SAFETY DEVICE AND INFLATING APPARATUS THEREFOR

Inventor: David John Ashard, Tingira Heights, NSW (AU)

Assignee: ZACTILL INTELLECTUAL PROPERTY PTY LTD, Tingira Heights, NSW (AU)

Appl. No.: 13/823,197
PCT Filed: Sep. 16, 2011
PCT No.: PCT/AU2011/001195
§ 371 (c)(1), (2), (4) Date: Mar. 14, 2013

Foreign Application Priority Data
Sep. 16, 2010 (AU) ......................... 20100904182
Dec. 9, 2010 (AU) ......................... 20100905429
Jun. 24, 2011 (AU) ......................... 20110902502

Publication Classification
Int. Cl.
B63C 9/08 (2006.01)
B63C 9/20 (2006.01)

U.S. Cl.
CPC . . B63C 9/081 (2013.01); B63C 9/20 (2013.01)
USPC ........................................ 441/89; 441/96; 441/97

ABSTRACT
A safety device including an article to be worn by a user and an inflatable bladder which is in use attached to the article. The safety device further includes an inflating apparatus for in use inflating the inflatable bladder with an inflating product. The inflating apparatus includes an inflating product compartment for storing the inflating product and a frangible valve for deterring flow of the inflating product from the inflating product compartment. An actuator is provided for rupturing the frangible valve thereby allowing inflating product to flow from the inflating product compartment to the inflatable bladder.
SAFETY DEVICE AND INFLATING APPARATUS THEREFOR

FIELD OF THE INVENTION

[0001] The invention concerns a safety device, particularly a safety device for keeping a user afloat in a body of water during an emergency situation. The invention further concerns an inflating apparatus for use in the safety device.

BACKGROUND OF THE INVENTION

[0002] More than a million people die annually as a result of drowning. In the great majority of drowning incidents the victim had no intention of going into the water, but came to be in the water due to an accident, for example being swept from a pier by a large wave.

[0003] As far as water recreational activities are concerned, cruising in small motorised boats rank high in the list of activities drowning victims were engaged in at the time of drowning. Such drowning incidents frequently occur as a result of boats capsizing or victims falling overboard after a collision with other boats or floating objects. Often victims are unable to reach their lifejackets or become exhausted from treading water before help arrives.

[0004] Another factor contributing to the number of drownings at sea is the occurrence of what is referred to as a “rip current” or a “rip tide”. A rip current is a strong channel of water which flows seaward from the shore, typically through the surf line. It can occur at any time, causing a swimmer to be taken deep into the ocean. Typically swimmers caught in a rip current will find that they are unable to fight the current, with the result that they have no alternative but to stay afloat for a prolonged period of time while awaiting the arrival of help. Victims of such currents, however, succumb when they become exhausted from treading water before any help can arrive.

[0005] A major danger associated with the sport of rock fishing is that of being swept by an unusually large wave while fishing from a rock platform. The main problem confronting a fisherman swept to sea in such a situation is to stay afloat while searching for a suitable place from which to climb from the water. Many fishermen, however, drown after becoming exhausted from having to tread water for an extended period of time without being able to reach a spot to climb from the water.

[0006] In light of the threat of drowning to persons engaging in water recreational activities, various personal flotation devices have been developed. Such devices include, for example, lifejackets having bladders filled with a buoyant material such as foam. Those lifejackets are, however, cumbersome to wear and are not appropriate for recreational bathers swimming in the surf, or for persons engaging in a range of other types of water recreational activities.

OBJECT OF THE INVENTION

[0007] It is the object of the present invention to substantially overcome or at least ameliorate one or more of the above disadvantages, or to provide a useful alternative.

SUMMARY OF THE INVENTION

[0008] According to a first aspect of the present invention there is disclosed herein a safety device including:

[0009] an inflatable bladder which is in use attached to an article to be worn by a user; and

[0010] an inflating apparatus for in use inflating the inflatable bladder with an inflating product; the inflating apparatus comprising:

[0011] an inflating product compartment for storing the inflating product;

[0012] a frangible valve for deterring flow of the inflating product from the inflating product compartment; and

[0013] an actuator for rupturing the frangible valve to allow inflating product to flow from the inflating product compartment to the inflatable bladder.

[0014] According to a second aspect of the present invention there is disclosed herein an inflating apparatus to be placed in fluid communication with an inflatable bladder, the inflating apparatus comprising:

[0015] an inflating product compartment for storing an inflating product;

[0016] a frangible valve for deterring flow of the inflating product from the inflating product compartment; and

[0017] an actuator for rupturing the frangible valve to allow inflating product to flow from the inflating product compartment,

[0018] such that in use, inflating product flowing from the inflating product compartment inflates the bladder.

[0019] Preferably the article is a garment or an accessory for attachment to a limb of the user.

[0020] Preferably the garment includes a first attachment formation and the inflating apparatus a second attachment formation, in use the first and second attachment formations co-operating to secure the inflating apparatus to the garment.

[0021] Preferably the garment is produced from material having thermal insulation properties for providing thermal insulation to a user immersed in water.

[0022] Preferably the garment is produced from material shielding the user against ultraviolet rays from the sun.

[0023] In an embodiment of the invention the garment is a rash guard.

[0024] In another embodiment the garment is a wetsuit.

[0025] Preferably the garment is produced from spandex, nylon, polyester or neoprene.

[0026] Preferably the garment includes a visibility enhancing coloured section for facilitating enhanced visibility of the user when floating in a body of water.

[0027] Preferably the coloured section is of a fluorescent material.

[0028] Preferably the accessory includes a band for attachment to a limb of the user.

[0029] Preferably the inflatable bladder is produced from rubber, latex or a plastics material.

[0030] Preferably the inflating apparatus is in use secured to a shoulder portion or a wrist portion of the garment.

[0031] Preferably the inflating apparatus includes a refilling valve through which the inflating product compartment is in use replenished with inflating product.

[0032] Preferably the inflating product is CO₂, liquid nitrogen, hydrogen or a CFC.

[0033] Preferably the safety device includes a conduit for providing fluid communication between the inflating product compartment and the inflatable bladder.

[0034] Preferably the conduit is flexible.

[0035] Preferably the conduit is produced from rubber, a plastics material, silicon or latex.

[0036] Preferably the conduit and/or the inflating apparatus include a fluid permeable barrier.
Preferably the fluid permeable barrier comprises a mesh.

Preferably the frangible valve includes one or more zones of weakness.

Preferably the frangible valve is produced from glass, acrylic resin, copper, polymethyl methacrylate (commonly known as "perspex") or a plastics material.

Preferably the actuator includes a strap, attached to a rupture member, whereby application of a force to the strap will cause the rupture member to rupture the frangible valve.

In an embodiment the rupture member is provided by having a portion of the conduit enclose the frangible valve such that in use a force applied to the strap causes the conduit to flex, thereby rupturing the frangible valve.

In another embodiment the rupture member is produced of a water-expandable material.

Preferably the inflating apparatus further includes an automated actuator for rupturing the frangible valve.

Preferably the automated actuator is in communication with a programmable module wherein the automated actuator is activated under control of the programmable module.

Preferably the programmable module is in electric communication with a sensor assembly wherein the programmable module in use activates the automated actuator responsive to information received from the sensor assembly.

Preferably the sensor assembly comprises a water sensor, a pressure sensor or both a water sensor and a pressure sensor.

Preferably the automated actuator comprises an electromagnet and a rupture member.

Preferably the rupture member includes biasing means.

Preferably the biasing means comprises a spring.

Preferably the programmable module is in electric communication with a polarity reverse module for changing the polarity of the electromagnet, wherein in use a change in polarity of the electromagnet will cause the rupture member to move under the influence of the biasing means to rupture the valve.

Preferably the programmable module signals a change in polarity to the polarity reverse module responsive to information received from the sensor assembly.

Preferably the inflating apparatus includes an information display.

Preferably the safety device includes a proximity device.

Preferably the water-expandable material is water-expandable foam.

Preferably the safety device includes a non-return valve for deterring inflating product escaping from the inflating bladder and returning to the inflating product compartment.

Preferably the safety device includes a plurality of inflatable bladders.

Preferably the safety device includes an auxiliary inflating arrangement whereby a user may use exhaled breath to supplement inflating product in the inflating bladder.

Preferably the safety device includes signalling means for in use signalling the location of the user during an emergency situation, typically an Emergency Position Indicating Radio Beacon (EPIRB).

In an embodiment the signalling means includes lighting means, typically a battery operated light emitting diode (LED).

In an embodiment the signalling means includes a siren.

In an embodiment the signalling means includes a GPS unit.

According to a further aspect of the present invention there is disclosed herein a safety device kit including:

an article to be worn by a user;

an inflatable bladder attachable to the article; and

an inflating apparatus for use inflating the inflatable bladder with an inflating product, the inflating apparatus comprising:

an inflating product compartment for storing the inflating product;

a frangible valve for deterring flow of the inflating product from the inflating product compartment; and

an actuator for use rupturing the frangible valve to allow inflating product to flow from the inflating product compartment to the inflatable bladder.

According to a third aspect of the present invention there is disclosed herein a safety device including:

an inflatable bladder which is in use attached to an article to be worn by a user; and

an inflating apparatus for use inflating the inflatable bladder with an inflating product, the inflating apparatus comprising:

an inflating product compartment for storing an inflating product;

a valve assembly for deterring flow of the inflating product from the inflating product compartment;

an actuator for opening the valve assembly to allow inflating product to flow from the inflating product compartment to the inflatable bladder; and

a sensor assembly operatively associated with the actuator, wherein the actuator in use opens the valve assembly responsive to measurements taken by the sensor assembly thereby allowing inflating product to flow form the inflating product compartment.

According to a fourth aspect of the present invention there is disclosed herein an inflating apparatus to be placed in third communication with an inflatable bladder, the inflating apparatus comprising:

an inflating product compartment for storing an inflating product;

a valve assembly for deterring flow of the inflating product from the inflating product compartment;

an actuator for opening the valve assembly to allow inflating product to flow from the inflating product compartment to inflate the inflatable bladder; and

a sensor assembly operatively associated with the actuator, wherein the actuator in use opens the valve assembly responsive to measurements taken by the sensor assembly thereby allowing inflating product to flow to the inflatable bladder.

Preferably the sensor assembly of the third and fourth aspects comprises a water sensor, a pressure sensor or both a water sensor and a pressure sensor.

Preferably the actuator of the third and fourth aspects comprises a servo motor.
BRIEF DESCRIPTION OF THE DRAWINGS

Preferred embodiments of the invention will be described hereinafter, by way of examples only, with reference to the accompany drawings, in which:

FIG. 1 is a schematic representation of a first embodiment safety device;
FIG. 2 is a schematic representation of a first embodiment inflating apparatus for use in the safety device of FIG. 1;
FIG. 3 is a schematic representation of a second embodiment safety device;
FIG. 4 is a schematic representation of a portion of a third embodiment inflating apparatus;
FIG. 5 is a schematic representation of a fourth embodiment inflating apparatus; and
FIG. 6 is a schematic representation of a portion of a fifth embodiment inflating apparatus.

DESCRIPTION OF PREFERRED EMBODIMENTS

In the description that follows below like reference numerals will be used to indicate like components.

FIG. 1 shows a first embodiment of a safety device, generally indicated with the reference numeral 10. In use, the safety device 10 serves to keep a user afloat in a body of water during an emergency situation, for example in the case of the user having fallen overboard from a sea vessel.

The inflating apparatus 18 includes an article to be worn by a user, here in the form of a garment 12, specifically a rash guard. The garment 12 of this embodiment is produced from polyester. Polyester is suitable as it firstly provides thermal insulation to the user while immersed in water and secondly provides protection against ultraviolet rays from the sun.

The garment 12 further includes a visibility enhancing coloured section 14, produced from a fluorescent material. In use the coloured section provides enhanced visibility of the user floating in a body of water. This feature serves to assist rescue teams in spotting the user while they search a particular body of water.

An inflatable rubber bladder 16 is secured to a torso region of the garment 12.

The safety device 10 also includes an inflating apparatus 18. The inflating apparatus 18 includes an inflating product compartment 20, shown in FIG. 2, for holding an inflating product for, in use, inflating the inflatable bladder 16 during an emergency situation. The inflating apparatus 18 is secured to a wrist portion of the garment 12 as shown. The inflating apparatus 18 could, of course, be attached to a number of positions on the garment 12. The specific location of the inflating apparatus 18 on the garment 12, however, will be a function of where it will interfere least with the recreational activities in which the user will engage when in the water.

The inflating product compartment 20 holds inflating product in the form of CO₂.

A schematic representation of the first embodiment inflating apparatus 18 is provided in FIG. 2. The inflating apparatus 18 firstly includes the inflating product compartment 20 in which the inflating product is stored. The inflating apparatus 18 further includes a refilling valve 19 through which the inflating product compartment 20 can be replenished with inflating product.

The inflating apparatus 18 is placed in fluid communication with the inflatable bladder 16 via a rubber conduit 22.

The inflating product is, however, prevented from flowing from the inflating product compartment 20 to the inflatable bladder 16 until a frangible valve, generally indicated by the reference numeral 24, is ruptured as discussed below. Upon the frangible valve 24 being ruptured, the inflating product is allowed to flow from the inflating product compartment 20 of the inflating apparatus 18, through the conduit 22 and to the inflatable bladder 16.

The frangible valve 24 comprises a tubular glass body 26. The tubular body 26 has a closed end 28 and an open end 30 placed in fluid communication with a mouth 32 of the inflating product compartment 20. The connection between the inflating product compartment 20 and the tubular body 26 is such that no inflating product escapes at the interface of the open end 30 and the mouth 32. Further, the closed end 28 of the tubular body 26 deters the flow of inflating product from the inflating product compartment 20 into the conduit 22.

The inflating apparatus 18 includes an actuator 34 for rupturing the valve 24. The actuator 34 firstly comprises a rupture member 36, here provided in the form of a portion of the flexible conduit 22 which encloses the tubular body 26 as shown. The actuator 34 further includes a strap 38 which is at its one end wound about the rupture member 36.

In an emergency situation, for example where the user has fallen overboard, the user pulls on the strap 38, thereby exerting a force on the strap. This force causes the rupture member 36 to flex. Such flexing, in turn, imparts a bending moment on the tubular body 26 of the frangible valve 24. Continued flexing of the rupture member 36 causes the tubular body 26, and as a result the frangible valve 24 to rupture. Rupturing of the frangible valve 24, in turn, allows the inflating product to escape the inflating product compartment 20 via the conduit 22 resulting in the bladder 16 becoming inflated.

It will be understood that rupturing of the frangible valve 24 results in the conduit 22 being filled with shards of glass. To deter such shards being fed to the inflatable bladder 16, the conduit 22 includes a fluid permeable barrier 40 in the form of a mesh.

Further, to enable disconnection of the inflating apparatus 18 from the conduit 22, the conduit includes a connector formation 42, here a quick-release connector. A snap-lock connector can also be employed.

In a second embodiment safety device, indicated with the reference numeral 50 in FIG. 3, the article to be worn by a user is provided in the form of an accessory, having a watch 52, which can be attached to a limb of the user. The safety device 50 further includes a band 54 which can extend around a limb of the user.

The safety device 50 also includes an inflating apparatus 18 for storing an inflating product in an inflating product compartment 20. Here, however, the inflating apparatus 18 includes a number of holes 56, the purpose of which will become apparent from the description which follows.

The safety device 50 also includes a frangible valve 24 housed within the inflating apparatus 18.

The safety device 50 further includes an inflatable bladder 16 which is secured to an outer surface of the band 54.

Unlike the safety device 10, the actuator 34 of the safety device does not include a strap. Rather, the actuator 34 includes a water-expandable material 58 comprising water-expandable compressed foam. In an emergency situation, for example where a user has fallen from a sea vessel, water enters the inflating apparatus 18 through the holes 56. The
water-expandable foam 58 will absorb such water, thereby being caused to expand. Continued expansion of the foam 58 will cause the frangible valve 24 to be ruptured in a manner similar to that of the safety device 10. Upon rupture of the frangible valve 24, inflating product flows from the inflating product compartment 20 to inflate the bladder 16.

[0109] FIG. 4 shows a portion of a third embodiment inflating apparatus 60. The inflating apparatus 60 includes an automated actuator 34 having a rupture member 36. The automated actuator 34 includes a magnet 62 in electric communication with a programmable module 64, the programmable module having a polarity reverse module. The automated actuator 34 also includes biasing means, here in the form of a spring 37. The rupture member 36 is placed proximate a frangible valve 24 located within a flexible conduit 22. The conduit 22 is in fluid communication with a non-illustrated inflatable bladder.

[0110] The inflating apparatus 60 includes a battery power source 66, here a nickel-cadmium battery, for driving electronic components of the inflating apparatus, an information display 68 and a proximity device 70, the purpose of which is discussed below. In order to activate the automated actuator 34, the inflating apparatus 60 includes a sensor assembly 72, here in the form of an electronic water sensor, to detect when the safety device has been immerced in water.

[0111] The magnet 62 comprises first and second magnetic components 62.1 and 62.2, the first magnetic component 62.1 comprising an electromagnet and the second magnetic component 62.2 comprising a permanent magnet. In “non-wet” conditions the magnetic components 62.1 and 62.2 have opposite polarities resulting in those components being attracted to one another and located in a non-illustrated first position wherein they are located adjacent one another. With the magnetic components 62.1 and 62.2 in the first position a compressive force is applied to the spring 37 causing it to become biased. The magnitude of the magnetic force holding the components 62.1 and 62.2 are of sufficient strength to deter the spring 37 from pushing them apart.

[0112] Upon the water sensor 72 being immersed in a body of water an electronic signal is communicated to the programmable module 64. Upon receipt of a signal informing that the water sensor 72 has detected water, the polarity reverse module is activated to cause the polarity of the first magnetic component 62.1 to be reversed. As the magnetic components now have similar polarities, they repel one another. Accordingly, as the force biasing the spring 37 is removed, the spring will return to its unbiased state. Due to the fact that the spring 37 was located in a biased condition, return of the spring to an unbiased state causes the second magnetic component 62.2 and, as a result, the rupture member 36 to undergo an amount of acceleration. Due to the position of the rupture member 36 relative to the frangible valve 24, the subsequent momentum of the rupture member causes it to impact upon the conduit 22, such impact resulting in the conduit flexing. Flexing of the conduit 22, in turn, ruptures the frangible valve 24, thereby allowing inflating product to escape the inflating product compartment of the inflating apparatus 60. The inflating product now flows in the direction of the arrow 74, thereby inflating the bladder.

[0113] The inflating apparatus 60 includes another actuator 34, provided in the form of a strap which operates on similar principles to the strap of the first embodiment safety device described above.

[0114] The programmable module 64 is pre-programmed to provide a number of modes of operation, those being: (i) a safe mode, (ii) an off mode, (iii) a remote mode, (iv) a manual mode and (v) a proximity mode.

[0115] In the safe mode the safety device will cause the frangible valve 24 to be ruptured upon the water sensor 72 detecting the presence of water. In the off mode a user is allowed to swim and the water sensor 72 will not trigger rupturing of the frangible valve 24. However, should the user find himself/herself in distress, the actuator 34 can still be used to rupture the frangible valve 24 in order to inflate the bladder. In the remote mode a user can also swim without the valve being ruptured. The programmable module, however, includes a receiver module for receiving signals from a remote signalling means. That mode thus allows, for example, a child to swim and a parent to cause the valve to be ruptured when the child is in distress. Rupture is achieved by the parent activating a remote signalling means to communicate with the programmable module via the receiving module.

[0116] The proximity mode operates via the proximity device 70 and serves as signalling means to alert an operator that the user of the safety device has moved beyond a set distance from a remote device held by the operator. That mode can, for example, be employed to alert parents inside a house that a child playing outside has moved outside a set range. The parent can then take appropriate action to ensure the safety of the child.

[0117] As mentioned above, the safety device includes an information display 68, in this embodiment provided in the form of a number of non-illustrated light emitting diodes (LEDs). The LEDs in use serve, for example to indicate (i) the selected mode of the safety device, (ii) low battery charge and (iii) low levels of inflating product within the inflating product compartment. The remote signalling means may also include indicating means to alert an operator that the valve has been ruptured and that the user of the safety device may be in distress.

[0118] Although not illustrated, the safety device to be attached to the inflating apparatus 60 also includes an auxiliary inflating arrangement whereby a user may use his breath to supplement its inflatable bladder. The user could also inflate the bladder via the auxiliary inflating arrangement, should the inflating apparatus malfunction and fail to inflate the bladder.

[0119] FIG. 5 shows a fourth embodiment inflating apparatus 78. The inflating apparatus 78 is similar in operation to the above described embodiments in that it includes a frangible valve 24 and an inflating product compartment 20 for holding inflating product. The inflating apparatus 78 also includes an actuator 34 whereby a force exerted thereon by a user will rupture the frangible valve 24 to allow inflating product to flow from the inflating product compartment 20 via a conduit 80 into an outlet conduit 82. A mesh 40 is provided for deterring shards of the ruptured valve 24 from being fed into the conduit 80. The outlet conduit 82 is sealed-off with a seal 84 when not in use. In use the outlet conduit 82 is connected to a non-illustrated conduit via a conventional snap-lock, the conduit being in fluid communication with a bladder.

[0120] The inflating apparatus 78 includes two holding compartments 86 and 88 which are sealed with water sealing caps 90 and 92. The first holding compartment 86 houses an electronic module 94 which is in communication and opera-
tively associated with a sensor assembly 93. The sensor assembly 93 includes a proximity sensor, an Emergency Position Indicating Radio Beacon (EPIRB), an electronic water sensor, a mechanical water pressure sensor with a countdown timer, a low battery alarm, a remote activation function, a service alert and a sensor activation function. The electronic module 94 is powered by a battery 96 housed within the second holding compartment 88. A further battery 98 is housed within a sealed chamber 97, and acts as a back-up for the battery 96. A strap 100 on the actuator 34 includes a switch 102 for activating and de-activating the electronic module 94.

[0121] The inflating apparatus 78 differs from the above described embodiments in that it includes an automated actuator 34.2 which comprises a servo motor. The servo motor 34.2 is powered by the battery 98.

[0122] As shown, the servo motor 34.2 is attached to a valve assembly 104. The valve assembly includes a valve 103, for locating inside an opening 105, a pin 106 and a release 108. The valve assembly 104 serves to discharge inflating product for leaking from the inflating product compartment 20 into the chamber 97 and into the outlet tube 82.

[0123] The pin 106 is attached to the servo motor 34.2. Upon activation of the servo motor 34.2, the valve 103 will be extracted from its sealing position while the pin 106 will cause the release valve 108, here in the form of a schrader valve, to be depressed, allowing inflating product to flow to the outlet conduit 82 via the chamber 97. Thus, the actuator 34.2 will cause inflating product to flow to the bladder without destruction of the frangible valve.

[0124] A filling valve 110 is provided for replenishing the inflating product compartment 20 with inflating product. The filling valve 110 is accessed when the sealed chamber 97 is opened by removing a cover 21.

[0125] A feature of the frangible valve 24 is that it is transparent and acts as a sight glass to enable a user to view the level of a coloured inflating product in order to determine whether the inflating product compartment 20 requires replenishment.

[0126] Activation of the servo motor 34.2 occurs responsive to activation parameters being detected by the sensor assembly 93.

[0127] Activating the inflating apparatus 78 via the switch 102 will, for example, enable the electronic water sensor to activate the servo motor 34.2 upon the water sensor detecting water. However, if the inflating apparatus 78 is de-activated by the switch 102, the mechanical pressure sensor will still activate the inflating apparatus 78. This will occur if a predetermined depth under water is detected. Upon detection of the predetermined depth, the countdown timer is activated. As soon as the timer reaches a set time interval, the servo motor 34.2 is activated, allowing inflating product to flow through the outlet conduit 82, as discussed above, to an inflatable bladder of a safety device. Should the user, however, resurface before lapping of the set time interval, the countdown timer will reset itself to deter the bladder from being inflated.

[0128] One application in which the proximity sensor of the inflating apparatus may find application is when a dockworker enters a specific area, for example a wharf area, where a signal can be communicated to the proximity device, allowing it to activate the inflating apparatus. However, once the dockworker exits the wharf area, the proximity sensor will cause the inflating apparatus to be deactivated. Of course, the mechanical pressure sensor will still cause inflating product to be released to an inflatable bladder, if the dockworker was to fall into the water with the inflating apparatus in a deactivated state.

[0129] FIG. 6 shows a schematic representation of a portion of a fifth embodiment inflating apparatus 120. The frangible valve 24 of the inflating apparatus 120 comprises two valve members 122 and 124, each having a threaded portion 126 to engage corresponding threaded sections 128 of the inflating apparatus 120. Each valve member 122 and 124 comprises a frangible tube 130 of polymethyl methacrylate. Each tube has a closed end 132 and an open end 134. The open end of each tube 130 is secured within one of the threaded portions 126 with a suitable adhesive. The adhesive serves to seal the tubes 130 within the valve members 122 and 124 so that a fluid can not pass between the outside wall of the tubes and inner surfaces of the valve members 122 and 124.

[0130] The tubes 130 are enclosed within a rubber conduit 136 to provide for fluid communication between the inflating product compartment 20 and the outlet tube 82. The rubber conduit 136 has a concertina shape which facilitates ease of assembly by providing that the conduit can be manipulated to be put in place when the frangible tubes 130 are in position.

[0131] An actuator strap 34 is provided for flexing the conduit 136 to rupture the tubes 130 thereby allowing inflating gas to flow from the inflating product compartment 20 through the conduit 136 to the outlet tube 82 from where it is fed to an inflatable bladder.

[0132] The inflating apparatus 120 further includes a sight glass 127 by which a user can determine whether the apparatus is to be replenished with inflating product.

[0133] In a sixth non-illustrated embodiment the safety device 10 includes a container. The container includes a tube by which a user can extract liquid held in the container. Typically the container will be secured to the garment, preferably the back of the garment.

[0134] In a seventh non-illustrated embodiment the safety device includes a signalling means for signally the location of the user during an emergency situation. Examples of signalling means include lighting means, typically a battery operated LED, a siren or GPS signalling unit.

[0135] In an eighth non-illustrated embodiment the garment is provided in the form of a wetsuit.

[0136] In a ninth non-illustrated embodiment the garment is produced from spandex.

[0137] In a tenth non-illustrated embodiment the garment is produced from nylon.

[0138] In an eleventh non-illustrated embodiment the garment is produced from neoprene rubber.

[0139] In a twelfth non-illustrated embodiment the inflatable bladder is produced from latex.

[0140] In a thirteenth non-illustrated embodiment the inflatable bladder is produced from a plastics material.

[0141] In a fourteenth non-illustrated embodiment the safety device includes a plurality of inflatable bladders to ensure that the safety device keeps the user afloat despite one or more of the inflatable bladders becoming punctured while the user awaits rescue.

[0142] In a fifteenth non-illustrated embodiment the inflating product is liquid nitrogen.

[0143] In a sixteenth non-illustrated embodiment the inflating product is a CFC.

[0144] In a seventeenth non-illustrated embodiment the frangible valve includes one or more zones of weakness.
In an eighteenth non-illustrated embodiment the frangible valve is produced from a thermoplastic acrylic resin, commonly sold under the trade name perspex.

In a nineteenth non-illustrated embodiment the frangible valve includes a copper body including one or more screwed sections for providing zones of weakness.

In a twentieth non-illustrated embodiment there is provided a safety device kit which can, for example, be retrofitted to a rash guard. The kit includes an inflatable bladder, which can be secured to the rash guard, and an inflating apparatus as discussed above.

Further, the kit also includes an attachment arrangement for facilitating attachment of the safety device to a user, for example a clipping arrangement whereby the safety device can be attached to a garment worn by the user.

In a twenty-first non-illustrated embodiment the inflatable bladder includes a non-return valve to deter inflating product from escaping the inflatable bladder and returning to the inflating product compartment.

In a twenty-second non-illustrated embodiment the accessory includes a compass.

In a twenty-third non-illustrated embodiment the inflating product is hydrogen.

In a twenty-fourth non-illustrated embodiment the inflating apparatus is secured to a shoulder portion of the garment.

In a twenty-fifth non-illustrated embodiment a water sensor is provided that can be connected to a neck portion of a garment worn by a user, the sensor being in electrical communication with the inflating apparatus. In use the water sensor will cause the inflating apparatus to be activated when the water sensor detects the presence of water on the neck portion of the garment.

In a twenty-sixth non-illustrated embodiment the frangible valve is produced from a plastics material.

In a twenty-seventh non-illustrated embodiment the conduit is produced from a plastics material.

In a twenty-eighth non-illustrated embodiment the safety device includes an auxiliary inflating arrangement whereby a user may use his breath to supplement the inflating product in the bladder. The auxiliary inflating arrangement includes a blow tube having a non-return valve.

It will be appreciated that a safety device can be constructed with different combinations of the above described valves and actuators. The frangible valve of FIG. 6 can for example be employed in the inflating apparatus of FIG. 5 instead of the frangible valve shown therein.

Although the invention has been described with reference to specific examples, it will be appreciated by those skilled in the art that the invention may be embodied in many other forms.

23. An inflating apparatus adapted to be placed in fluid communication with an inflatable bladder, the inflating apparatus comprising:
an inflating product compartment for storing an inflating product;
a valve assembly for deterring flow of the inflating product from the inflating product compartment;
an actuator for opening the valve assembly to allow inflating product to flow from the inflating product compartment to inflate the inflatable bladder; and
a sensor assembly operatively associated with the actuator, wherein the actuator is adapted to open the valve assembly responsive to measurements taken by the sensor assembly, thereby to allow inflating product to flow to the inflatable bladder.

24. The inflating apparatus according to claim 23, wherein the sensor assembly includes a water sensor and a pressure sensor.

25. The inflating apparatus according to claim 24, wherein the sensor assembly includes a countdown timer.

26. The inflating apparatus according to claim 25, wherein the countdown timer is adapted to be activated when the pressure sensor indicates that a predetermined depth under the surface of a body of water has been reached.

27. The inflating apparatus according to claim 26, wherein the countdown timer is adapted to cause the actuator to open the valve after a predetermined time interval.

28. The inflating apparatus according to claim 27, wherein the countdown timer is adapted to be reset before lapsing of the predetermined time interval to prevent the inflatable bladder from inflating.

29. The inflating apparatus according to claim 28, wherein the countdown timer is adapted to be reset when the inflating apparatus is caused to return to the surface of the body of water.

30. The inflating apparatus according to claim 29, wherein the valve is a frangible valve.

31. The inflating apparatus according to claim 23, wherein the actuator includes a water-expandable rupture member, in use placing the water-expandable member in contact with water causes the rupture member to expand to rupture the frangible valve.

32. The inflating apparatus according to claim 23, wherein the actuator includes a strap, the strap being attached to a rupture member, whereby in use application of a force to the strap will cause the rupture member to rupture the frangible valve.

33. The inflating apparatus according to claim 29, further comprising signalling means for in use signalling the location of the user during an emergency situation.

34. The inflating apparatus according to claim 33, wherein the signalling means comprises an Emergency Position Indicating Radio Beacon (EPIRB).

35. The inflating apparatus according to claim 30, wherein the actuator includes an electromagnet and a rupture member.

36. The inflating apparatus according to claim 35, wherein the rupture member is attached to biasing means for biasing the rupture member.

37. A safety device including:
an inflatable bladder which is in use attached to an article to be worn by a user; and
an inflating apparatus for in use inflating the inflatable bladder with an inflating product, the inflating apparatus comprising:
an inflating product compartment for storing the inflating product;
a valve for deterring flow of the inflating product from the inflating product compartment;
an actuator for opening the valve to allow inflating product to flow from the inflating product compartment to the inflatable bladder; and
a sensor assembly operatively associated with the actuator, wherein the actuator opens the valve assembly responsive to measurements taken by the sensor assembly to allow inflating product to flow to the inflatable bladder.

38. A safety device according to claim 37, wherein the article is a rash guard or a wetsuit.

* * * * *