

United States Patent

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[54] LUMINOUS ENERGIZER FOR FIBER-OPTICAL CABLES

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[51] Int. Cl. F21v 29/00, G02b 5/16

[58] Field of Search. 240/1 EL, 47; 350/96

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[57] ABSTRACT

A luminous energizer for a plurality of fiber-optical cables comprises an aluminum heat-sink block formed with external cooling fins and a chamber closely receiving a halogen lamp. A plurality of passages in the block are aligned transversely of the lamp filament and lie in a common plane therewith. Each passage is provided with a light-conducting rod in heat-transferring relation with the block. An end of a fiber-optical cable can be plugged into the end of each passage to receive light from the rod. Polarizing or color filters may be interposed between the end of the cable and the rod or otherwise built into the block.

1 Claim, 3 Drawing Figures

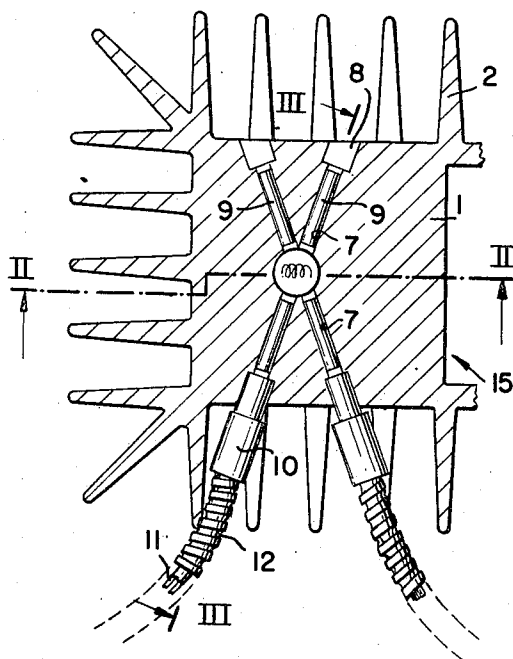


FIG. 1

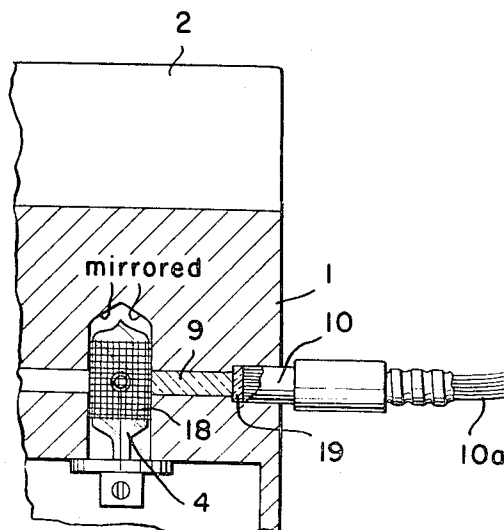
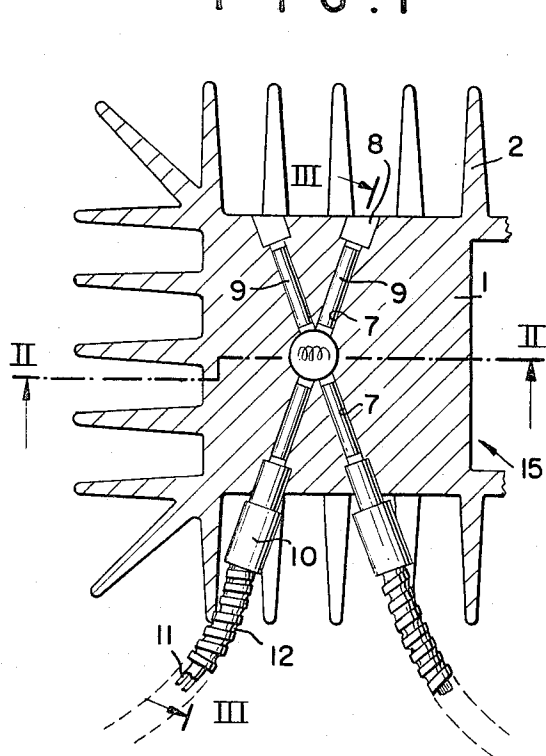


FIG. 3

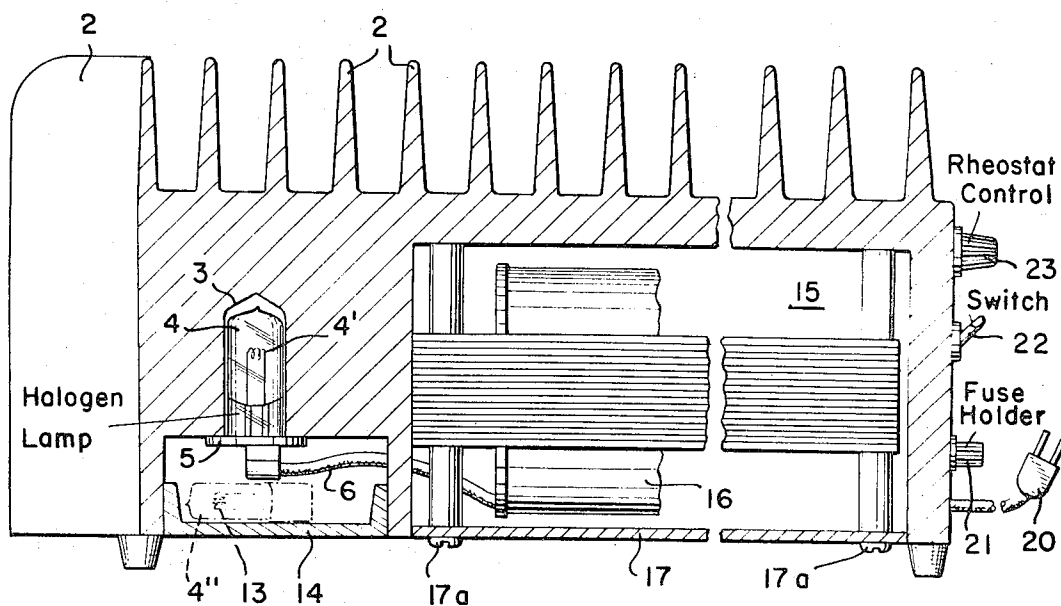


FIG. 2

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LUMINOUS ENERGIZER FOR FIBER-OPTICAL CABLES

1. Field of the Invention:

The present invention relates to an apparatus for optically energizing a light-conducting cable or rod.

2. Background of the Invention:

Light-conducting cables consisting of a bundle of flexible light-conducting fibers that transmit light from one end to the other with very little loss. Because of this property they are often used by doctors and dentists to illuminate body cavities and by persons doing fine mechanical work since the light which can be generated by the so-called "transmitting" end of the cable is virtually heatless and much greater than the amount of light an equivalent, conventional light source could produce. Furthermore, light carried by such cables is useful for any of a multitude of sophisticated electronic devices, for example, by those measuring minute movements. Many other uses are also known, e.g. in the computer industry.

The customary apparatus used to optically energize such a light-conducting cable utilizes a high-power and, therefore, high-wattage hot lamp of the type used in movie and slide projectors. This lamp must, in conventional systems, be cooled by some sort of ventilator and its light is often focused by a lens system. Furthermore, only a rather limited number of cables, four at the most, can be so illuminated and energized.

OBJECTS OF THE INVENTION

It is, therefore, the general object of the present invention to provide an improved apparatus for luminously energizing a light-conducting cable or rod.

A more specific object is to provide such an apparatus which overcomes the above-mentioned disadvantages of excessive size, complexity, heating, and cost.

SUMMARY OF THE INVENTION

The above objects are attained, in accordance with a principal feature of the present invention, by an apparatus having a heat-conducting rectangular parallelepipedal block which is formed with a substantially central chamber along a vertical axis adapted to receive a geometrically similar light-generating lamp, and with a plurality of passages communicating with this chamber and aligned with the lamp. Each passage is provided with a light-conducting body that fits closely therein so that it will dissipate as much of the heat that it absorbs from the lamp as possible.

According to further features of the present invention, the block, which acts as a heat sink for the lamp, is formed of aluminum with cooling fins, and simultaneously serves as the mount for a transformer connected to the lamp to supply it with electric current. The lamp is an incandescent halogen-type (e.g. iodine or xenon) lamp with an elongated filament. For best results it has been found that the passages should be oriented transversely to this filament, and should all lie in substantially the same plane as the filament.

DESCRIPTION OF THE DRAWING

The above and other objects, features, and advantages will become more readily apparent from the following description, reference being made to the accompanying drawing, in which:

FIG. 1 is a horizontal section through an apparatus according to the present invention (along line I—I of FIG. 2);

FIG. 2 is a section taken along lines II—II of FIG. 1, respectively; and

FIG. 3 is a section corresponding to line III—III of FIG. 1, illustrates a modification.

SPECIFIC DESCRIPTION

As shown in FIGS. 1-3, the apparatus comprises an aluminum block 1 formed with a plurality of cooling fins 2 and an upright central bore 3 forming a chamber closely fitting a halogen lamp 4. This lamp 4 is mounted in a socket 5 connected to a power supply described below.

Extending radially outwardly from this central bore 3 in a common plane are four passages 7 in line with the lamp 4 and communicating with the chamber 3. Each passage 7 has a mouth 8 adapted to receive the plug-in end 10 of a fiber-optical cable 11 protected by a sheath 12. In addition, a light-conducting glass rod 9 is tightly fitted and cemented in each passage 7.

In order to allow limited relative expansion and contraction between the block 1 and the lamp 4, a flexible grid or screen cap 18 of metal can be slipped over the bulb 4 to allow maximum heat transfer between this bulb 4 and the block 1 while allowing virtually all of the light to pass.

The inside of the chamber 3 and, if desired, of the passages 7 is provided with a reflecting mirror coating to ensure maximum light transfer.

Thus, light generated by the bulb 4 passes through the rod 7 and, if desired, through a filter 19 before entering the exposed ends of the fibers forming the cable 11. Heat generated by this bulb 4 is absorbed by the aluminum block 1 and dissipated by the fins 2. Heat picked up by the rods 9 is largely dissipated into the walls of the passages 7 so that the heat-sensitive cables 11, whose fibers are independently of smaller cross-section than that of the respective rod, are effectively protected.

As best seen in FIG. 2, the block 1 is formed below the bulb 4 with a recess or compartment 13 covered by plate 14. This recess 13 allows replacement of the bulb 4 and can even serve to store spare bulbs 4'. A second, larger recess or compartment 15 is provided with a cover 17 and houses a transformer 16 which is connected to the normal A.C. source to supply the correct voltage to the small halogen lamp 4 through a flexible cable 6 leading to the removable lamp socket 5.

The lamp 4 has a helically coiled filament 4' which is slightly elongated. To absorb the greatest possible amount of light, the passages 7 are directed toward the broad side of this filament, thus, the passages 7 lie transversely to and in substantially the same plane as the filament 4', forming an acute angle to each side thereof.

Four separate cables 11 can be plugged into the illustrated embodiment. These cables 11, however, can simply be branches of a common, larger cable if greater light intensity is desired. In addition, fuses and a potentiometer can be employed in conjunction with the transformer 16 to vary the light intensity, or a variable transformer can be used.

As can also be seen from the drawing, especially FIGS. 2 and 3, the aluminum block 1, finned on four

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sides surrounding the lamp, is a rectangular paral-
lelopiped and is solid except for the chamber and
downwardly open compartments 13 and 15. The cover
14 of the former is press-fitted into place whereas the
cover 17 is held in place by bolts 17a which pass
through spacer sleeves 17b and also fix the transformer
16 in the compartment 15. The compartment 13 is axi-
ally aligned with the chamber 3, the walls of which hug
the glass envelope of the lamp and conform generally
to the configuration thereof or are separated therefrom
by the thickness of the metal grid. The common plane
of the passages 7 is horizontal and each of these
passages, which may also accommodate diverse optical
components such as the polarizing or color filter 19, is
trained at the filament of the lamp at the same angle.
The fibers of the cable are seen at 10a in FIG. 3. In FIG.
2, there is illustrated the line cord 20 which serves to
connect the apparatus to an electrical outlet. This line
cord is in series with a safety fuse 21, an on-off switch
22 and a rheostat 23 or other voltage control for adjust-
ing the intensity of the lamp. Through the fuse, switch
and rheostat, the step-down transformer 16 is electri-
cally energized to operate the low-voltage lamp.

I claim:

- 1. An apparatus for transmitting light, comprising, in
combination:
a massive solid heat-conductive aluminum block pro-
vided with a chamber generally centrally in said
block and substantially surrounded by portions of
substantially a major fraction of the thickness of
the block;
cooling fins formed on the exterior of said block for
dissipation of heat to the surrounding atmosphere;

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- a high-intensity halogen lamp received in said
chamber and having its envelope closely sur-
rounded by the material of said block, the wall of
said chamber is formed with a light-reflecting coat-
ing;
- a metallic grid in said chamber between said en-
velope and said wall;
- a plurality of generally radially outwardly extending
bores formed in said block and opening into said
chamber, said lamp being provided with an elon-
gated filament, said one of said bores extending
transversely to said filament, said bores including
two bores on each side of a plane through said
body parallel to said filament, the bores on each
side of said plane including acute angles with one
another;
- respective solid light-conducting rods received in
said bores and hugged by the material of said body
for heat transmission thereto, said rods having
inner ends closely juxtaposed with the envelope of
said lamp;
- a flexible fiber-optical light conductor connected to
said body at one of said bores and juxtaposed with
the opposite end of one of said rods, said rods hav-
ing a greater cross sectional area than that of the
fibers of said conductor;
- an electrical transformer mounted on said block and
connected with said lamp for electrically energiz-
ing same; and
- a light filter between said one of said rods and said
conductor.

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