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Harrigan

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[54] DECORATIVE STRUCTURE

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240/141

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[58] Field of Search 240/1 EL, 10 R, 10 B,
240/10 P, 13, 17, 95, 98, 106 R, 141

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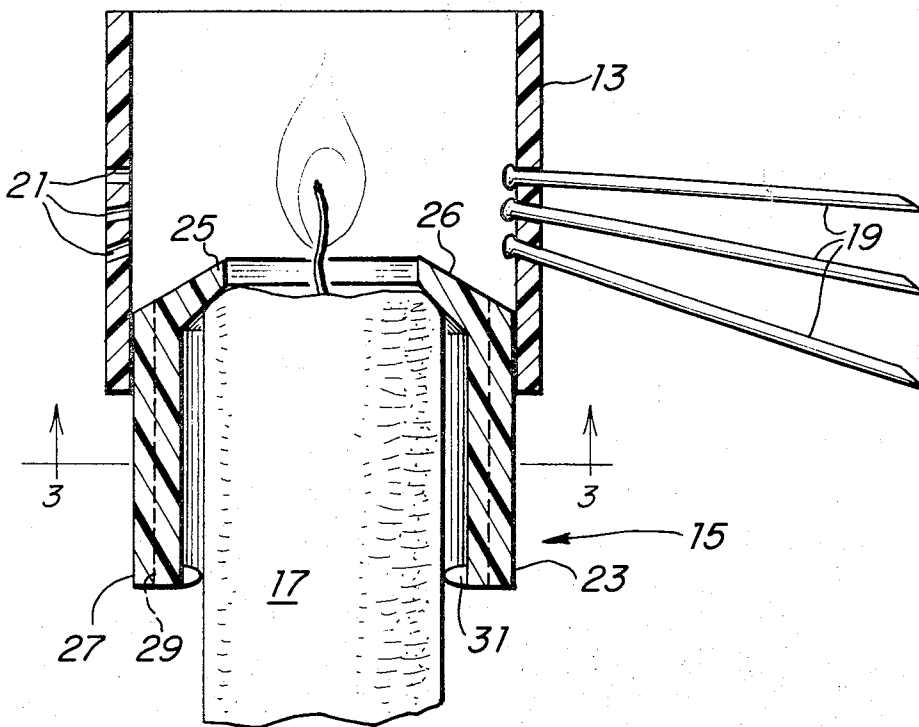
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[57] ABSTRACT

A decorative structure consisting of a plurality of optical fibers mounted within a hollow slide and chimney which rest on the upper edge of a conventional candle. The inner ends of the fibers are disposed adjacent the candle flame so that light is transmitted to the outer tips thereof.

1 Claim, 9 Drawing Figures



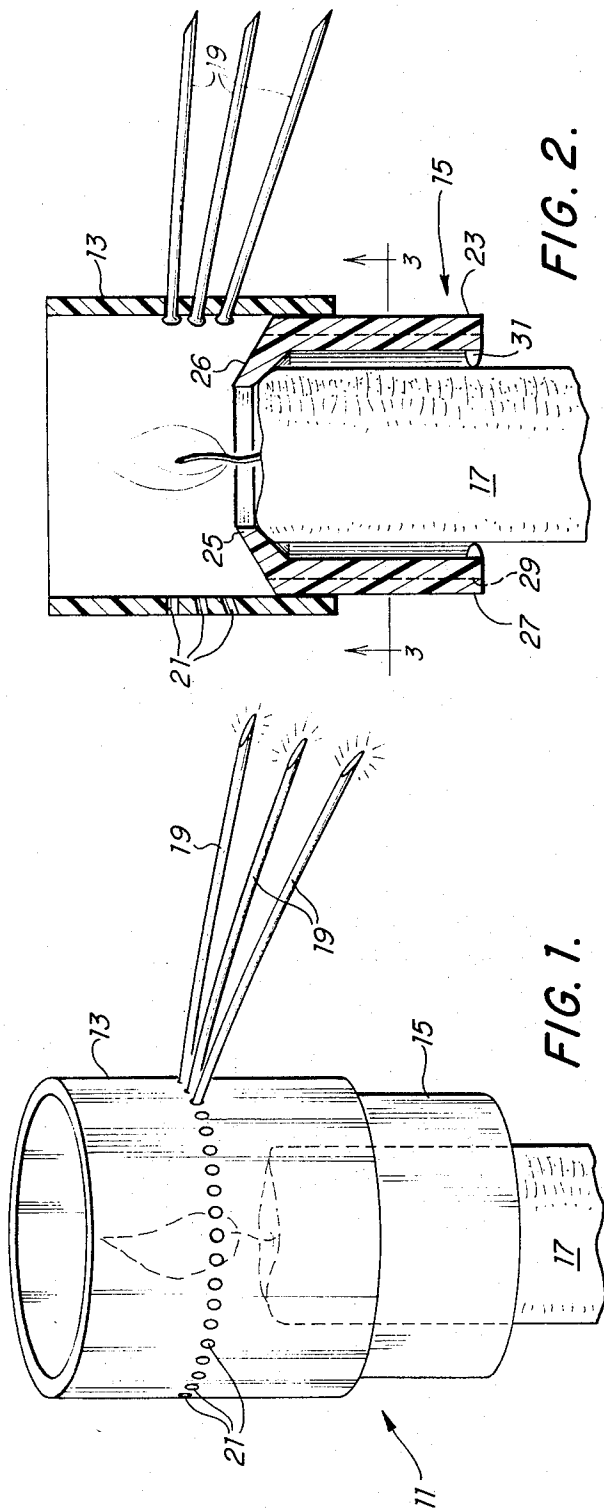


FIG. 2.

FIG. 1.

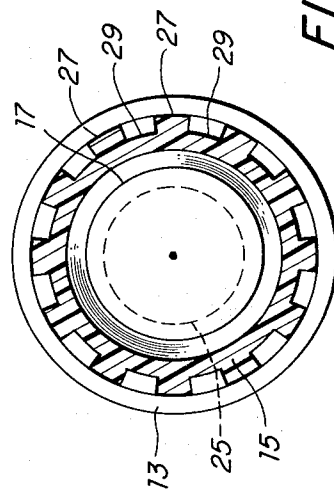


FIG. 3.

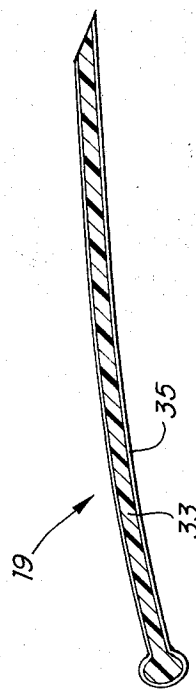


FIG. 4.

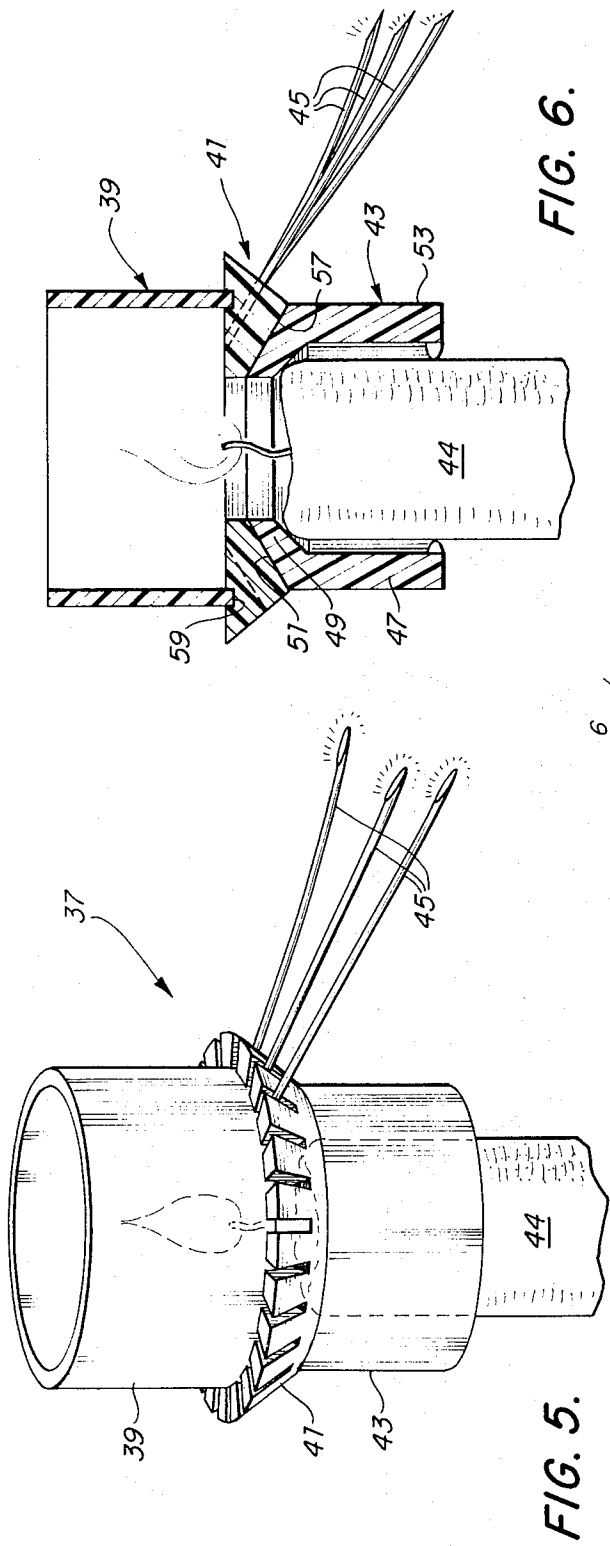


FIG. 6.

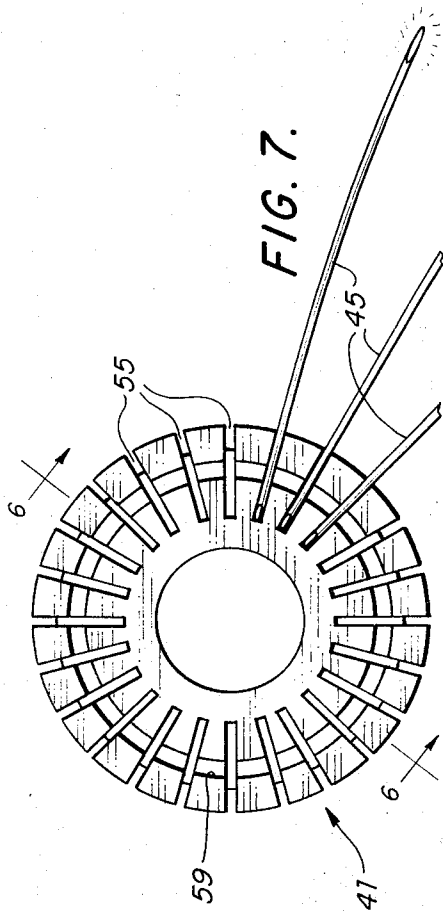
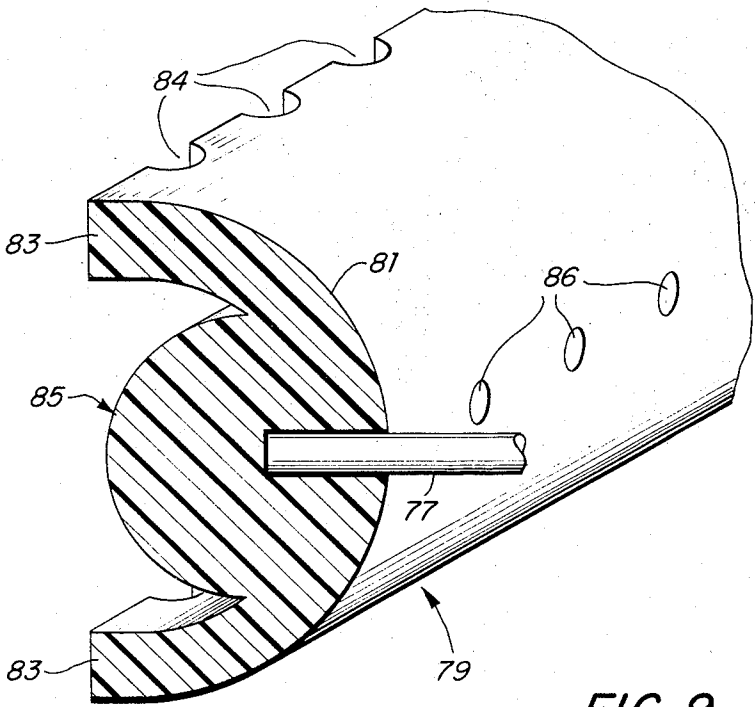
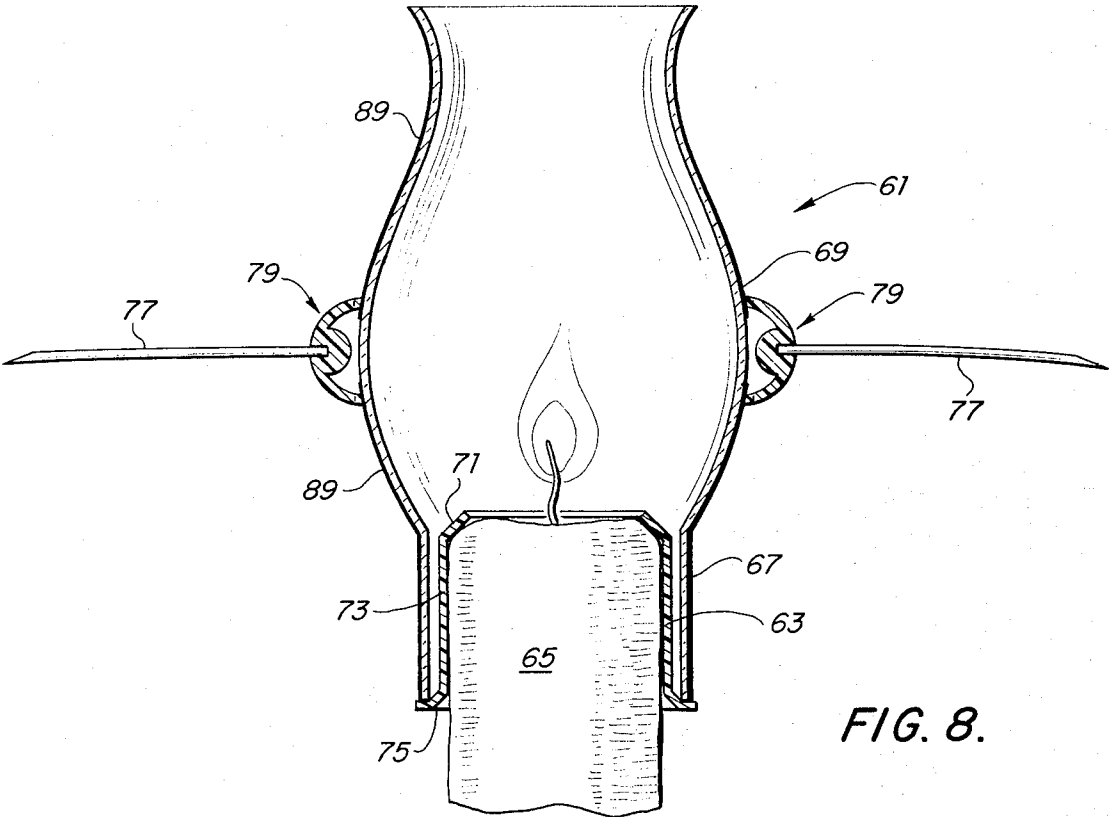


FIG. 7.



DECORATIVE STRUCTURE

This invention relates to light - conducting fibers and materials, decorative structures, and, more specifically, to decorative optical-fiber structures which use an open flame as their source of light.

Although modern production techniques have lowered the cost of glass and plastic optical fibers so that such fibers are now used for decorative purposes, the need for self-contained electrical sources of illumination has heretofore prevented the marketing of an inexpensive optical-fiber decorative structure.

Therefore the primary object of the present invention is to provide an inexpensive optical-fiber display structure.

A more specific object is to provide an optical-fiber display structure which uses an open flame, e.g., the flame of a candle, as its source of light.

Other objects are to provide an inexpensive optical-fiber display structure in kit form which can be assembled by a potential user; a structure wherein the display pattern can be changed by the user; and a structure wherein the color of the light of the candle flame and/or the light from the tips of the fibers can be changed by the user.

The above and other objects are achieved by means of a special annular hollow slide and chimney into which a plurality of optical fibers are mounted. The slide and chimney are adapted to fit over the top of a candle, and are supported by the upper edge of the candle. The fibers are mounted within the chimney so that the inner end of each fiber is disposed adjacent, and directed toward, the brightest portion of the flame of the candle. As the candle wick burns and the wax melts, the slide and chimney follow the decreasing length of the candle so that the inner ends of the fibers remain directed toward the flange.

In another embodiment tubular sleeves of a transparent or translucent material can be slidably mounted within the chimney so as to change the color of the flame as viewed, and/or also to change the color of the light being emitted from the tips of the fibers.

In another embodiment the slide and/or chimney can take the shape of a square so as to fit over the upper edge of square candles. Various other configurations can also be used to fit onto candles and other light sources of various shapes.

In still other embodiments the chimney may consist of a tubular sleeve which rests upon an annular disc which contains a plurality of fibers. The disc, in turn, can be affixed to a movable slide or chase (sometimes known as a "wax-saver") which rests upon the upper edge of the candle.

A fuller understanding of the nature and objects of the present invention is provided by the following detailed description which is to be read in connection with the accompanying drawings wherein:

FIG. 1 is a perspective view of one preferred embodiment of the present invention;

FIG. 2 is a side view, in partial cross section, of the structure of FIG. 1;

FIG. 3 shows a cross-sectional plan view through section 3-3 of FIG. 2;

FIG. 4 is a cross section of one of the optical fibers used with the structure of FIG. 1;

FIG. 5 is a perspective view of another preferred embodiment of the present invention;

FIG. 6 is a side view, in partial cross section, of the structure of FIG. 5;

FIG. 7 is a perspective view of a portion of the structure of FIG. 6;

FIG. 8 is another preferred embodiment of the present invention and;

FIG. 9 is a cross section of the light gathering lens of the embodiment of FIG. 8.

Referring to FIGS. 1, 2, and 3, there is shown a decorative structure 11 made up of a tubular chimney 13 which is attached to a movable slide or chase 15. The latter fits over the top of a candle, identified as 17, and rests on the upper edge of the candle. Although slide 15 and candle 17 are shown as being tubular and rod-shaped respectively, it should be noted that either element may be square, or rectangular in cross section, or may take any other common configuration. It is important only that the cross section of the slide be sized so that it can rest upon the upper edge of the candle.

A plurality of elongated fibers 19 are mounted through the sidewall chimney 13 to form a decorative display pattern.

From FIGS. 2 and 3, it is shown that chimney 13 may be a cylindrical sleeve or tube open at both ends and having a plurality of orifices 21 in one, or more, tiers (FIG. 2) as desired. Orifices 21 preferably are spaced evenly around the sidewall and may be sized to form a friction fit with each of the fibers.

Chimney 13 may be formed of an opaque or translucent material, but preferably is of a transparent material such as thermosetting plastic or glass. The material may be colored so as to mute the light of the flame. This may be desirable as it will prevent the light of the flame from distracting from the light being emitted at the outer tips of the fibers. The coloring may be impregnated into the material or may be applied to the inner surface of the chimney either by a lacquer or by inserting a color sleeve within the chimney. If the fibers are allowed to extend through the sidewall, as shown, and no color sleeve is used, the light at the tips of the fibers will be white and in contrast with the color of the chimney. The color at the fiber tips will be the same as that of the sleeve, however, if a colored sleeve is inserted within the chimney.

Orifices 21 are positioned so that the inner end of each optical fiber is adjacent and preferably also axially aligned with the brightest portion of the flame. If several tiers of fibers are to be provided, then it is important that the inner ends of all of the fibers are aligned with the flame. This will result in the longitudinal axis of the orifices in the lower tiers being directed upward toward the flame while those orifices in the top tiers are directed downward toward the flame. As shown, the height of chimney 13 need only be sufficient to mate with slide 15 and still completely enclose the flame.

From FIG. 2 it can be seen that slide 15 is formed with a cylindrical sidewall 23 having an inwardly extending annular lip 25 at one end. Lip 25, in turn, has an upper surface 26 which is angled upward and inward so as to engage the upper edge of the candle. The width of lip 25 is sufficient to engage the upper edge of the candle yet still provide a large opening about the candle wick.

The outer surface of sidewall 23 (FIG. 3) may be fluted with a series of parallel ridges and grooves, 27 and 29 respectively, which are formed parallel to the major axis of the slide. Grooves 29 serve as vent open-

ings to facilitate the flow of air upward through the structure, and also serve to cool the inner surface of the chimney as well as the inner ends of the fibers. Both the depth and width as well as the number of grooves 29 and ridges 27 can be varied as desired. For purposes of clarity, the fibers have been omitted from FIG. 3.

The depth of the ridges is such that the slide forms a friction fit within the inside of chimney 13. Thus the two pieces — chimney 13 and slide 15 — can be releasably connected. This permits the user to change the height the chimney extends above the candle flame merely by moving the chimney up or down over the slide.

If desired, however, a permanent connection can be made by joining together the two pieces with a cement or the like. It is also possible to fabricate the chimney and slide as a single piece. This may reduce manufacturing costs significantly, but will make it somewhat more difficult to light the candle with the structure in place.

The lower end of the slide can be provided with three or more detents 31 which extend inwardly. These serve as stabilizers and help maintain parallel alignment between the chimney and slide and the candle.

Referring to FIG. 4, it is shown that each optical fiber 19 preferably is comprised of a central light-conducting core 33 surrounded by a light-reflecting sheath or jacket 35. The light-conducting core has a higher index of refraction than that of the jacket. Both portions are constructed of materials well known in the art. For example, jacket 35 can be formed of a polymethylmethacrylate having an index of 1.40 or less while core 33 is of polystyrene having an index of refraction of about 1.50. In the alternative, to further decrease material cost, light-transmitting fibers without a jacket may be used. Glass as well as plastic rods of various compositions are suitable.

It is important to reach a balance between flexibility of the fibers and their light-emitting capability. Each fiber should be sufficiently flexible so that it can be bent or curved into decorative designs of various configurations, and yet must also have sufficient cross sectional area to permit an adequate amount of light to be emitted. I have found that plastic fibers with a diameter of 0.20 inches provide good light transmission yet are also flexible. The smaller diameter fibers are more flexible while the larger diameters transmit the most light.

Significantly, additional individual lights can be formed by nicking or cutting the sidewall of each fiber to a shallow depth. This will cause the light to be refracted to the surface thereby becoming visible at each cut. In this manner, a number of points or "sparks" of light can be emitted along the entire length of each fiber.

In the above structure, fibers 19 are mounted within the chimney by inserting one end thereof into one of the orifices 21. This may be done by the potential user who obtains the various elements in kit form and inserts a desired number of fibers into the orifices. The inner end of each fiber can be secured within an orifice by means of a cement or the like.

In an alternative mounting method, intense heat may be applied to the inner end of each fiber. This causes the end of the fiber to bead and form a bulb-like tip. Two purposes are served by this operation. It prevents the individual fibers from being removed from the chimney and also acts like a lens to greatly concentrate

the light gathering and transmitting quality of the fiber and thereby increase the overall "brightness" of the structure.

Various other methods can be adopted to increase the amount of light being transmitted to the tips of the fibers. The inside surface of the chimney may be coated to form a mirror-like reflective surface, or, in the alternative, light-refracting lenses may be used. Such lenses, for example, may be placed between the inner ends of the fibers and the open flame. Various types of lens arrangements are possible. They can be formed by molding a hollow sleeve of thermoplastic material to form a convex lens surface. The sleeve is sized so that it can be curved into a circle and placed horizontally within the chimney so that the lens portion is adjacent the flame of the candle and opposite the fibers. When such an insert is used, it is necessary to minimize the amount of fiber projecting through the chimney, or, in the alternative, to extend the fibers so that they project into the sleeve, opposite the lens portion. A circumferential groove or the like can be formed in the sleeve for such purpose.

I have also found that bundles of fibers can be successfully substituted for individual fibers. Each fiber in a bundle has a small diameter of about 0.05 to 0.10 inches; a typical bundle contains ten or more fibers, each fiber being approximately the same length. I have further found that the use of three or four bundles is sufficient to produce an attractive design. Each bundle is mounted in a manner similar to the mounting of the individual fibers.

Heat of the candle flame generally will produce no harmful effect on the decorative structure, providing the candle is not moved while lighted. When the candle is moved while lighted, however, there is the possibility that it will be tipped to one side or the other with the result that the flame may touch the inner ends of a few fibers and cause some distortion or melting. The use of a heat shield eliminates such a possibility. A simple shield can be produced by inserting a glass tube or cylinder within the chimney.

I have also found that a slide and chimney alone can serve as an effective wind shield. I therefore envision the use of my invention outdoors when the light of an open candle is desired in open spaces. In this embodiment, the movable slide and chimney are mounted over the top of the candle in a similar manner to that described above.

Referring to FIGS. 5 and 6 there is shown another embodiment of the present invention, identified as structure 37. This structure is formed of a tubular chimney 39 which is mounted on top of a disc or washer 41. The latter is coupled to a slide 43 which rests on a candle 44. A plurality of optical fibers 45 extend through notches in the edge of the washer.

Chimney 39 is a hollow, thin walled sleeve open at both ends. It is fabricated of an opaque, translucent, or transparent plastic material, or of glass, which may be colored as desired. Air vents (not shown) may be formed in the bottom of the chimney but usually are not necessary. Slide 43 is similar to slide 15 of FIGS. 1 through 4, having a sidewall 47 (FIG. 6) and an inwardly extending annular lip with a smooth upper surface 51. Unlike slide 15, however, slide 43 may have a smooth outer surface 53 as it does not mate with another surface.

From FIG. 7 it is seen that washer 41 is an annular ring having a series of thin notches 55 extending radially inward from the outer edge. The width of each notch is preferably slightly less than the diameter of the fibers so that each fiber can form a tight fit within a respective notch. Washer 41 is fabricated from a soft plastic, hard rubber, or similar material having some flexibility and "give" to simplify mounting of the fibers. The number of notches can be varied as desired. I have found, however, that at least 24 notches are desirable. As shown in FIG. 6, more than one fiber can be inserted within each notch. The length of the fibers can be varied so as to form several tiers of light emitting tips.

The inner edge 57 of washer 41 (FIG. 6) is flat and is formed at an angle which corresponds to the angle of surface 51 of lip 49.

In this manner the washer can be secured to the slide simply by placing the former over the slide until the two surfaces 51 and 57 come into contact. To form a permanent connection, the two surfaces 51 and 57 may be joined by a cement or the like.

Chimney 39 can be attached to washer 41 by means of an annular groove 59 which is formed on the top flat surface of the washer. The diameter and width of the groove, as well as its depth, is such that it firmly contains the lower end of chimney 39 and anchors the latter to the washer. If necessary, the two pieces can be joined by a cement.

Although not shown any one of a variety of colored transparent sleeves can be utilized to provide different colors at the outer end of the fibers. In FIGS. 1 through 4, this may be done simply by inserting a colored sleeve within chimney 13. In FIG. 6 the same effect is realized by placing an annular ring of the same transparent material on top of washer 41.

Another preferred embodiment of the present invention is shown in FIGS. 8 and 9. Referring to FIG. 8, there is shown a chimney 61 which is supported by a slide 63. The latter rests upon the upper edge of a candle 65.

Chimney 61, which is open at both ends, may be cylindrical or, as shown, may have a cylindrical lower portion 67 and a convex upper portion 69 which surrounds the candle flame. The chimney is formed of a thermosetting plastic or glass. Its inside surface may be coated with reflective material to concentrate the light from the candle.

Slide 63 has an inwardly extending annular lip 71 which engages the upper edge of the candle, a tubular body 73 which surrounds the candle, and an outwardly

extending lip 75 at the lower end thereof. Lip 75 is sized to support the lower edge of chimney 61 while tubular body 73 maintains axial alignment between the chimney and slide.

Optical fibers 77 are secured to the outer surface of the chimney by means of a flexible strip 79. As shown in FIG. 9, strip 79, in cross section, has a convex outer surface 81 which terminates in a pair of legs 83. These serve to hold the strip to the outside surface of the chimney by means of a cement or the like. A plurality of notches can be formed along the length of legs 83; these notches serve as air vents.

The inside surface of the strip is also convex and is designed to form a light-concentrating lens portion 85. A plurality of holes 86 are formed in the convex surface 81 opposite the lens portion. The inner ends of each fiber 77 is mounted within a respective hole 86 either by friction fit or by means of a cement. The lens 85 is designed to focus the light of the candle flame upon the base of holes 86 thereby maximizing the amount of light reaching and being transmitted through the fibers.

Strip 79 may be formed of a thermosetting plastic and can be extruded as a continuous length then cut into lengths and mounted about the inside surface of chimney 61. The fibers can be inserted before or after the strip has been attached to the chimney. As shown, the outer surface of the chimney may be colored 89. The color extends over the entire surface of the chimney except for a horizontal band where strip 79 is attached. Thus the light emitted from the tips of the fibers contrasts with the light of the candle flame as seen through the chimney.

It should be noted that the cross section of either slide 43 or slide 63 also can be formed in any practical configuration to fit over wax and tallow candles of various shapes and diameters, if cylindrical, and also artificial candles which use butane or other combustible materials as fuel.

What is claimed is:

1. A decorative structure, comprising:

- a plurality of optical fibers, each having a light receiving end and a light emitting end, arranged about a light source;
- a light source consisting of a flame;
- a holder for said optical fibers;
- opening(s) to allow for the entrance of air; to supply said flame light source and to allow for the exit of heat and the products of combustion; and
- a fuel supply for said flame light source.

* * * * *