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(54) Optical smoke detectors.

(57) A flash reflector (60) for maximising the intensity of light passing into an air sampling chamber (70) of a smoke detector which enables a reduction in power requirements for the light source. The reflector (60) includes a concave reflection element (61) to focus light from each infinitesimal cross-sectional element of the arc of ionized gas in a flash tube (62), the light output from the whole length of the tube which is optionally of U-shape being focused into the central region (72) of the sampling chamber.

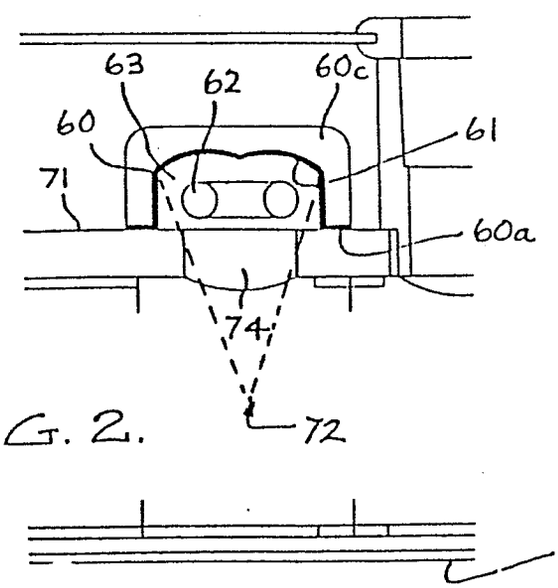

FIG. 2.

EP 0 135 362 A2

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OPTICAL SMOKE DETECTORS

This invention relates to a light source for use in an optical smoke detector of extremely high sensitivity. In particular, a smoke detector as disclosed in my Australian Patent Application No. PG 0820/83 a cross reference to which is incorporated therein, may utilise the light source herein.

The present invention is particularly adapted for use with an axial-light absorber as described in my co-pending Australian application No. PG0821/83 and a sampling chamber disclosed in my co-pending Australian Application No. PG0820/83 both filed 12th August 1983.

The sampling chamber is particularly suited for use with the sampling device or point disclosed in my co-pending Australian Application No. PG0116/83 filed 4th July 1983.

Cross-reference is also made to my co-pending Australian Application No. PG1975/83 filed on 21st October, 1983, disclosing optical air pollution monitoring apparatus and No. PG4919/84 filed on 9th May 1984, disclosing an improved solid state anemometers and temperature, all of which are hereby incorporated herein as part of the disclosure.

With optical smoke detectors it is necessary to provide a light source of low capacity to irradiate any smoke particles that are drawn into the sampling chamber.

Reduction in energy input lengthens the operational life of the light tube and serves to decrease current drain from a standby battery required to maintain operation in the event of mains failure. Reduction in current drain either increases the life of the battery or reduces the capacity requirement and therefore the cost of the standby battery.

The present invention has for its principal objective the provision of a focusing reflector for a Xenon flash tube, optionally of substantially U-shape configuration, wherein the reflector is configured to match

the shape of the Xenon discharge arc, the reflector adapted to be positioned on the side of an air sampling chamber between an ambient air inlet and outlet, the light emission from the arc being focused into the central region of the sampling chamber.

Conveniently, the light is transmitted through an open window in the sampling chamber the perimeter of the reflector body being sealingly attached to the outer surface of the chamber surrounding the window opening to enable circulation of atmosphere within the reflector body when in operation.

The invention will be described in greater detail having reference to the accompanying drawings in which:

Figure 1 is a section view of a sampling chamber showing various components including a light reflector.

Figures 2 and 4 show detailed sectional views of the reflector construction.

Figure 3 is a sectional view on line A-A of Figure 4 and Figure 5 is a sectional view in line C-C of Figure 4.

The reflector body 60 includes a concave U-shaped reflector element 61 designed to focus light inpinging thereon from each infinitesimal cross-sectional element of a U-shaped Xenon flash tube into a central region 72 of air sampling chamber 70. The body 60 is attached to a flat surface of the chamber 70 by sealing flanges 60a and 60b. The flat surface 71 of chamber 70 enables simplified sealing and allows the use of an open window 74 for transmission of light into the chamber. The open window allows for circulation of air around the flash tube 62 thereby preventing the build up of potentially damaging ozone in the device.

Alternatively, the light window 74 may be sealed by clear glass or plastic (not shown) to seal the reflector chamber, whereby the reflector chamber 60 can be filled with an inert gas such as nitrogen. Further, alternatively, a flash tube of quartz glass which prevents the formation

of potentially corrosive ozone, can be used. However, the use of an inert gas is costly whereas the latter alternative prevents detection of scattered ultra violet light, thereby altering the calibration of the sampling tube in respect of certain products of combustion.

The reflector 60 is provided with a mounting base 63 which is preferably in the form of a printed circuit board serving as a mounting for the electrode leads of the flash tube 62. Sealing of the circuit board base 63 to the reflector body 60 by sealing flange 60c and sealing of the flanges 60a and 60b to the side of the sampling tube 71 is preferably achieved by a silicone rubber glue. This allows operation of the chamber at other than atmospheric pressure.

The size of the window aperture 74 and the spacing between the light tube 62 and the window together with the focal distance of the concave curved reflector are each optimized to maximise light intensity within the sampling chamber without unduly increasing spurious or stray incident light reflected off the internal walls of the sampling chamber.

The curvature of the reflecting element is developed to follow the "U" shape of the flash tube such that the light output from the whole length of the tube is focused through the flash window into the centre of the sampling chamber.

Accordingly, the use of the reflector of the present invention directly results in a reduction of energy consumption of the lamp by a factor of 2 and without any loss of sensitivity in the detector.

A commensurate extension in lamp life is achieved.

CLAIMS

1. A focusing reflector for a Xenon flash tube, optionally of substantially U-shape configuration, wherein the reflector is configured to match the shape of the Xenon discharge arc, the reflector adapted to be positioned on the side of an air sampling chamber between an ambient air inlet and outlet, the light emission from the arc being focused into the central region of the sampling chamber.

2. A reflector as claimed in claim 1 wherein the reflector includes a mounting base and peripheral flanges for mounting in sealed relation or said sampling chamber.

3. A reflector as claimed in claim 1 or claim 2 wherein the curvature of the reflector is developed to follow the shape or configuration of the flash tube such that the light output from the whole length of the flash arc is focused into the centre of the sampling chamber.

4. A reflector as claimed in claim 2 or 3 wherein the light is transmitted through an open window in the sampling chamber to enable circulation of the tube atmosphere within the reflector body when in operation.

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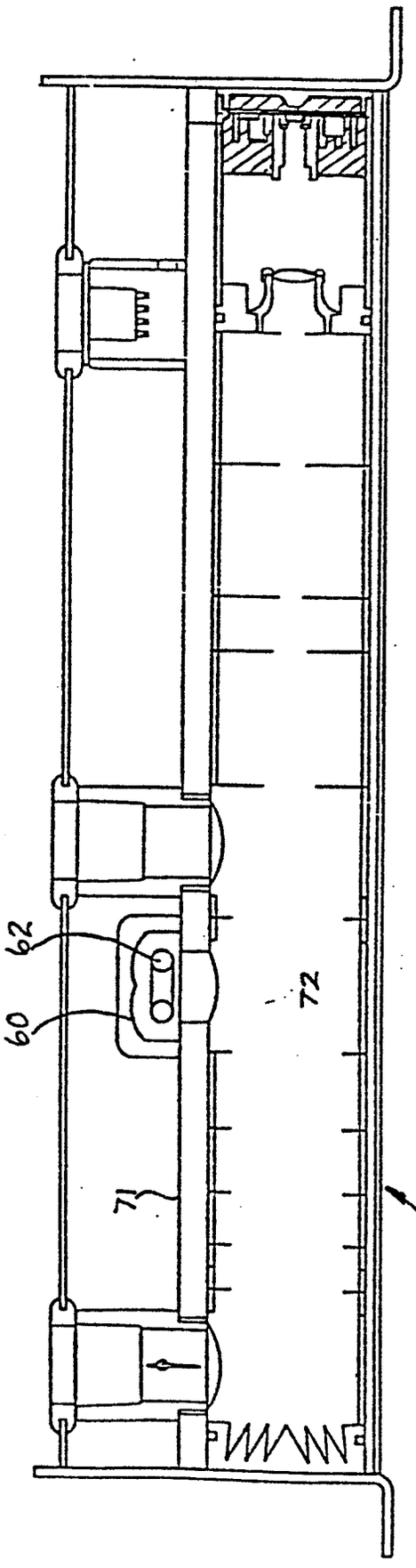


FIG. 1.

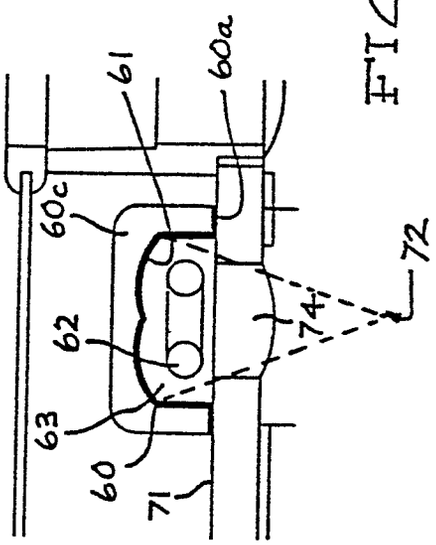
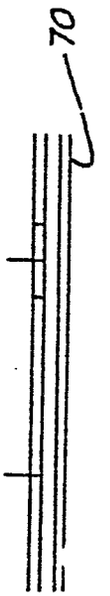


FIG. 2.



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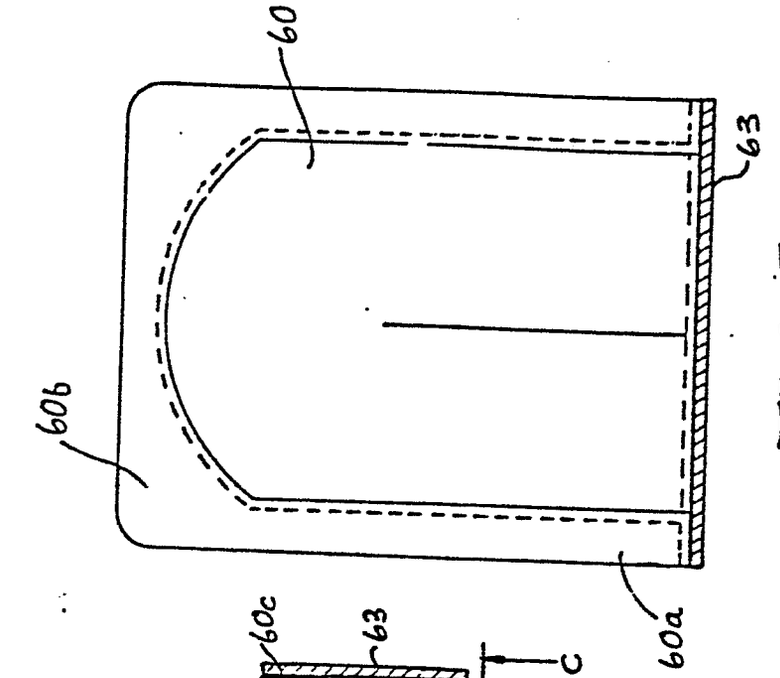

FIG. 5.

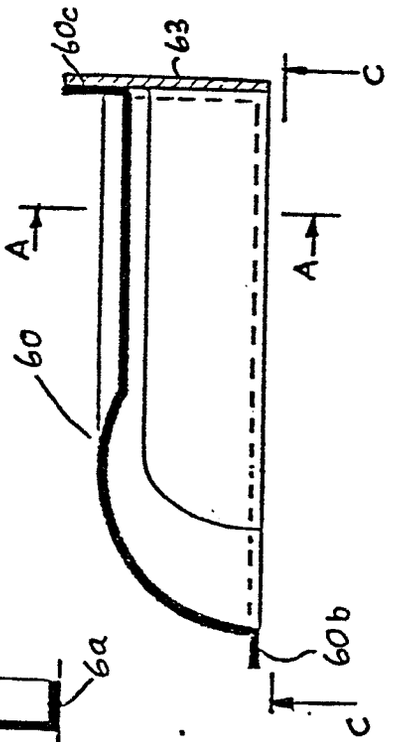

FIG. 4.

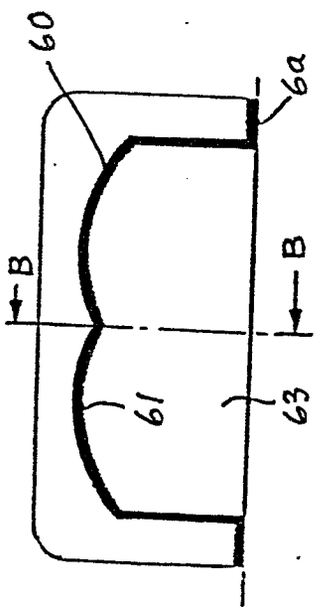

FIG. 3.