Nov. 13, 1956 W. T. FLEMING 2,770,162

APPARATUS FOR VISUALLY DETECTING SUSPENDED MATTER IN FLUID

Filed June 5, 1952 2 Sheets-Sheet 1

Fig. 1.

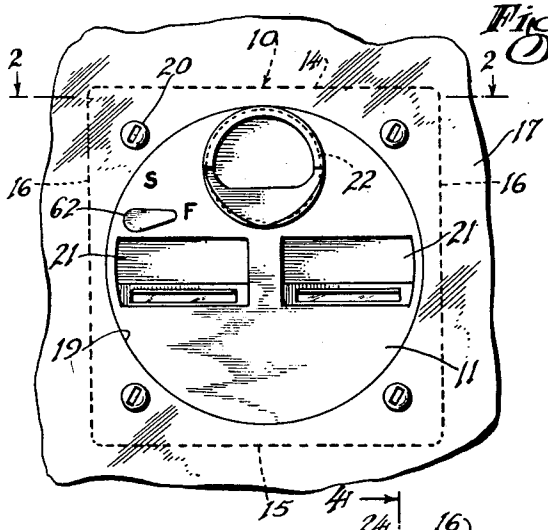


Fig. 4.

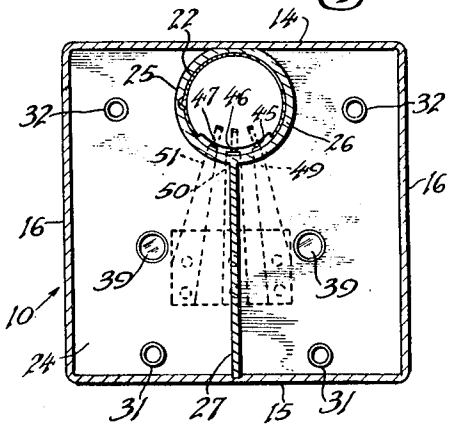


Fig. 2.

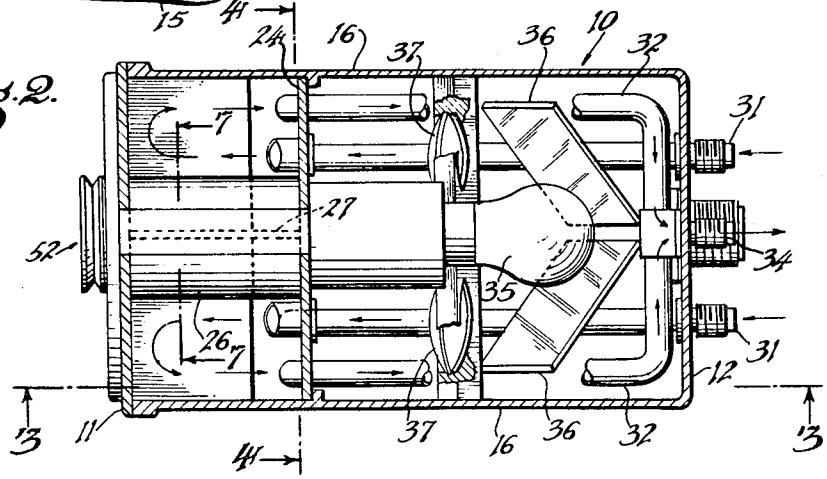
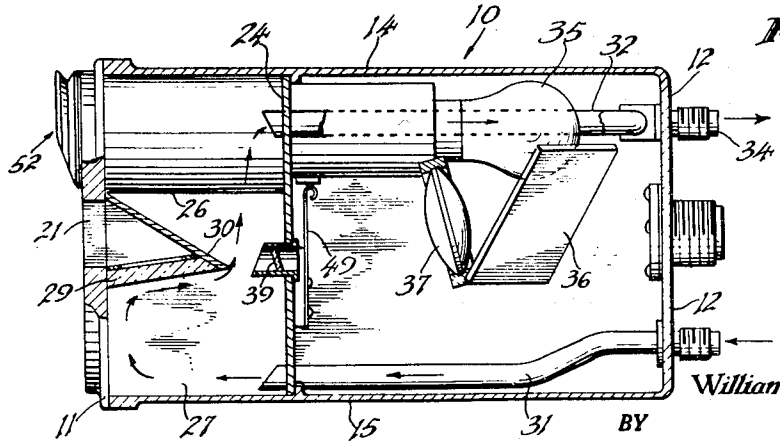


Fig. 3.



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Nov. 13, 1956 W. T. FLEMING 2,770,162

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Filed June 5, 1952 2 Sheets-Sheet 2

Fig. 5.

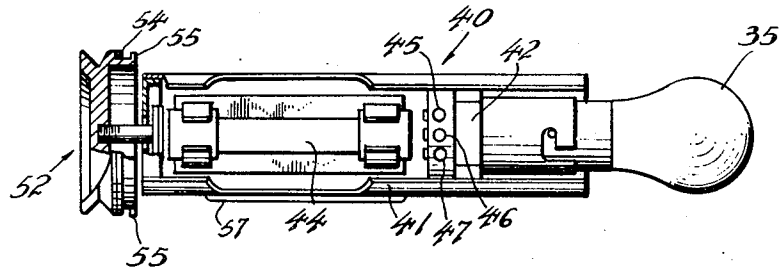


Fig. 6.

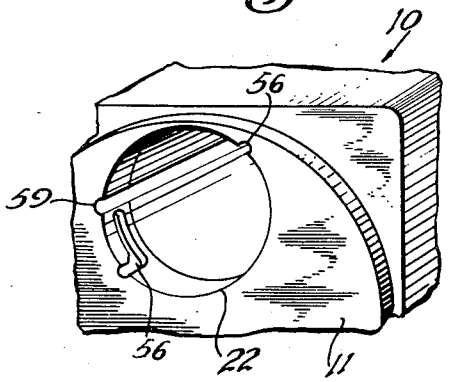


Fig. 7.

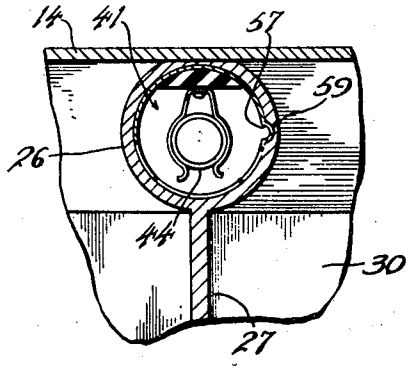
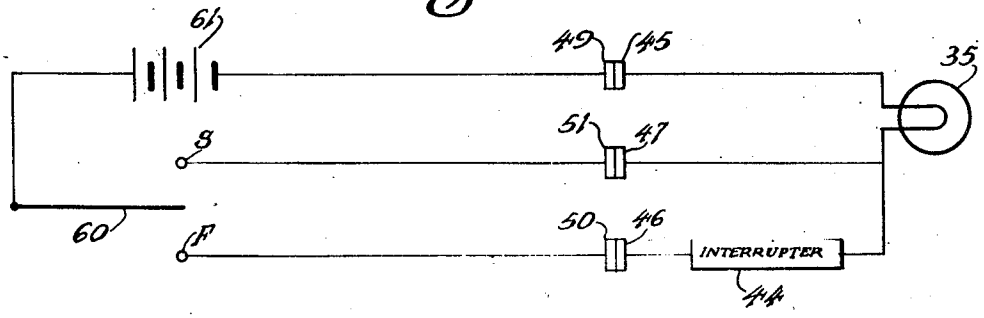


Fig. 8.



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APPARATUS FOR VISUALLY DETECTING SUSPENDED MATTER IN FLUID

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Application June 5, 1952, Serial No. 291,952

2 Claims. (Cl. 88—14)

The present invention relates to apparatus for visually detecting suspended matter in fluid, such as smoke in air, and, more particularly, is concerned with improvements in such apparatus which facilitate the servicing and maintenance thereof.

Visual smoke detectors generally are designed to supervise one or several compartments or zones in which smoke may occur, and essentially comprise a chamber through which a stream of air withdrawn from a zone or compartment is passed, a source of light including an electric lamp for directing a beam of light through the chamber in a manner to illuminate smoke particles in the stream, and a window for observing at least a portion of the stream to visually detect such illumination of smoke particles. In order to more readily detect illuminated particles, the light beam is intermittently interrupted, preferably by means of a current interrupter connected in the lamp circuit.

Heretofore, it has been proposed to utilize visual smoke detectors which are adapted to be installed on the instrument panel of aircraft or other craft or vehicles where the space for such apparatus is extremely limited. Consequently, such apparatus is compact in construction and arrangement, and is more or less permanently mounted in its place, whereby removal thereof or access to the interior of the chamber involves considerable difficulty in the event the lamp or the current interrupter requires replacement.

Accordingly, an object of the present invention is to provide apparatus of the foregoing character which is of such improved construction that the lamp and/or the current interrupter or other expendable elements are readily accessible for replacement or repair.

Another object is to provide such improvements which serve to properly position the lamp in the optical system.

A further object is to provide such improvements in a simple, practical and economical manner.

Other and further objects of the invention will be obvious upon an understanding of the illustrative embodiment about to be described, or will be indicated in the appended claims, and various advantages not referred to herein will occur to one skilled in the art upon employment of the invention in practice.

In accordance with the invention, the foregoing objects are generally accomplished by providing a unit including a housing removably positioned in an opening of the detector casing, a lamp socket carried by the housing, a lamp connected in the socket, a current interrupter (if desired) carried by the housing and in electrical connection with the lamp socket, circuit establishing contact means associated with the housing and the detector casing, a closure for the casing opening at the outer end of the housing, and means for orienting the contact means and/or the lamp.

A preferred embodiment of the invention has been chosen for purposes of illustration and description, and is shown in the accompanying drawings forming a part of the specification wherein:

Fig. 1 is a front elevational view illustrating a smoke detector in accordance with the present invention as seen when mounted on the instrument panel of a craft or vehicle.

Fig. 2 is a sectional view taken along the line 2—2 on Fig. 1 illustrating the interior of the detector as seen from the top thereof.

Fig. 3 is a sectional view taken along the line 3—3 on Fig. 2.

Fig. 4 is a sectional view taken along the line 4—4 on Fig. 2.

Fig. 5 is a plan view of the removable unit as seen from the bottom thereof.

Fig. 6 is a fragmentary perspective view illustrating means for effecting securement of the unit to the detector casing.

Fig. 7 is a sectional view taken along the line 7—7 on Fig. 2 illustrating means for orienting the unit.

Fig. 8 is a wiring diagram illustrating the electrical circuit in which the lamp is connected and the cooperating contact means for establishing this circuit.

Referring to the drawings in detail and more particularly to Figs. 1 to 4 thereof, there is shown a smoke detector including a generally rectangular casing **10** which has a front wall **11**, a rear wall **12**, a top wall **14**, a bottom wall **15** and side walls **16**. As shown in Fig. 1, the casing is adapted to be mounted on an instrument panel **17** having a circular (or other shaped) aperture **19** by securing the front wall of the casing to the back of the panel by screws **20** so that a substantial area of the front wall is visible through the aperture.

The smoke detector, by way of example, is illustrated herein as being of the type which provides for supervision of two zones or compartments, and, for this reason, the front wall **11** of the casing has two window openings **21**, each of which enables the air samples respectively withdrawn from the zones to be viewed therethrough. These window openings are arranged side by side and preferably are generally rectangular. The front wall also has a circular opening **22** at the middle thereof and above the openings **21**, the purpose of which will become apparent hereinafter.

The forward end of the casing **10** is divided into two isolated sample receiving chambers by a generally rectangular plate or partition **24** having its side edges in air-tight connection with the inside of the top, bottom and side walls of the casing, respectively, and having a circular aperture **25** (Fig. 4) in coaxial alignment with the opening **22**, a cylindrical tube **26** extending from the opening **22** to the aperture **25** and being in air-tight connection with the inside of the top wall of the casing along its length at the upper part thereof, and a rectangular middle plate or partition **27** having its side edges in air-tight connection with the inside of the front and bottom walls, the partition **24** and the lower portion of the tube **26**.

Each of the openings **21** is provided with a V-shaped window structure positioned between the middle partition **27** and a side wall of the casing, respectively, which structure comprises a rearwardly and upwardly inclined transparent member **29** (Fig. 3) extending from the lower edge of the opening **21** and a rearwardly and downwardly inclined opaque member **30** extending from the upper edge of the opening **21** having its inner end in air-tight connection with the inner end of the transparent member **29**.

The air sample receiving chambers just described, each are further provided with means for circulating the air sample therethrough. To accomplish this, an inlet conduit **31**, connected to the zone from which the sample is taken (not shown), extends through the rear wall of the casing and the partition **24**, and an outlet conduit

32 extends from each chamber through the partition 24. These outlet conduits merge at the rear of the casing, and a common outlet conduit 34 extends through the rear wall of the casing to a suction device (not shown) for inducing the flow of air.

The air sample in each chamber is adapted to be illuminated by a light source or lamp 35 and means for providing a beam of light for each chamber including a mirror 36, a lens 37 and a window or lens 39 in the partition 24 (Figs. 2 and 3) which are constructed and arranged to direct the light beam below the transparent member 29.

As shown in Fig. 5, the lamp 35 is associated with a readily removable unit 40 which facilitates replacement of the lamp in the event it burns out, without unmounting the casing 10 or otherwise opening the same to have access to the lamp. This unit includes a generally tubular, partly cylindrical housing 41, having a lengthwise opening at the bottom thereof, which is slidably positioned in the tube 26 with its inner end extending rearwardly beyond the partition 24, and includes a lamp socket 42 at the inner end of the housing in which the lamp 35 is connected in such a manner that it is positioned in the casing with its filament between the two mirrors 36. If desired, the housing 41 may also include a current interrupter 44 which is accessible for replacement through the lengthwise opening of the housing. In order to facilitate electrical connection of the lamp and the current interrupter in a circuit described hereinafter, the socket has contact elements 45, 46 and 47 adapted to engage contact elements 49, 50 and 51, respectively, mounted on the rear wall of the partition 24 (Figs. 3 and 4).

Insertion and withdrawal of the unit 40 is facilitated by a closure 52 at the outer end of the housing 41. This closure also serves to close the opening 22 and may be provided with a gasket 54 for forming an air-tight seal. The unit 40 may be frictionally retained in its operative position or, as shown, may be more positively locked in such position by means such as a bayonet joint including projections 55 on the closure cooperating with bayonet slots 56 formed in the casing front wall adjacent the opening 22 (Fig. 6). If such securement is desired, the closure is linked to the housing in a manner to permit relative rotative and longitudinal movement between these parts so that the closure turns independently of the housing. A further advantage of this construction is that the interlock between the closure and casing serves to longitudinally orient the contact elements with each other and the lamp with the mirrors.

The housing 41 also is oriented about its longitudinal axis to insure proper alignment and engagement of the contacts 45, 46 and 47 with the contacts 49, 50 and 51, respectively. This may be accomplished by a tongue and groove arrangement such as shown in Fig. 7, which comprises a longitudinal groove or recess 59 in the tube 26 and a longitudinal key, projection or tongue means 57 on the housing.

In Fig. 8, a circuit is shown which illustrates the manner in which the lamp 35 and the current interrupter 44 may be connected through the contact elements with provision for a steady or flashing beam of light. In the portion of this circuit contained in the unit 40, one terminal of the lamp is connected to contact element 45, one terminal of the current interrupter is connected to contact element 46, and the other terminal of the lamp and of the interrupter are both connected to contact element 47. In the portion of this circuit associated with the casing 10, a single-pole-double-throw switch 60 has its switch arm connected to one terminal of a battery 61 or other source of electrical energy and has one pole S (steady) connected to contact element 51 and has its other pole F (flash) connected to contact element 50, and contact element 49 is connected to the other terminal of the battery. Thus, when the switch arm engages the pole S, steady current is supplied to the lamp through contact elements 45, 49, 47 and 51, the current interrupter being out of this circuit; and, when the switch arm engages the pole F, interrupted current is supplied to the lamp through contact elements 45, 49, 46 and 50 and the interrupter.

As shown in Fig. 1, the arm of the switch 60 may be controlled by a pivotally mounted lever 62 on the front wall of the casing, the indicia S and F indicating the position of the switch arm.

From the foregoing description, it will be seen that the present invention provides an improved smoke detector or the like wherein the lamp and/or current interrupter are mounted for easy replacement thereof in a simple, practical and economical manner.

As various changes may be made in the form, construction and arrangement of the parts herein, without departing from the spirit and scope of the invention and without sacrificing any of its advantages, it is to be understood that all matter herein is to be interpreted as illustrative and not in any limiting sense.

I claim:

1. In apparatus for visually detecting suspended matter in a stream of fluid, the combination of a casing having an opening in the front wall thereof and having a transverse partition dividing the casing into forward and rearward sections formed with a circular aperture in coaxial alignment with the opening, a cylindrical tube extending between the opening and the aperture, electrical contacts in the casing adjacent the inner end of said tube, and a forward to rearward extending partition depending from said tube to the bottom of said casing and extending between said transverse partition and said casing front wall for dividing the forward section of said casing into a pair of isolated chambers, a window structure in each of said isolated chambers including a rearwardly and upwardly inclined transparent member; means including conduits extending through said transverse partition for circulating a stream of fluid through each of said chambers and adjacent said transparent members, a pair of windows in said transverse partition constructed and arranged to direct a light beam past said transparent members and through the portion of said streams adjacent said members; a pair of reflectors mounted in the rearward section of said casing for directing a light beam through each of said windows; and a unit including a generally tubular housing removably positioned within said tube, a lamp socket carried by said housing element at the inner end thereof including electrical contacts for engaging said first mentioned contacts, a lamp in operative connection with said socket positioned in the rearward section of said casing adjacent each of said reflectors for directing a beam of light thereon, said tube and said unit having a cooperating orienting means for effecting engagement of said respective electrical contacts, and a closure for said casing front wall opening mounted at the outer end of said housing.

2. In apparatus for visually detecting suspended matter in a stream of fluid, the combination of a casing having an opening in the front wall thereof and having a transverse partition dividing the casing into forward and rearward sections formed with a circular aperture in coaxial alignment with the opening, a cylindrical tube extending between the opening and the aperture, and a forward to rearward extending partition depending from said tube to the bottom of said casing and extending between said transverse partition and said casing front wall for dividing the forward section of said casing into a pair of isolated chambers; a window structure in each of said isolated chambers including a rearwardly and upwardly inclined transparent member; means including conduits extending through said transverse partition for circulating a stream of fluid through each of said chambers and adjacent said transparent members; a pair of windows in said transverse partition constructed and arranged to direct a light beam past said transparent members and through the portion

of said streams adjacent said members; a pair of reflectors mounted in the rearward section of said casing for directing a light beam through each of said windows; and a unit including a generally tubular housing removably positioned within said tube, a lamp socket carried by said housing element at the inner end thereof, a lamp in operative connection with said socket positioned in the rearward section of said casing adjacent each of said reflectors for directing a beam of light thereon.

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