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(54) Safety torch.

(57) A safety torch is divided into a battery compartment (1) and a sealed, in use, switching and lamp compartment (2) separable therefrom. The compartments are electrically connected by fixed connections (9,10,11) passing sealingly through a common wall of the two compartments. The switching and lamp compartment (2) is openable but automatically sealingly lockable, and a tool may be provided to enable the lock to be opened. The switching and lamp compartment is considered to be an "increase safety" enclosure and the battery compartment an "intrinsic safety" enclosure. Switching a lamp (15) of the torch on or off may be accomplished by relative movement between two parts of the switching compartment.

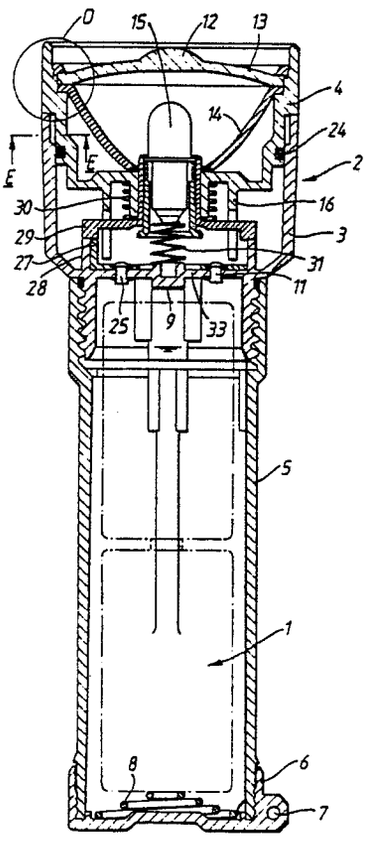

FIG. 1.

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SAFETY TORCH

The present invention relates to safety torches.

Safety torches are intended for use in hazardous, particularly potentially explosive atmospheres, and find use in, for example, the gas industry, the petroleum industry, the fire-fighting service and the like. Some electrical switching processes may involve some spark which could, if not contained or be rendered intrinsically safe, initiate an explosion in such an atmosphere. Sources of heat must be similarly contained. Thus, stringent regulations have been set out for safety torches. These are presently embodied in British Standards BS 4683 and BS 5501 and European Standard EN 50.

Such torches, which term is intended to encompass any portable or wearable light source, or even a fixed lamp, are generally constructed of plastics material which should be substantially unbreakable even in various extremes of temperature and other conditions. Any external parts which must be of metal are of spark free material to avoid sparks should the torch be dropped.

Since such torches are generally powered by dry or rechargeable cells, hereinafter referred to as batteries, there are occasions when, in use in an explosive atmosphere, the batteries must be changed. Hitherto, this has not been possible since the torch must remain integral while in an explosive atmosphere to prevent any danger of ignition. It is one object of the present invention to overcome this disadvantage by providing a safety torch having a separate battery compartment to allow changeover of batteries while the lamp, a potentially dangerous heat source, and switching is maintained in a separable sealed compartment.

This separation of the two compartments has another advantage in that the requirements for a separate battery compartment are less stringent than for a compartment containing a bulb and switch. Each compartment must be subjected to an impact test following which the switch containing compartment must pass a test (under low vacuum) in which a harmful level of dust or moisture must not enter. On the other hand, the battery compartment may even be holed, providing the hole is sufficiently small to deny access to the interior of an operator's finger.

Another advantage of the present invention is that the beam pattern of the torch may be varied without prejudicing the sealed integrity of the unit.

According to a first aspect of the present invention there is provided a safety torch having a battery compartment and a sealed, in use, switching and lamp compartment separable therefrom, and electrically connected thereto by fixed connections passing sealingly through a common wall of the two compartments.

The switching and lamp compartment is openable but automatically sealingly lockable, and a tool may be provided to enable the lock to be opened.

The lamp provided within the switching compartment may be withdrawn only when the seal has been unlocked.

Thus, in terms of explosion proof concepts of protection, the switching and lamp compartment is considered to be an "increased safety" enclosure and the battery compartment an "intrinsic safety" enclosure.

Switching the lamp on or off may be accomplished by relative movement between two parts of the switching compartment.

Said two relatively movable parts may be separated upon unlocking.

The relative movement may be relative rotation or pivoting.

The relative movement may, in addition to switching the lamp on or off, also cause movement of the lamp or one part of the switching compartment relative one to the other, whereby the beam pattern of light emitted may be varied.

The beam pattern may be variable from a narrow concentrated beam to a widely angled beam, or any beam pattern in between.

The switching compartment may incorporate substantially parabolic reflector means surrounding the lamp, located such that the lamp is substantially at the focus of the parabola to give said narrow beam and not at the focus to give said widely angled beam.

According to a second aspect of the present invention there is provided a safety torch having two relatively rotatable portions for switching the torch on and off, and also to give, when on, a variation in beam pattern, said two portions being sealingly lockable to prevent their separation except upon operation of an unlocking tool.

The two portions may be separated to allow changeover of the lamp.

The two portions may form together a sealed switching compartment of the torch which may be connected to a separable battery or power compartment.

Embodiments of the present invention will now be more particularly described by way of example and with reference to the accompanying drawings, wherein:

FIGURE 1 is a cross-sectional view of a safety torch embodying the invention;

FIGURES 2a 2b,2c and 2d show diagrammatically the locking and switching actions;

FIGURES 3a,3b and 3c are scrap views of the locking mechanism;

FIGURE 4 is an elevation looking into one part of a switching compartment of the torch;

FIGURE 5 is a cross-sectional scrap view taken along the line B-B of Figure 4;

FIGURE 6 is a view of one end of the switching compartment;

FIGURE 7 is a scrap view, to a larger scale, of a cross-section in zone D of Figure 1;

FIGURE 8 is a cross-section of a switching compartment of an alternative embodiment;

FIGURE 9 is a section taken along the line A-A of Figure 8; and

FIGURE 10 shows four alternative fastening methods for a clip used with the embodiment of Figures 8 and 9.

Referring now to Figure 1, there is shown a safety torch comprising a battery compartment 1 and a switching compartment 2. The switching compartment is itself composed of a head portion 3 and a lens ring portion 4, the inter-relationship of which will be described in more detail below.

The battery compartment 1 comprises a cylinder 5, screw-threaded at one end to join with the switching compartment 2 and at the other closed by a cap 6, having a hanging loop 7, the cap being preferably joined to the cylinder 5 by adhesive or welding. Access to the interior of the battery compartment 1 may be obtained by unscrewing it from the switching compartment 2. The exterior and interior of the battery compartment 1 are conventional, except that there is no switch as is often found in other torches. The batteries, which may be one or more in number (two being shown for convenience) are biased upwardly (as seen in Figure 1) by spring 8, which acts as one contact, into engagement with a second contact 9 on the exterior surface of the switching compartment where it forms a common wall 33 with the battery compartment.

As can be seen more clearly from Figure 6, contact 9 extends to an edge wall of the head portion 3 and connects to the interior of the head portion by means of stud 10. Spring 8, acting as the other contact of the batteries is connected to stud 11 which passes through the common wall 33 into the interior of the switch compartment. Thus the switch compartment 2 is completely physically separated from the battery compartment 1, which can therefore be removed even in an hazardous area in order to replace the battery or batteries.

The switch compartment 2 comprises, as stated above, a lens ring portion 4 and a head portion 3, which are rotatable with respect one to the other, at least through a portion of a full rotation.

Lens ring portion 4 comprises a lens 12 and coverplate 13 (which may optionally be replaced by a simple coverplate) sealed to the rim of the lens ring. Within the coverplate 13 is a parabolic reflector 14 having an aperture on its axis of rotation to allow insertion of a lamp 15. Rearwardly, referring to the direction of emitted light, of the reflector 14 is an annular cam follower holder 16, the purpose of which will be explained in more detail below. Finally, the lens ring portion comprises a pair of outwardly directed locking dogs 17 (see Figure 2) for connecting the lens ring portion 4 with the head portion 3.

The head portion 3 comprises a screwthreaded extension for connection to the battery compartment 1 and a pair of inwardly directed locking dogs 18 for connection with the lens ring portion 4.

As can be seen from Figure 2, there are four positions of relative rotation between the lens ring portion 4 and the head portion 3, at least some of which may be delineated by means of abutment means 19 (see Figure 4) which operate on a bump to pass principle. Between them, locking dogs 17 and 18 extend through substantially 360° so that, only in position 1 (Figure 2a) can the two portions be separated. Once the lens ring portion is rotated clockwisely (as seen in Figures 2 and 4) to position 2 (Figure 2b), two zones 20 of the dogs overlap and the portions cannot be separated. The portions can be further rotated to positions 3 and 4 (Figures 2c and 2d) where they remain locked together.

The locking mechanism is shown in Figure 3, which is drawn from the opposite side to the views of Figure 2 and thus clockwise rotation tends towards the unlocking position. A short length of spring metal 21 is attached to the lens ring portion 4 to bear against the inside surface of the head portion 3, which is provided at one point with a locking abutment 22 adjacent a through hole 23. In the unlocked configuration, the remote end of the spring 21 lies beyond the locking abutment 22 and the two portions may be assembled. On rotation of the lens ring portion 4 in an anti-clockwise direction (as seen in Figure 3), the remote end of spring 21 passes the locking abutment 22 and thereafter the two portions remain locked by the dogs. Rotation in the opposite sense brings the remote end of the spring 21 into contact with the locking abutment 22 and further rotation in that direction is impossible thereby preventing the dogs from attaining their unlocked disposition. In order to unlock the two portions, a thin elongate tool must be inserted through the through-hole 23 to force the spring 21 towards the lens ring portion 4 and simultaneously, the portions must be rotated. This action will allow the spring to pass by the locking abutment 22 to the unlocked position shown in Figure 3a. Since the required tool should always be kept away from

the hazardous area in which the torch is intended to be used, the switching compartment cannot be opened within the potentially explosive atmosphere. As can be seen from Figure 3c and Figure 1, the space between the two portions is separated from the remainder of the interior of the switching compartment by means of seal 24 to prevent ingress of dust or moisture to the interior of the switching compartment.

Within the head portion 3 is a die cast metallic, and therefore electrically conductive, double cam plate 26, held in position by means of the stud 11 and another stud 25. It is thus connected to the negative terminal of the batteries through stud 11. The cam plate 26 comprises a pair of cams 27 rising in an anti-clockwise direction as seen in Figure 4. Disposed around a portion of the periphery of the cam plate 26 is a pair of abutments 28 of plastics material or other non-conductive material.

A double arm cam follower 29 held for rotation with lens ring portion 4 by means of cam follower holder 16 is biased towards cam plate 26 by means of spring 30. Cam follower 29 is of conductive material and connects with the negative terminal of the lamp 15. Thus, when cam follower 29 is in contact with cam plate 26, electrical continuity is maintained therethrough, returning through the lamp to the batteries via spring 31 and contact 9.

However, in rotation positions 1 and 2, the ends of the cam follower 29 are supported by the non-conducting abutments 28 and thus the lamp is not illuminated. When the lens ring portion is turned to position 3, the cam follower 29 passes from the non-conducting abutments 28 and contacts the cams 27 thus ensuring electrical continuity but at a point where the cams 27 are at a high position. Thus, the centre of the lamp 15 held via the cam follower 29 is located forwardly of the focus of the parabolic reflector 14 and a wide angled beam of light results. As the lens ring portion 4 is rotated further to position 4, the cam follower 29 goes down the slopes of the cams 27 and thereby retracts the lamp 15 towards the parabolic reflector.

At the base of the slope, the centre of the bulb 15 is adapted to be substantially at the focus of the parabolic reflector, and a narrow concentrated beam of light results. At positions between 3 and 4, the light beam may be of varying form.

Figures 8-10 show an alternative embodiment in which the axis of rotation of the switching compartment is arranged at right angles to the battery compartment. In all important respects, this embodiment functions in the same manner as the previously described embodiment. Torches with right angle heads are adapted to be held in pockets or belts and thus a clip 32 may be provided, being attached to the torch by a number of possible methods, shown in Figure 10. The torch has been described and illustrated as being essentially cylindrical. It may, of course, take other shapes and especially, the lamp 15 may be replaced by a strip light or fluorescent tube or even a chemical light source, in which case a rectangular or some other cross section may be appropriate.

Since the switching compartment 2 and the battery compartment 1 are physically separated, the torch is safe and allows the option of changing batteries within a potentially explosive atmosphere if it should be required. The switching compartment 2 cannot be opened except with a special tool which, of course, should be kept away from any potentially hazardous area. Simple rotation between two portions of the switching compartment enables the light to be switched on and off, and also enables a variation in the beam pattern of the light emitted.

Claims

1. A safety torch characterised in that it comprises a battery compartment (1) and a sealed, in use, switching and lamp compartment (2) separable therefrom, and electrically connected thereto by fixed connections (9,10,11) passing sealingly through a common wall of the two compartments.

2. A torch as claimed in claim 1, characterised in that the switching and lamp compartment (2) is openable but automatically sealingly lockable, and a tool is provided to enable the lock to be opened.

3. A torch as claimed in claim 2, characterised in that a lamp (15) provided within the switching compartment (2) is withdrawable only when the seal has been unlocked.

4. A torch as claimed in any one of the preceding claims, characterised in that switching the lamp (15) on or off is accomplished by relative movement between two parts of the switching compartment.

5. A torch as claimed in claim 4, characterised in that said two relatively movable parts are separable upon unlocking, and in that the relative movement is relative rotation or pivoting.

6. A torch as claimed in claim 5, characterised in that the relative movement, in addition to switching the lamp on or off, also causes movement of the lamp or one part of the switching compartment relative one to the other, whereby the beam pattern of the light emitted can be varied, for example from a narrow concentrated beam to a widely angled beam, or any beam pattern in between.

7. A torch as claimed in claim 6, characterised in that the switching compartment incorporates substantially parabolic reflector means (14) surrounding the lamp (15) and located such that the

lamp (15) may be substantially at the focus of the parabola to give said narrow beam and may be not at the focus to give said widely angled beam.

8. A safety torch characterised in that it comprises two relatively rotatable portions, rotation thereof causing switching of the torch on and off, and also to give, when on, a variation in beam pattern, said two portions being sealingly lockable to prevent their separation except upon operation of an unlocking tool.

9. A torch as claimed in claim 8, characterised in that the two portions are separable to allow changeover of a lamp (15).

10. A torch as claimed in either claim 8 or claim 9, characterised in that the two portions form together a sealed switching compartment (2) of the torch which may be connected to a separable battery or power compartment (1).

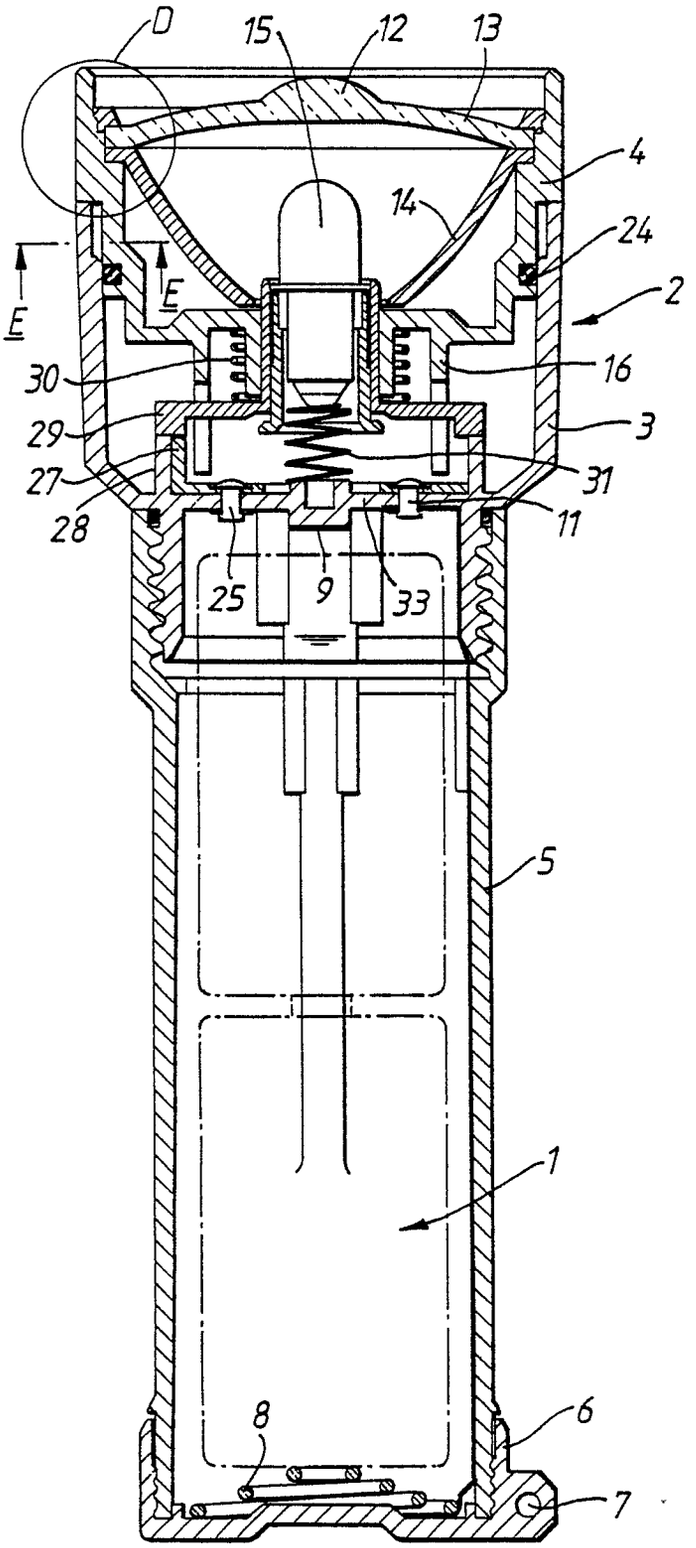

FIG.1.

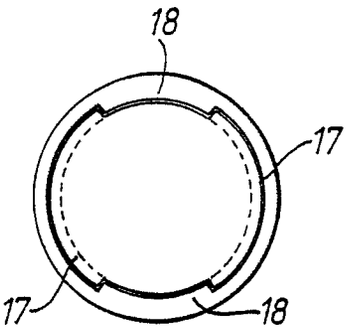

FIG.2a.

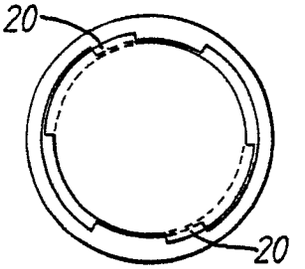

FIG.2b.

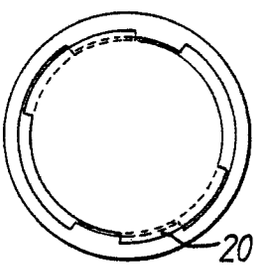

FIG.2c.

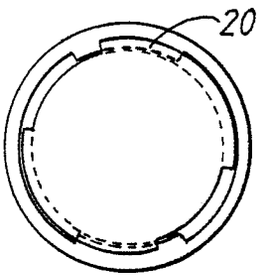

FIG.2d.

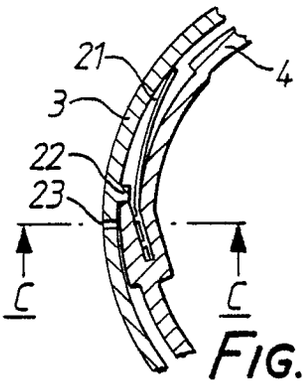

FIG.3a.

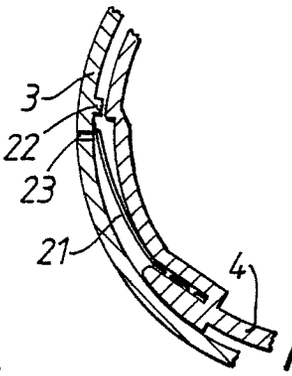

FIG.3b.

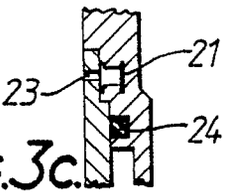

FIG.3c.

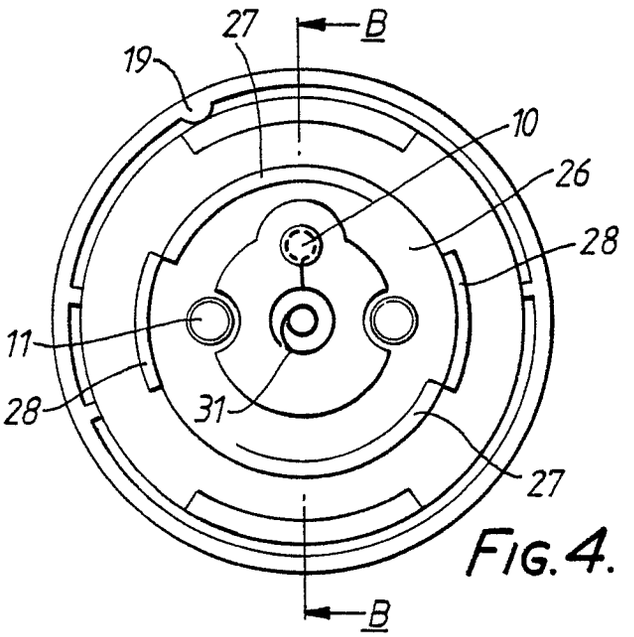

FIG.4.

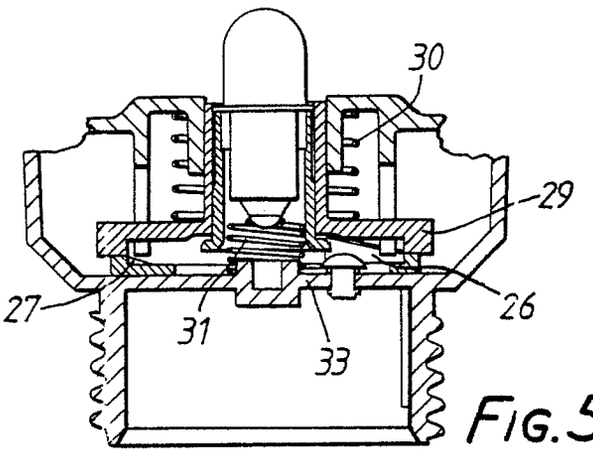

FIG.5.

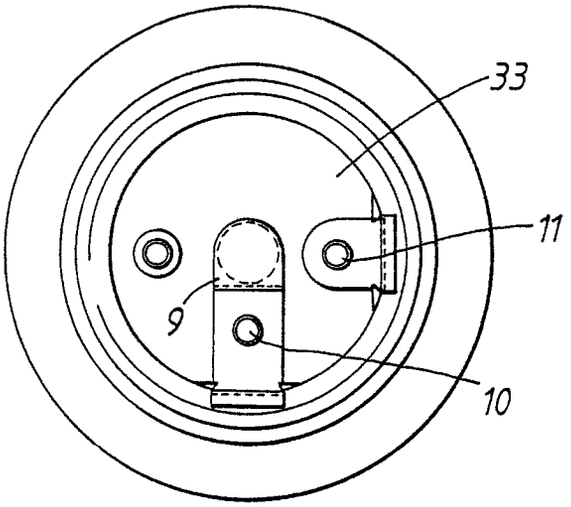

FIG.6.

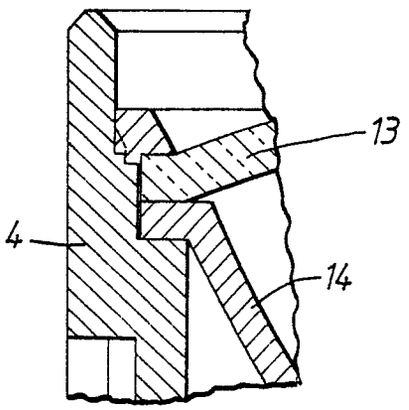

FIG.7.

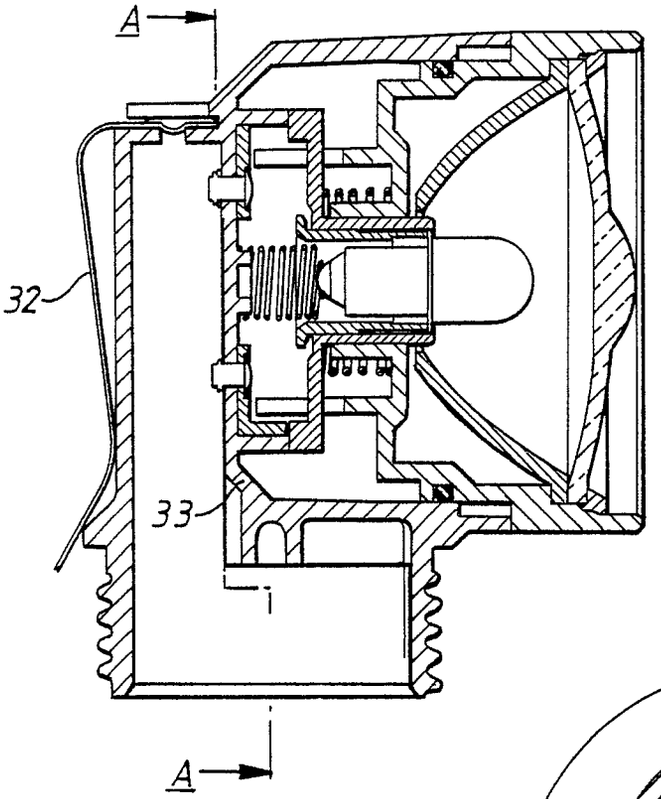

FIG. 8.

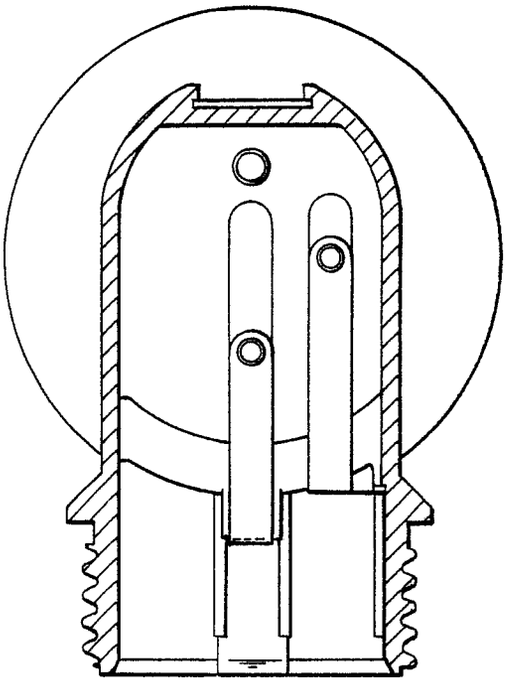

FIG. 9.

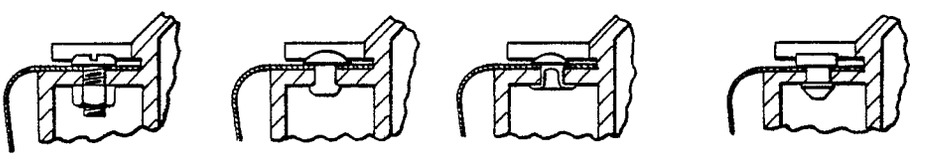

FIG. 10.