

LOCATION OF OVERBOARD PERSON OR OBJECT OR OF WATER-CHEMICAL INTERFACE

FIELD OF THE INVENTION

This invention relates to marine safety equipment, and more particularly to communication of the location of a person or other object that has fallen overboard, or the location of objects or of boundaries of abnormal substances in the water, using location information provided by satellites.

BACKGROUND OF THE INVENTION

Persons travelling on a boat across a body of water are exposed to the possibility of falling overboard, and of drowning, in part because of confusion or an inability to determine the present location of the overboard person. If the boat from which the person falls overboard is a small keel boat, the boat master may be able to turn the craft around within a radius of 3-10 boat lengths after first becoming aware of the mishap; in a large keel boat, the distance required to turn is much larger because of the greater inertia of the large keel boat. The upper surface of a large body of water, such as a river, lake, sea or ocean, is seldom flat and often manifests a sequence of peaks and troughs ("swells") that serve to hide the exposed or above-water portion of the overboard person in the water. A large body of water is often perturbed by surface current that can carry a person or object in the water in an arbitrary direction at a rate greater than 3 feet per second. In such an instance, knowledge of the point of entry into the water of the overboard person is of little help in locating the person five minutes after the overboard incident. Thus, it is often crucial to determine the present location of the overboard person so that a boat or other watercraft can quickly return to that location and search for and retrieve the overboard person. Several workers in this field have developed approaches to (1) advise the boat's occupants of the overboard incident or (2) indicate the location where the overboard incident occurred or (3) assist in retrieval of the overboard person, once that person is located.

Sunken vessel locator apparatus that operates only if the vessel is submerged is disclosed in U.S. Pat. No. 3,686,656, issued to Richards. The apparatus includes a water-responsive switch and alarm with a water-tight battery is attached to the vessel and generates a distinctive sound underwater when the switch senses that it has become submerged. The distinctive sound might be used to determine the direction from which, but not the location of, the alarm that produces the sound.

Lieb discloses an alarm system, including a portable transmitter attached to the body of a person to be monitored, that is activated upon its immersion in water, in U.S. Pat. No. 3,810,146. The transmitter issues a distinctive signal that is sensed by a nearby receiver that activates an alarm to indicate that the monitored person (for example, a non-swimmer) is immersed in water. The transmitter switch is activated by electrical bridging of two electrodes through immersion of the volume between the electrodes in water or another liquid with relatively high electrical conductivity. The alarm system does not indicate the location of the monitored person in the water.

An alarm system that operates in a similar manner to that of Lieb is disclosed by Antenore in U.S. Pat. No. 4,079,364. The alarm system is automatically released

from the wearer's body upon immersion in water and floats on the top surface of the water. The alarm is received above the water.

A Man Overboard Package, allegedly arranged to provide lifesaving apparatus for a person who has fallen overboard into water from a boat, is disclosed in U.S. Pat. No. 3,886,612, issued to Schnirel et al. The Package includes a rocket and rocket launcher that carries the remainder of the apparatus (inflatable life rings, etc.) to a position adjacent to the overboard person in the water. The Package provides no means of locating the overboard person, except for a line of length at most 600 feet that is dropped between the boat and the overboard person by the rocket and launcher.

U.S. Pat. No. 4,305,143, issued to Simms et al, discloses a Man Overboard sensor and rescue system. Part of the apparatus is worn on a person's clothing and is activated by immersion in water. This part of the apparatus, when activated, emits ultrasonic waves that are carried underwater to and sensed by a receiver carried on a boat. This receiver then activates an audible alarm or visual display, indicating that a person has fallen overboard, and may also cause flotation equipment and a marker buoy to be discharged from the boat. The marker buoy may or may not be adjacent to the person overboard, and the buoy's location would have to be found by line of sight visual searching.

Man Overboard rescue apparatus for use on a sailboat is disclosed by McDonald in U.S. Pat. No. 4,343,056. After a person has fallen overboard and been located, a lifeline and attached life ring is tossed to that person, and the person is pulled to the boat by a boom structure attached to a mast on the sailboat. A similar invention, disclosed in U.S. Pat. No. 4,599,073 by Fryer et al, uses a flotation sling to lift the overboard person into the boat. Beckly, in U.S. Pat. No. 4,599,074, discloses a Man Overboard retrieval device including a boom attached to the bow or other exposed portion of a boat, to be used to reel an overboard person into the boat. U.S. Pat. No. 4,747,797, issued to Hindle, discloses Man Overboard retrieval apparatus including an inflatable ring or small boat, part of which converts to a sling to haul the overboard person out of the water and into the boat. Wilson et al, in U.S. Pat. No. 4,843,994, disclose use of a specially configured boat fender as an auxiliary float, to be thrown to a person who has fallen overboard from a boat. None of these apparatus provides a means for locating the overboard person so that a boat can move to that location.

Otaka discloses a system for automatically stopping a boat when the sole crewperson on the boat falls overboard, in U.S. Pat. No. 4,630,205. The (sole) crewperson wears a radio transmitter that transmits a signal continuously at a certain intensity when that person is aboard the boat. The transmitted signal is attenuated or stops altogether when the crewperson falls overboard, and the resulting absence of signal causes the boat to stop. In another embodiment, the on-board system computes the accumulated time since the crewperson fell overboard and causes the boat to maneuver to return to the approximate location where this overboard incident occurred. The radio transmitter worn by the crewperson can transmit a rescue signal when the overboard incident occurs, but this signal contains no information on the location of the crewperson or the transmitter.

A liquid immersion switch that is activated when the switch wearer falls overboard from a boat is disclosed