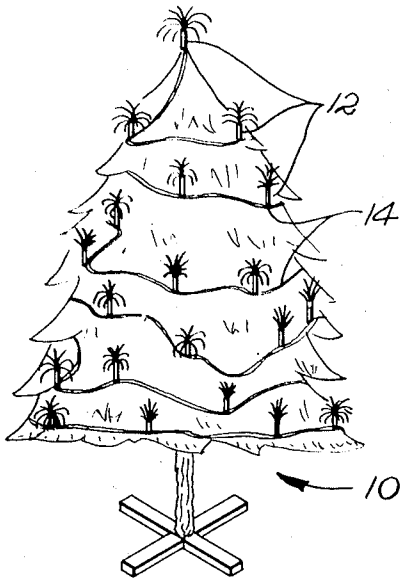


Fig. 1.

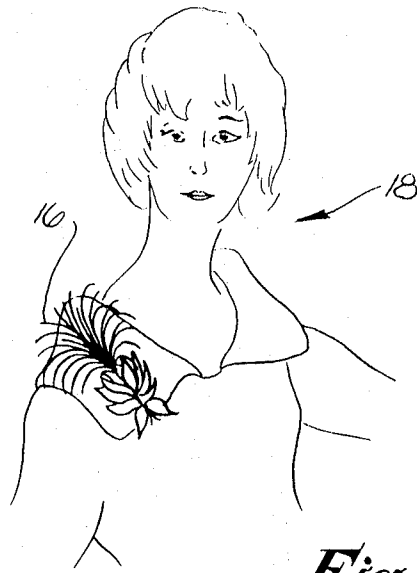


Fig. 2.

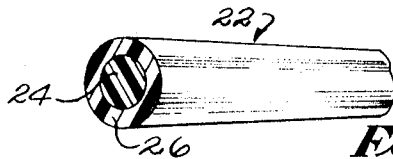


Fig. 3.

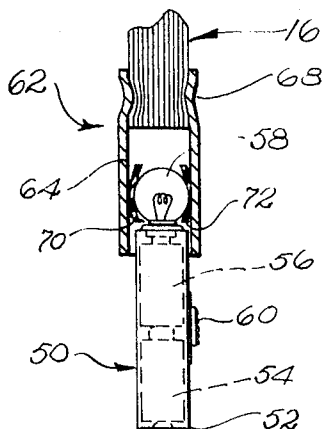


Fig. 5.

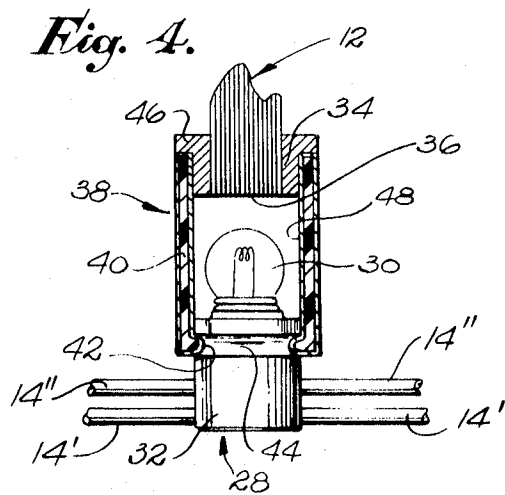
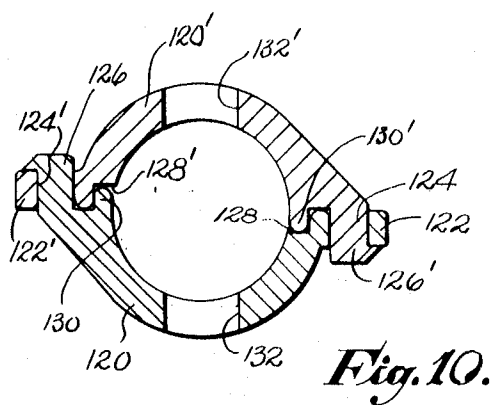
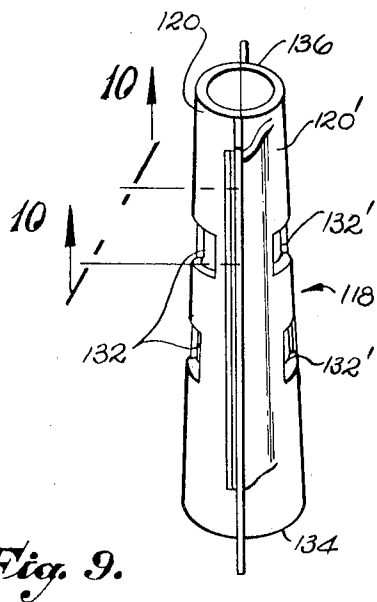
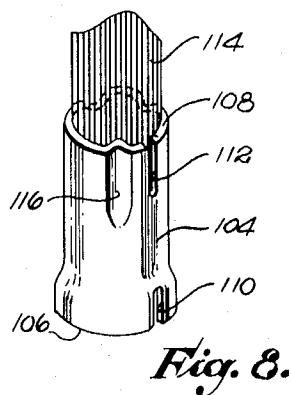
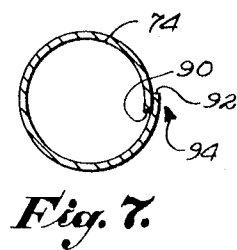
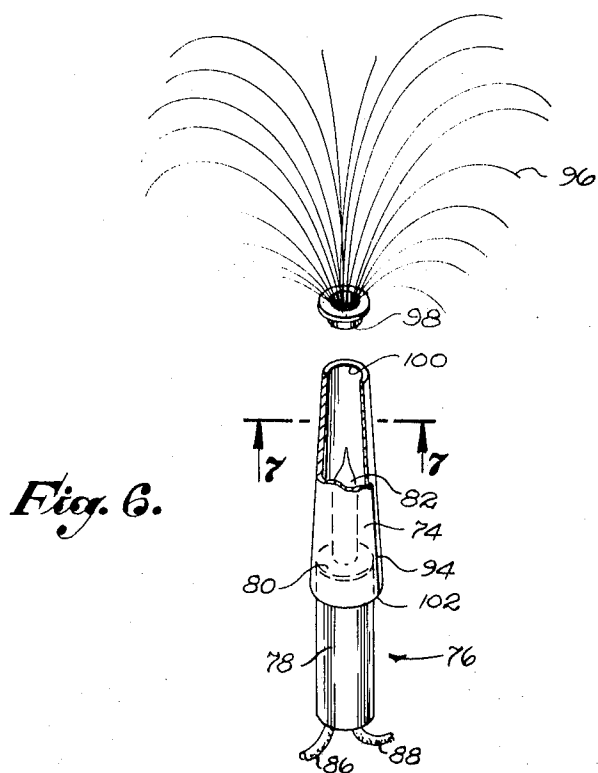


Fig. 4.

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ORNAMENTAL ILLUMINATION DEVICE AND ADAPTER

FIELD OF THE INVENTION

The fields of art to which the invention pertains include the fields of optics and radiant energy, particularly with respect to light conducting rods, such as optical fibers, and decorative lights including displays and ornaments of the tree decorating type.

BACKGROUND AND SUMMARY OF THE INVENTION

The advent of modern manufacturing procedures for fabricating plastic as well as glass optical fibers has made such fibers available for decorative purposes. In such utility, the fibers are often bundled together at one end with the fibers at the other end unrestrained to flare outwardly forming a spray or bouquet of light. An illumination source for the fibers must be provided and this has generally been accomplished by the special construction of a holder including a light bulb and particularly adapted to maintain the light receiving bundled ends of the fibers a predetermined distance from the bulb. The holder is shaped internally to concentrate light from the bulb onto the bundled fiber ends and is formed with vent openings so that heat may be readily dissipated. Provision is made for disposing a light filter and/or heat reflector between the light bulb and bundled fiber ends. Such structures enable the utilization of optical fibers for a variety of decorative purposes whereby unique aesthetic lighting effects can be achieved. The holders themselves have been designed with aesthetic exterior lines so that they can be in view without detracting from the visual pleasantness of the effect. However, the holder is a significantly large component of the entire structure and does limit the utility of the optical fiber spray as a decorative unit. Furthermore, the cost of the illumination source and holder, as well as its bulkiness, inhibits the widespread use of optical sprays for decoration, particularly where a plurality of individual units are required, for example, in the decoration of a Christmas tree or the like.

The present invention enables the illumination of optical fiber sprays without requiring bulky and expensive light source holders. The invention enables a single spray to be illuminated in such a manner that it can be worn by a person, for example, as a component of a corsage, or a plurality of illuminated sprays can be strung out and draped around a Christmas tree or the like. In particular, an adapter is provided herein which enables a spray of optical fibers to be slideably fastened, clipped or otherwise secured to an ordinary light bulb or miniature light bulb such as is found on a string of Christmas tree lights. The adapter carries the bundled ends of the optical fibers at one end and is formed to engage the light bulb or its holder so as to dispose the bundled fiber ends adjacent the light bulb. The adapter includes a casing for the light bulb which is cylindrically shaped and formed internally to close fit the bulb, the bulb socket and/or its husk. The casing may be formed internally to slideably engage the bulb, or the open end of the casing may be formed to slide or clip onto the bulb, bulb socket, and/or bulb husk. The light-receiving optical fiber ends are bundled within a sleeve which is slideably secured at the forward end of the casing. Alternatively, the casing may be integrally formed as an extension of the bundling sleeve so that they constitute a single-structural unit.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a Christmas tree which is draped with a string of optical fiber sprays in accordance with this invention;

FIG. 2 is a perspective view illustrating the manner in which a single spray can be worn by a person as a component corsage;

FIG. 3 is a perspective view of an optical fiber utilized in this invention;

FIG. 4 is a combined elevational cross-sectional view of an adapter utilized in this invention and connected to a light bulb socket;

FIG. 5 is a combined elevational cross-sectional view of an alternative adapter structure of this invention connected to a light bulb;

FIG. 6 is a perspective view of another alternative adapter connected to a miniature light bulb assembly, and partially broken away;

FIG. 7 is a cross-sectional view on line 7—7 of FIG. 6, in the direction of the arrows;

FIG. 8 is a perspective view of another alternative adapter of this invention;

FIG. 9 is a perspective view of another alternative adapter of this invention; and

FIG. 10 is a cross-sectional view taken on line 10—10 of FIG. 9, in the direction of the arrows.

DETAILED DESCRIPTION

Referring to FIG. 1, there is shown a Christmas tree 10 which has been decorated by disposing thereabout a plurality of optical sprays 12. Each spray 12 can be illuminated by an ordinary light bulb, or a miniature light bulb can be utilized. The manner of such illumination and mechanism of attachment to the light bulb will be described in more detail hereinafter. The light bulbs are strung out on electrical wiring 14 so that the bulbs receive current from a common electrical source through a standard household electrical outlet. In this regard, a string of lights which is ordinarily utilized to decorate a Christmas tree or the like can be utilized with the light bulbs in parallel or series connection, or any other arrangement appropriate to the structure to be decorated can be utilized.

Referring to FIG. 2, there is illustrated the decorative use of a single spray 16 of optical fibers which is worn by a person 18 as a component of a corsage 20 or other decorative accessory. In this case, a portable illumination source is utilized which is now shown in FIG. 2 but which will be illustrated hereinafter as will be the manner of illumination of the spray 16 and connection to the light source.

The optical fiber sprays utilized in this invention are composed of a plurality of single optical fibers bundled together at one end and unrestrained at the other end to flare outwardly from the point of bundling with a visually pleasing fullness. One can utilize from 10 to about 20 optical fibers to constitute a decorative spray useful herein, but any reasonable number of optical fibers can be utilized.

Referring to FIG. 3, each optical fiber 22 comprises a central light-conducting core 24 encased within a light reflecting jacket 26. The optical fiber 22 is constructed of materials well known to the art wherein the light-conducting core 24 has a higher index of refraction than the jacket 26. For example, a core 24 can be formed of polystyrene having an index of refraction of 1.60 and the jacket 26 can be formed of a polymethylmethacrylate having an index of refraction of 1.49. Methods of forming such fibers are well known in the art. For use in the present invention, a balance should be struck between flexibility of the fibers and light emitting capability. The fibers should be sufficiently flexible to allow the formation of decorative spray shapes in a variety of forms, and yet the fibers should conduct sufficient light to be decoratively aesthetic. To obtain an aesthetically attractive display, one can utilize optical fibers having diameters of 7 mils. or more.

Referring to FIG. 4, there is illustrated the manner of attachment of an optical spray 12, such as is illustrated in FIG. 1, to a light source 28. The light source 28 comprises a light bulb 30 (which may be a 6 volt light bulb if used in series) and a socket husk 32 therefore. Electrical wiring 14' and 14'' are connected through the socket husk 32 in the usual manner of stringing such light bulbs in parallel so that failure of a particular light bulb does not short out the entire string of lights. This can also be achieved with a series connection by shunting each bulb in the manner of a typical decorative string of miniature lights. However, any other manner of connection can be utilized as desired.

The optical fibers constituting the spray 12 have their ends bundled within a metallic sleeve or grommet 34 and are cut

coplanar with the rear end thereof to define a light-receiving surface 36. An adapter 38 connects the bundled ends of the optical fiber spray 12 to the light source 28. The adapter 38 can be of metal or plastic and is formed to engage the light source at one end and to carry the optical fibers at its other end. In this particular embodiment, the adapter 40 includes a hollow cylindrical, tubular portion 40 which is turned inwardly at its lower end to form a slight annular flange 42 internally thereof which engages a groove 44 formed annularly at the forward end of the socket husk 32. The tubular portion 40 of the adapter 38 is formed internally to close fit the bulb 30 and encases the bulb 30 when the adapter 38 is secured to the socket husk 32. The forward end of the adapter 38 is formed to slideably and frictionally receive the bundling sleeve 34. An annular shoulder 46 is formed on the forward part of the sleeve 34 to limit the extent to which the bundled fiber ends are inserted within the adapter 38. However, the shoulder 46 can be omitted and the sleeve 34 retained simply by friction. Alternatively, the sleeve 34 and cylindrical portion can be of one piece integral construction.

In use, the metallic sleeve 34 containing the bundled ends of the optical fiber spray 12 is slid into one end of the adapter 38 and held there by friction. A string of lights such as 28 is draped over a Christmas tree or other item to be decorated, in the manner of FIG. 1, and the adapter is merely snap fitted over the light source 28 so as to encase the bulb 30 and be securely retained in the groove 44 on the socket husk 32. One can eliminate the groove 44 and merely secure the adapter 38 by means of friction, the spray 12 being light in weight and readily supported on the socket husk 32.

In accordance with the foregoing, the bundled ends of the optical fibers constituting the spray 12 are disposed adjacent the light bulb 30 so that the light-receiving ends 36 of the fibers are directly illuminated by the bulb 30. To aid such illumination, the internal surfaces of the tubular adapter portion 40 can be coated with a highly light-reflecting material 48. In this embodiment, the adapter 38 is constructed of aluminized molded plastic having interior and exterior surfaces coated with aluminum 48. By the utilization of an adapter 38 constructed as described hereinabove, a simple, inexpensive and convenient method is provided for rapidly affixing and removing optical fiber sprays such as 12 to a plurality of strung lights. The bundled fiber ends 36 are disposed in close proximity to the light bulb 30 so that illumination therefrom is adequate to properly illuminate the optical fibers in the spray 12.

Referring now to FIG. 5, there is illustrated an alternative embodiment of the invention. FIG. 5 illustrates the manner in which a single spray 16 of optical fibers can be connected to a portable light source 50 so that it may be worn as a decorative accessory in the manner depicted in FIG. 2, or otherwise as desired. In this embodiment, the light source 50 comprises a battery housing or case 52 enclosing two pen light batteries shown in shadow at 54 and 56, and a low voltage light bulb 58 threaded into the housing in the usual manner (not shown) so as to be in electrical contact with the batteries 54 and 56 when a switch 60 is pushed to its "on" position.

In this embodiment, the connector 62 is formed entirely of metal and includes a hollow, cylindrical tubular portion 64 for encasing the light bulb 58. In contrast to the structure depicted in FIG. 4, the structure in FIG. 5 does not utilize a separate member such as the sleeves 34 to bundle the light receiving ends of the optical fibers constituting the spray 16. Rather, the fibers are gathered together and cut to define a light-receiving lower surface 66 which is disposed within the tubular connector 62. The forward end of the connector 62 is then crimped as shown at 68 to secure the fiber ends. Accordingly, the adapter 62 in this embodiment is formed integrally as a single-structural unit with the means for bundling the ends of the optical fibers of the spray 16.

As a further modification, the adapter 62 is provided with a pair of oppositely disposed, deformable fastening tabs 70 and 72 which are secured internally of the tubular portion 64 so as

to engage the light bulb 58. In use, the adapter 62 is merely pushed down onto the light bulb 58 whereupon the tabs 70 and 72 are spread apart by the thrust of the bulb 58 until the side portions of the bulb extend against the tabs, whereupon the spring momentum of the tabs 70 and 72 causes them to engage the bulb 58, thereby securing the adapter 62 to the light source 50.

The optical fiber sprays 16 and attached light source 50 can be secured on a person in a manner depicted in FIG. 2 or can be utilized for a variety of other decorative purposes. If it is desired to remove the spray 16, one need merely lift the adapter 62 away from the light source 50 whereupon the tabs 70 and 72 are forced open to free the adapter 62.

It may be desirable to combine certain features of the adapters depicted in FIGS. 4 and 5. For example, one might utilize the flange snap action obtained with the adapter 38 of FIG. 4 with the integral one piece bundling construction of the adapter 62 of FIG. 5.

Referring to FIG. 6, there is illustrated another alternative embodiment of the invention in which an adapter 74 is provided for utilization with a miniature or subminiature light assembly 76. The miniature assembly 76 includes a husk 78 carrying a socket 80 and miniature bulb 82 therefor, energized via electrical leads 86 and 88 in the usual manner. Referring additionally to FIG. 7, the adapter 74 is in the form of a hollow truncated cone, formed from a single-plastic blank which is curved so that the edges 90 and 92 thereof overlap to form an expansible seam, indicated at 94, lengthwise of the adapter 74. A spray 96 of optical fibers have their ends bundled within a grommet 98 in the manner depicted in FIG. 4. The grommet 98 is disposed and held by friction in the top, narrower opening 100 defined by the adapter 74. In use, the adapter 74 is slid onto the husk 78, the husk 78 being held frictionally within the adapter 74 through the opening 102 defined at the lower end thereof. As the adapter 74 is pushed onto the husk 78, the overlapped edges 90 and 92 separate to accommodate to its diameter and effect a pressure grip on the husk 78.

Referring to FIG. 8, still another alternative embodiment is illustrated in which the adapter 104 of metal formed to have a hollow cylindrical shape wider at its bottom end 106 than at its top end 108. Each end 106 and 108 defines a slit 110 and 112, respectively, from the edge thereof, allowing the ends 106 and 108 to be expansible or compressible. The bundled ends of a plurality of optical fibers 114 are disposed within the narrower, top end 108 of the adapter and that end is crimped, as indicated at 116 to secure the fiber ends in place. In use, the adapter 104 is pushed onto the socket or husk of a light source such as is illustrated in FIG. 4 or 6, the lower end 106 thereof expanding to accommodate the diameter of the husk.

Referring now to FIGS. 9 and 10, there is illustrated still another embodiment of this invention in which an adapter 118 is formed of plastic in two identical longitudinal halves 120 and 120'. Each half 120 and 120' is formed with a flanged edge 122 and 122', which is slotted as at 124 and 124', and a hooked flanged member 126 and 126' which is formed to protrude through the slot 124' and 124 respectively. Each half 120 and 120' is additionally formed with an inner longitudinal shoulder 128 and 128' and an oppositely disposed inner longitudinal lip 130 and 130' for engagement with the shoulder 128' and 128 of the opposite half. Slots 132 and 132' are formed through each 120 and 120' as windows for venting of heat generated from the light bulb with which the adapter is utilized. Many light bulbs with which the adapters 118 are utilized remain cool during operation since the vents are not needed in all cases. In use, the adapter 118 is assembled by snap engaging the opposite longitudinal edges thereof, as illustrated in the drawings, whereby the adapter 118 is provided with a truncated cone shape. The wider end 134 of the adapter 118 is pushed onto the husk of a miniature light or the like and the bundled fiber ends of a plurality of optical fibers are slideably disposed and frictionally secured within the narrower end 136 of the adapter in the manner as illustrated in FIG. 6.

It is to be understood that the foregoing embodiments merely exemplify the invention which may take many different forms that are radically different from the specific illustrative embodiments disclosed. Therefore, specific structural and functional details disclosed herein are not to be interpreted as limiting, but merely as a basis for the claims which define the scope of the invention.

I claim:

1. A decorative device for use with a light bulb and bulb holder, comprising:
 - a plurality of optical fibers having light-emitting ends and light-receiving ends;
 - means for bundling said light-receiving fiber ends;
 - an adapter, comprising a cylindrically shaped casing for said light bulb, carrying said bundled fiber ends at one end thereof and formed internally to close fit said light bulb whereby to dispose the bundled fiber ends adjacent said light bulbs; and
 - means internally of said casing for engaging said light bulb.
2. The invention according to claim 1 in which said fibers are unrestrained whereby to flare outwardly from said bundling means.
3. A decorative device for use with a miniature light assembly of a bulb and holder, said device comprising:
 - a plurality of flexible optical fibers having light emitting and light receiving ends;
 - a member short relative to the length of said fibers for bundling said light-receiving fiber ends and constituting sole fiber contact support; and
 - means for connecting said bundling member to said bulb holder to dispose said light-receiving fiber ends in close proximity to said bulb and constituting sole support for said bundling member;
 - said fibers being unrestrained whereby to flare outwardly from said bundling member.
4. The invention according to claim 3 in which said connecting means is formed for ready release from said holder.

5. The invention according to claim 3 in which said connecting means is formed to snap onto said bulb holder.

6. The invention according to claim 3 in which said connecting means comprises a casing for said light bulb cylindrically shaped and formed internally to close fit said bulb.

7. The invention according to claim 3 in which said bundling member comprises a sleeve encasing said light-receiving fiber ends and said connecting means comprises a cylindrical casing for said bulb formed to slidably receive said sleeve at one end.

8. The invention according to claim 3 in which said bundling member and connecting means constitute a one-piece unit.

9. A decorative device for use with a light bulb and bulb holder, comprising:

- a plurality of optical fibers having light-emitting ends and light-receiving ends;
- means for bundling said light-receiving fiber ends; and
- an adapter carrying said bundled fiber ends at one end thereof and formed as an expansible truncated cone to slide-fit said bulb holder to dispose the bundled fiber ends adjacent said light bulb.

10. A decorative device, comprising:

- a miniature light assembly of a bulb and holder;
- a plurality of flexible optical fibers having light-emitting and light-receiving ends;
- a member short relative to the length of said fibers for bundling said light-receiving fiber ends and constituting sole fiber contact support; and
- means for connecting said bundling member to said bulb holder to dispose said light-receiving fiber ends in close proximity to said bulb and constituting sole support for said bundling member;
- said fibers being unrestrained whereby to flare outwardly from said bundling member.

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