Jan. 5, 1943. F. M. NICHOLS 2,307,707

SIGNAL FLARE

Filed May 20, 1939




Fig. 2

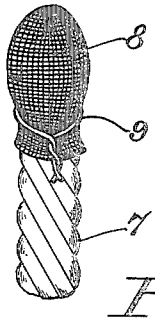



Fig. 3

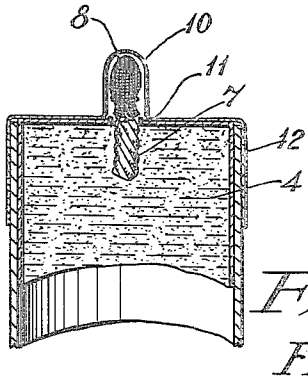



Fig. 4

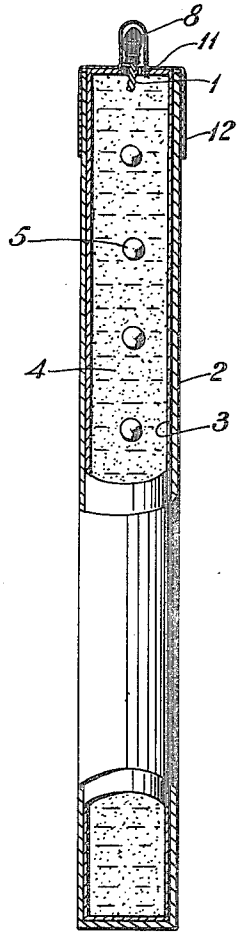



Fig. 1

Frank M. Nichols INVENTOR

BY Paul B. Cochran

ATTORNEY

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# UNITED STATES PATENT OFFICE

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## SIGNAL FLARE

Frank M. Nichols, South River, N. J.

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2 Claims. (Cl. 102—36)

This invention relates to an improved signal flare and more particularly to a pyrotechnic signal flare which is ignitible by exposure to water.

Many disasters at sea involving wrecks or burning of passenger liners and freighters and more recently of transoceanic air-liners, where passengers and personnel have had to take to lifeboats, rafts or individual life-belts have been especially catastrophic, particularly if the disaster occurred at night because no means have been available to signal rescuing vessels or airplanes which might unknowingly have been in the relatively near vicinity and departed because of inability to establish the location of the survivors.

In order to reduce the severity of such tragedies and to eliminate loss of life and prolonged exposure and submersion through failure of rescuers to locate survivors in marine disasters even though at times they may have been in close proximity to each other, I have devised a means whereby a survivor, although temporarily sustaining life with only a life-belt, may clearly signal his location in such a manner that it can be detected at a considerable distance, thus greatly promoting his chances for rescue by vessels or planes within the visibility of the signal.

Under the aforementioned circumstances, particularly when a survivor has only a raft or life-belt, the conventional signal flares would be rendered utterly useless and even if in some manner they are protected from the destructive effects of water, no means are usually available to ignite the flare, since prior to the present invention, direct mechanical ignition by percussion or friction or by application of fire to the flare fuse is required and obviously under many conditions such methods of ignition are quite useless.

My device, however, affords a convenient and certain means for automatically igniting signal flares without the necessity for mechanically applying fire to the flare fuse, thus insuring ignition of the combustible and explosive elements of the flare where such devices are needed to establish location on the surface of bodies of water.

This invention has as a primary object the provision of a signal flare which is automatically ignitible by brief submersion in or contact with water. Another object is the provision of a flare which may be safely stored for extended periods without danger of accidental ignition and without deterioration or inactivation of the ignition medium. Another object of the invention is the provision of a means for igniting signal flares and the like which avoids the need for mechanical application of fire. A further object is the provision of an improved fuse which is ignited by brief submersion in or contact with water. A still further and ancillary object of the invention is the provision of a life-saving device consisting of a life-belt or the like in combination with an automatically water ignitible signal flare.

These objects are accomplished by means of an improved flare comprising a fuse which is partially or wholly coated, impregnated with or embedded in a water ignitible substance, said fuse being in contact at one end with a pyrotechnic substance within the flare structure.

In the accompanying drawing which illustrates the preferred embodiment of my invention:

Figure 1 is a sectional view of the improved flare disposed within a cylindrical container.

Figure 2 represents an enlarged detail of the top of a conventional fuse material embedded in a hereinafter described water ignitible substance.

Figure 3 is an enlarged detail of the preferred and unique confining means consisting of a flexible wire screening enclosing the top of the fuse and the water ignitible substance.

Figure 4 is an enlarged cross-section detail of the top construction of the flare including a removable friction cap of the cylindrical container.

Referring specifically to the drawing: in Figure 1, the treated fuse enclosed in wire gauze 8 and extending into the pyrotechnic elements of the flare 4 and 5 is represented by 1. The fuse unit is closely confined in the close-fitting friction cap 12 of the cylindrical container 2 which holds flare unit 3. When the friction cap 12 is removed from the cylindrical container 2 which may be constructed of glass, light metal or plastic material and the exposed end of the fuse briefly immersed in or contacted with water, the water ignitible substance ignites and burns vigorously and in turn ignites the fuse. The fuse burning through its length ignites the pyrotechnic substance within the flare which may be constructed like an ordinary Roman candle containing a conventional pyrotechnic or other combustible substance 4. As this material burns it forcibly ejects flaming balls 5 which are thrown into the air and become visible at considerable distances.

In Figure 2, the water ignitible material is represented by 6 surrounding one end of a conventional fibrous fuse material 7.

Figure 3 illustrates a means of confining the ignitible end of the fuse which preferably consists of 30 mesh flexible wire screening 8, preferably conforming approximately to the size and shape of the fuse 7 carrying the water ignitible material and held in position by an encircling wire 9. The confining means should be sufficiently porous to permit the penetration of water and yet prevent the water ignitible substance when fused from escaping.

In Figure 4 the friction cap of the cylindrical container is fabricated to closely enclose the top of the improved fuse in order to avoid oxidation of the water ignitible substance by reducing the surrounding air space. A further means of preventing penetration of air from the body of the

flare to the top of the fuse is illustrated by 11 which represents to a close-fitting collar seal forming a part of the enclosing disc cover of the flare which may be conveniently coated with a substance impermeable to air such as a high melting paraffin wax or a pyroxylin lacquer. That part of the fuse extending into the pyrotechnic substance may also be coated or impregnated with wax or the like to further prevent penetration of air to the water ignitible substance. The top removable section of the cylindrical container may if desired be threaded or provided with interlocking means and sealed at the joint with a suitable sealing composition such as a high melting wax or rubber adhesive. The container may be filled with an inert gas such as nitrogen and tightly sealed or if the container is made of glass it may be exhausted after the flare unit has been placed therein and then sealed off under vacuum.

An alternative means of preventing ingress of air to the water ignitible substance contemplates a means whereby the substance may be kept wetted with an inert liquid such as a petroleum hydrocarbon (kerosene). In this case the top disc cover of the flare should be fabricated of an oil-resistant material such as neoprene, a polymerized 2 chloro-butadiene 1,3, and the fuse also coated with a thin film of the same or similar oil-resistant material to prevent migration of the liquid hydrocarbon into the pyrotechnic substance in the main flare body. An absorbent substance such as cotton may be wetted with a petroleum hydrocarbon and placed inside the cap over and around the fuse unit outside the wire mesh confining means.

I do not limit my invention to any particular type of flare since any conventional pyrotechnic flare such as a Roman candle, sky-rocket, smoke flare (for daytime use), etc., which are ignited by the customarily employed fuse is operable and considered within the purview of my invention.

For the water ignitible substance as employed for coating or impregnating the exposed end of the fuse or in which the fuse may be embedded, I preferably utilized a water ignitible alkali metal, for example, sodium, potassium, rubidium or caesium. For economic and technical reasons, I prefer to employ the more commercially available and somewhat less violently active metal sodium. It is known that this substance generally will not spontaneously ignite when placed unconfined on the surface of water but when confined in accordance with the present invention, it ignites and fires the fuse which progressively burns along its length into the pyrotechnic substance in the body of the flare. From this point, the actual firing of the flare proper ensues in the same manner as is accomplished from conventional ignition means through the mechanical application of fire.

In some cases, for example, when sodium is employed, the fuse material may be conveniently partially or wholly coated or impregnated with the water ignitible substance by fusing and applying said substance in an inert atmosphere. Alternatively the substance in some cases may be molded about the top of the fuse so that the fuse is embedded therein or it may be merely mechanically affixed to the side or top of the fuse by a mechanical holding means such as a wire. Certain of the water ignitible substances such as sodium tend to fuse and flow when brought into contact with water and I have, therefore, found it necessary to confine such materials in juxtaposition with the fuse, for example, by enclosing them within a fine mesh screen (60 or 80 mesh) as illustrated in the accompanying drawing, thus maintaining the required intimate association with the fuse and facilitating and insuring ignition of the active substance.

Only very small quantities of the water ignitible substance are required, the amount being regulated by the type of fuse employed with the flare. For the combustible fibrous fuse element commonly used in conventional Roman candle construction, a quantity of the metal sodium from about 0.02 gram to 0.20 gram has been found to effectively ignite the fuse material when the unit is brought into contact with water momentarily.

The new flare finds particular merit as a signal device on large bodies of water in cases where there is present no means of mechanically igniting the flare, particularly for life-saving purposes where it may be conveniently fastened to or placed in a life-boat, raft, or life-belt. One or more of the new flares in properly sealed containers as hereinbefore described may be readily installed in a life-saving device as a part thereof ready for instant use by removing the top section of the container or by breaking the container if fabricated of glass.

The improved flare is of particular advantage in that it is not dependent upon a mechanical means for its ignition but is rather ignited by a chemical reaction brought about by a momentary exposure of the active substance to water. Its importance in connection with life-saving equipment such as a life-belt is immeasurable since the immersion of such equipment together with a survivor when in use precludes the ignition of signal flares by previously available mechanical means. The new flare unit is certain in its action and non-hazardous in storage. It is economical in its construction and will not deteriorate and become inactive during extended storage periods.

As many widely different embodiments of the invention may be made without departing from the spirit and scope thereof, it will be understood that the invention is not limited to the specific embodiments thereof except as defined in the appended claims.

I claim:

1. A water ignitible marine signal of the pyrotechnic flare type comprising a rigid, non-inflammable, cylindrical, water-proof casing containing pyrotechnic material and a combustible fuse element for the pyrotechnic material, one end of said fuse extending into the pyrotechnic material and the other end having intimately associated therewith a body of alkali metal adapted to ignite the same when contacted with water, a cap of 60–80 mesh wire gauze over and enclosing the associated fuse end and alkali metal adapted to prevent escape of the alkali metal from the fuse.

2. A water ignitible marine signal of the pyrotechnic flare type comprising a rigid, non-inflammable, cylindrical, waterproof casing containing pyrotechnic material, one end of said fuse extending into the pyrotechnic material and the other end having intimately associated therewith a body of sodium metal adapted to ignite the same when contacted with water, a cap of about 80 mesh wire gauze over and enclosing the associated fuse end and sodium metal adapted to prevent escape of the alkali metal from the fuse, and a glass cover over said fuse.

FRANK M. NICHOLS.