

SAFETY/WARNING DEVICE

Field of the Invention

This invention relates to a hazard/safety warning device for indicating the presence of a hazard and/or the location of a person or object, particularly, though not exclusively, in abnormal situations.

Background of the Invention

Hazard/safety warning devices are used in a multitude of applications to indicate the location of a hazard such as a toxic or an inflammable spillage on a roadway; to warn drivers of a disabled vehicle on a roadway; to warn of a fire hazard; to illuminate a desired path such as an airport runway (particularly in remote areas); and other similar uses including the indication of a safe landing zone for medical and/or emergency evacuation helicopters; and to indicate the location of people or objects in situations of reduced visibility.

A commonly used hazard/safety warning device is a pyrotechnic flare. These flares glow very brightly but have numerous disadvantages. Some of these disadvantages include their very short operational life following ignition, and their comparatively short shelf life. They are also hazardous to use in certain situations such as in or near combustible materials, or in or near woods or parklands, where the risk of accidental fires is always present. They can also harm a user or other persons due to their high temperatures, sparks, and toxic and/or noxious fumes given off when burning. Other disadvantages of such devices include their susceptibility to damp, their comparative ineffectiveness in very wet conditions, their need to be held or supported by a user in order to be effective, and the fact that once ignited they can be used only once. They can also be difficult to extinguish if it becomes desirable to do so.

Another commonly used hazard/warning device is shown in US Patent 4,447,802 to Bose. This shows a flashing orange light located within a metallic or plastic housing such as has been used by local councils and road repairers for many years. These are relatively bulky, heavy and expensive. Because of their weight and bulk, these devices are not suitable to be carried by a user as a safety location device. They are also intended to be stood on a flat base and are, therefore, quite easily knocked over, which reduces their effectiveness (particularly on uneven terrain). They are also designed to have new or recharged batteries replaced upon discharge of the current batteries. As a consequence, there is an element of ongoing maintenance in their use, along with an element of unreliability due to connection defects between the battery terminals and the conductors supplying the lamp device.

Non-illuminating devices are also often used as hazard/safety warning devices. Such devices include reflective strips, reflective triangles and the like. These devices are adapted to reflect incident light such as that emitted from the headlight of a vehicle. The usefulness of such devices at night in the absence of any illuminating light is minimal.

- 5 US patent 5,122,781 to Saubolle discloses a hazard warning device incorporating a stem-like body having a strut assembly similar to an umbrella frame which is able to be deployed between a folded condition and a deployed condition in which the struts form a tripod support for the device. Mounted on top of the stem-like body is a lens containing a light emitting diode. This device overcomes many of the above problems in relation to
10 pyrotechnic flares in that it does not operate by means of combustion. Both the shelf life and the operational life of such a device are also greater than those of pyrotechnic flares. However, this device does have several limitations. The device is supported by the tripod which needs to be deployed by moving the struts from the folded condition to the deployed condition and carefully placed on the ground so that it stands upright. This can be time-
15 consuming, especially where a large number of the devices need to be laid out. There is nothing enabling the device to re-orientate itself in the upright position if it tips over whilst being placed in position. In conditions of high wind or running water, there is nothing to enable the device to be secured in position, nor is the device sealed which limits its useability in abnormal situations.
- 20 In the light of the abovementioned limitations in the devices known in the prior art, the present invention is directed towards providing a hazard/safety warning device which is suitable for use in a wide range of hazard/safety situations. The invention is also directed towards providing a hazard/warning device which is easy to use.

Summary of the Invention

- 25 According to the present invention there is provide a hazard/safety warning device including:

an-elongated body;

illumination means located at one end of the elongated body; and

- engagement means on the body, distant from the illumination means, adapted to
30 releasably engage a supporting means for supporting the device in a desired orientation.

- The engagement means preferably cooperates with complementary engagement means in the supporting means. These engagement means may include protrusions and corresponding recesses. For instance, the engagement means on the elongated body may
35 include substantially horizontal protruding ribs and the complementary engagement means

may also include slots. Additionally, the complementary engagement means may include a recess for receiving an end of the elongated body, preferably in a snug fit. The complementary engagement means may further include a resilient tongue adapted to rest against one of the protruding ribs to further inhibit removal of the end of the body from the
5 recess.

The device of the present invention may be combined with a number of alternative supporting means. One such supporting means includes a base body which can sit upon a substantially flat surface. The base body, when combined with the warning device, is self-righting to maintain the warning device upright. Preferably, the base body is substantially
10 hemispherical or frusto-hemispherical and includes a weight, such as cast iron or steel or some other suitable material, to facilitate the self-righting feature.

The base body preferably has a substantially vertical, centrally-located recess for snugly receiving an end of the elongated body of the warning device. Preferably, the snug fit will be sufficiently firm to inhibit the warning device from disengaging from the base body
15 except with substantial force by a user. The snug fit may be achieved by ribs on the elongated body and/or adjoining walls of the recess being resilient. In this case the walls of the substantially vertical recess may include a protrusion or shoulder which may be displaced, by virtue of the resilience of the ribs and/or the walls, when a rib of the elongated body passes the protrusion or shoulder.

Alternatively, the supporting means may be a spiked member having a pointed end adapted for insertion into the ground and a distant end which includes the corresponding engagement means for engaging with the elongated body of the warning device. The corresponding engagement means may be a collar member dimensioned to snugly receive
20 an end of the elongated body. The collar member may further include a resilient tongue adapted to rest against a rib of the elongated body to further inhibit disengagement of the warning device from the spiked member.
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The supporting means may alternatively be a strap for securing the warning device to a body or a person. In this case, the engagement means on the warning device may be two arms on opposed sides of the elongated body which extend substantially parallel with the
30 axis of the elongated body. Preferably, these arms may be biased to press against the respective sides of the elongated body in order to grip the strap securely.

In a further preferred aspect of this invention, the illumination means includes a globe or a light emitting diode located within a fresnel lens. The lens may be substantially cylindrical although having a gradually diminishing diameter as the sides extend from opposed ends of
35 the lens to the centre thereof. The sides of the lens have circular grooves and ridges which extend about the lens. In a preferred aspect, the top of the lens may be substantially flat or

slightly curved having coaxial circular grooves and ridges located thereon. The lens is designed and configured to produce a horizontal annulus of light for use in illuminating roads, pavements and other substantially horizontal surfaces. The top of the lens is designed and configured to operate like a torch, emitting a divergent beam in a substantially axial direction.

The lens may be dyed orange, red, blue, green or any other colour to make it appropriate for its designated purpose. The light source may incorporate a standard krypton filled filament lamp, or one or more light emitting diodes.

The illumination means may be operable by any suitable mechanism such as a switch. In one aspect of the invention, the illumination means is activated by rotating the fresnel lens about its axis bringing the electrical contacts, necessary to complete an electrical circuit with batteries held within the elongated body, into contact. In an alternative switching system, the contacts may be enclosed in an inert atmosphere and operated by a permanent magnet device such as, for example, a reed switch operated by the magnet.

In this aspect of the invention, the warning device may further comprise a tab located, for instance, on the side of the body, which is adapted to snap off when the fresnel lens is rotated for the first time, thereby indicating to a user whether the device is new or has been used or otherwise tampered with. The design of the lens where it attaches to the body may include a sealing device such as, for example, an O-ring, so that the lens assembly is free to move but can still remain safe to use. Preferably, the design of the lens is such that it can be in two or more layers or parts so that if one fails for any reason (eg. impact) the second or subsequent parts will maintain the integrity of the device.

Brief Description of the Drawings

The invention will now be described with reference to the attached drawings in which:

Figure 1 is a perspective view of a hazard/safety warning device according to a preferred embodiment of this invention;

Figure 2 is a perspective view of the device of Figure 1 with the illumination means removed;

Figure 3 is a side view of the portion of the device shown in Figure 2;

Figure 4 is a perspective view of an illumination means suitable for use in the device of this invention;

Figure 5 is a side cross-sectional view of an illumination means suitable for use in the device of this invention;

Figure 6 is a side cross-sectional view of the device of Figure 1 shown in engagement with a base body;

Figure 7 is a perspective view of the base body shown, in cross-section, in Figure 6;

Figure 8 is a side view of the base body of Figure 7 showing its internal structure;

5 Figure 9 is a perspective view of the device of Figure 1 shown in engagement with a spiked member;

Figure 10 is a perspective view of the device of Figure 1 shown in engagement with a strap.

10 The device illustrated in Figure 1 includes an elongated body 1, a fresnel lens 2 and a series of substantially parallel, longitudinally displaced ribs 3 on the elongated body 1. The elongated body 1 has side-arms 4 on opposite sides thereof. The elongated body 1 is of substantially circular or oval cross-section although it includes longitudinally extending flat surfaces 5 on opposite sides thereof, which are located at approximately 90° from the side-arms 4. These flat surfaces 5 are adapted to contain written information and/or
15 markings for a user to record the number of hours which the device has been operated (in order to provide an indication of the remaining battery life). The elongated body 1 has a generally flat base 6. The elongated body 1 also has a tab 7 located immediately beneath the fresnel lens 2 which is designed to snap off when the device is operated for the first time by rotating the lens 2 in order to complete the electrical circuit. When the tab 7 has
20 been snapped off, a user will be able to recognise that the device has previously been used or tampered with.

Figures 2 and 3 show the elongated body 1 detached from the fresnel lens (not shown). At the top end of the elongated body 1 is a connecting means 8 for connecting the elongated body 1 to the fresnel lens 2. Beneath the connecting means 8 is an annular recess 8A for
25 receiving an O-ring. The top of the elongated body 1 is circular to enable the fresnel lens 2 to partly rotate about it. Adjacent the top of the elongated body 1 are radially displaced slots 9 for receiving corresponding projections on an internal surface of the fresnel lens adapted to guide and limit rotational movement of the fresnel lens 2 relative to the elongated body 1.

30 As shown in Figure 3, the side-arms 4 are affixed to the elongated body 1 adjacent the top thereof and extend downwardly substantially parallel with sides of the elongated body 1. The inner surface of each arm 4 and the opposed surface of the elongated body 1 have small protrusions 10 which serve to hold a strap passing between the arms 4 and the elongated body 1 in a more secure manner. Figure 10 shows a strap attached to the
35 illustrated warning device by means of the side-arms 4.

Figures 4 and 5 show suitable fresnel lens structures for the illumination means of this invention. These figures show a substantially (although not entirely) cylindrical lens having a top surface 11 and a side surface 12. The side surface 12 contains a series of annular grooves 13 and ridges 14 extending about the side surface 12. The top surface 11 has a number of concentric circular grooves 13 and ridges 14.

Figure 6 shows the warning device positioned within a base body 15. Figure 6 also shows an O-ring 8B positioned within the annular groove 8A. The O-ring is incorporated to prevent ingress of flammable or destructive gases or liquids from entering into the warning device. This makes the warning device better suited for use in abnormal situations such as, for example, hazardous environments.

Figure 6 also shows two batteries 21 located co-axially within the elongated body 1. A switch contact 30 touches one terminal of the batteries adjacent the flat base 6 of the elongated body 1. The switch contact 30 extends the length of the batteries 21 to near the top end of the elongated body 1 where a top portion 32 of the switch contact 30 contacts a printed circuit board 31. The printed circuit board 31 also contacts the other terminal of the batteries 21. The printed circuit board 31 contains electrically conductive tracks (not shown) to complete an electrical circuit thereby enabling current from the batteries 21 to pass through the globe or light emitting diode (not shown) and through the switch contact 30. The globe or light-emitting diode is mounted on the printed circuit board 31. When the device is not in operation, the top portion 32 of the switch contact 30 is in contact with an insulated portion of the circuit board. When in operation, that is after the fresnel lens 2 and the circuit board 31 (which is secured to the lens) have been rotated from a non-operational position to an operational position, the top portion 32 of the switch contact 30, contacts the conductive tracks to complete the electrical circuit. The surface of the printed circuit board 31 which contacts the top portion 32 of the switch contact 30 may be coated with an insulating varnish to prevent premature electrical leakage from the batteries 21. The varnish over the conductive tracks will be scratched away by the first rotation of the circuit board 31 relative to the top portion 32 of the switch contact 30 for electrical contact between said top portion 32 and the conductive tracks.

The base body 15 is more clearly shown in Figure 7. Body 15 is substantially hemispherical in configuration. The base body 15 has a flat base section 16 and rounded side portions 17. The base body 15 has a recess 18 which extends from a hole 19 in a top portion thereof. A lower portion of the wall 20 of the recess 18 is configured so as to snugly receive the elongated body 1. The ribs 3 press against the lower portion of the wall 20 in a resilient manner to provide the snug fit.

Suitable weighted material 22, such as cast iron or steel, is located adjacent the base section 16 of the base body 15.

Figure 9 shows the illustrated warning device engaged with a spiked member 23. The spiked member 23 includes an upper collar member 24, a central pipe section 25 and a spike end 26 distant from the collar member 24. The collar member 24 may simply be a rubber connector adapted to snugly fit around a bottom portion of the elongated body 1. The leg section 25 may simply be a piece of standard PVC piping or any other suitable material. The spike end 26 may be a moulded or zinc die cast spike.

The fresnel lens 2 may be made of impact-resistant polycarbonate. The base body 15 is preferably made of an impact-resistant plastic of sufficient resilience and strength to allow the unit to be dropped from a reasonable height, such as 1 metre. The elongated body 1 is also preferably made of an impact resistant plastic.

The warning device of this invention can be used in a number of different ways. It may be used as a hand-held warning device, for instance, by airport personnel when guiding an aeroplane or a helicopter into a parking bay or emergency landing area. The axial rays act as a landing aid for aeroplane or helicopters landing in emergency or unscheduled situations. When used in the hand-held manner, the device can also operate as a torch as indicated above. The device may, alternatively, be placed within a base body in the situations where the device is intended to be placed upon the ground or some other similar surface and where it is desirable that it maintains an upright orientation. The configuration of the base body described herein enables the device to be unloaded from a vehicle onto the ground without any great care or precision being taken to set it in an upright position as this position will be obtained by the self-righting operation of the base body. This aspect of the invention is particularly useful in high wind situations or where the device is likely to be knocked by persons or animals in the relevant vicinity.

The device is also adapted to be fitted to a spiked member in which case it is particularly suitable for use in snow conditions where a number of the devices can be staked out to indicate the line of a roadway or boundary. Similar applications can be made of the device of this invention in flooded areas in which case the length of the spike is determined in order to be sufficient for the illumination means to appear above the water level.

The device of this invention is also adapted to be attached to a strap which can then be connected to a body such as the arm of a user, or a tree.

The above description of the invention is given by way of illustration and is not intended in any way to limit the scope of the invention. It will be apparent to persons skilled in the art that the scope and/or application of the invention is not restricted to the preferred embodiments of the invention described herein.

**CLAIMS**

1. A hazard/safety warning device including:

an elongated body;

illumination means located at one end of the elongated body; and

- 5 engagement means on an end of the body distant from the illumination means and being adapted to releasably engage a supporting means for supporting the device in a desired orientation.

2. A hazard/safety warning device as claimed in claim 1, wherein the engagement means cooperates with complementary engagement means in the supporting means.

- 10 3. A hazard/safety warning device as claimed in claim 2, where in the engagement means includes protrusions and the complementary engagement means in the supporting means is a recess for receiving an end of the elongated body in a snug fit.

- 15 4. A hazard/safety warning device as claimed in claim 3, wherein the complementary engagement means includes a resilient tongue adapted to rest against one of the protrusions to further inhibit removal of the end of the body from the recess.

- 20 5. A hazard/safety warning device as claimed in claim 3 or claim 4, wherein the recess has walls which include a complementary protrusion which is displaced, by virtue of the resilience of the ribs and/or the walls, when one of the protrusions of the elongated body passes the complementary protrusion.

6. A hazard/safety warning device as claimed in any one of claims 1 to 5, wherein supporting means is a base body which is self-righting to maintain the warning device upright.

- 25 7. A hazard/safety warning device as claimed in claim 6, wherein the base body is substantially hemispherical or frusto-hemispherical and includes a weight to facilitate self-righting.

- 30 8. A hazard/safety warning device as claimed in any one of claims 1 to 5, wherein the supporting means is a spiked member having a pointed end adapted for insertion into the ground, and a distant end which includes the complementary engagement means.

9. A hazard/safety warning device as claimed in claim 8, wherein the complementary engagement means is a collar member dimensioned to snugly receive the engagement means.



10. A hazard/safety warning device as claimed in any one of claims 1 to 5, wherein the supporting means is a strap for attaching the warning device to a person or object.
11. A hazard/safety warning device as claimed in claim 10, wherein the engagement means includes at least one arm on the side of the elongated body and which extends substantially parallel with the axis of the elongated body.
12. A hazard/safety warning device as claimed in claim 11, wherein the arm is biased to press against the side of the elongated body in order to grip the strap securely.
13. A hazard/safety warning device as claimed in any one of claims 1 to 11, wherein the illumination means includes a light source located within a fresnel lens, the lens being substantially cylindrical although having a gradually diminishing diameter as its sides extend from opposed ends of the lens to the centre thereof.
14. A hazard/safety warning device as claimed in claim 13, wherein the sides of the lens have circular grooves and ridges extending about the lens.
15. A hazard/safety warning device as claimed in claim 13 or claim 14, wherein the top of the lens is substantially flat having coaxial circular grooves and ridges located thereon.
16. A hazard/safety warning device as claimed in any one of claims 13 to 15, wherein the lens is designed and configured to product a horizontal annulus of light for use in illuminating roads, pavements and other substantially horizontal surfaces; and the top of the lens is designed and configured to operate like a torch by emitting a divergent beam in a substantially axial direction.
17. A hazard/safety warning device as claimed in any one of the claims 1 to 16, wherein the illumination means is activated by rotating the illumination means about its axis to allow electrical contacts to contact each other to complete an electrical circuit with at least one battery held within the elongated body.
18. A hazard/safety warning device as claimed in claim 17, wherein the warning device includes a tab located on the side of the elongated body which is adapted to break off when the illumination means is rotated for the first time so as to indicate to a user whether the device is new, or has been used or otherwise tampered with.
19. A hazard/safety warning device as claimed in any one of claims 1 to 18, wherein there is a substantially gas and water tight seal between the illumination means and the elongated body.
20. A hazard/safety warning device as claimed in claim 18, wherein the seal is an O-ring.



21. A hazard/safety warning device as claimed in claim 17 or claim 18, wherein one of the electrical contacts includes a circuit board rotatable with the illumination means, the circuit board having electrically conductive tracks.
22. A hazard/safety warning device as claimed in claim 21, wherein the electrically
5 conductive tracks have an insulating layer to prevent premature electrical leakage from the battery, the insulating layer being adapted to be removed upon the first rotation of the illumination means relative to the elongated body.
23. A hazard/safety warning device substantially as hereinbefore described with
reference to the accompanying drawings.

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