US 20190061889A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2019/0061889 A1**

Cardi et al. (43) **Pub. Date: Feb. 28, 2019**

(54) **INCONSPICUOUS FLOTATION APPARATUS**

(71) Applicants: **Paul D. Cardi**, Sarasota, FL (US); **Nancy Gail Cardi**, Sarasota, FL (US)

(72) Inventors: **Paul D. Cardi**, Sarasota, FL (US); **Nancy Gail Cardi**, Sarasota, FL (US)

(21) Appl. No.: **16/115,419**

(22) Filed: **Aug. 28, 2018**

Related U.S. Application Data

(60) Provisional application No. 62/550,918, filed on Aug. 28, 2017.

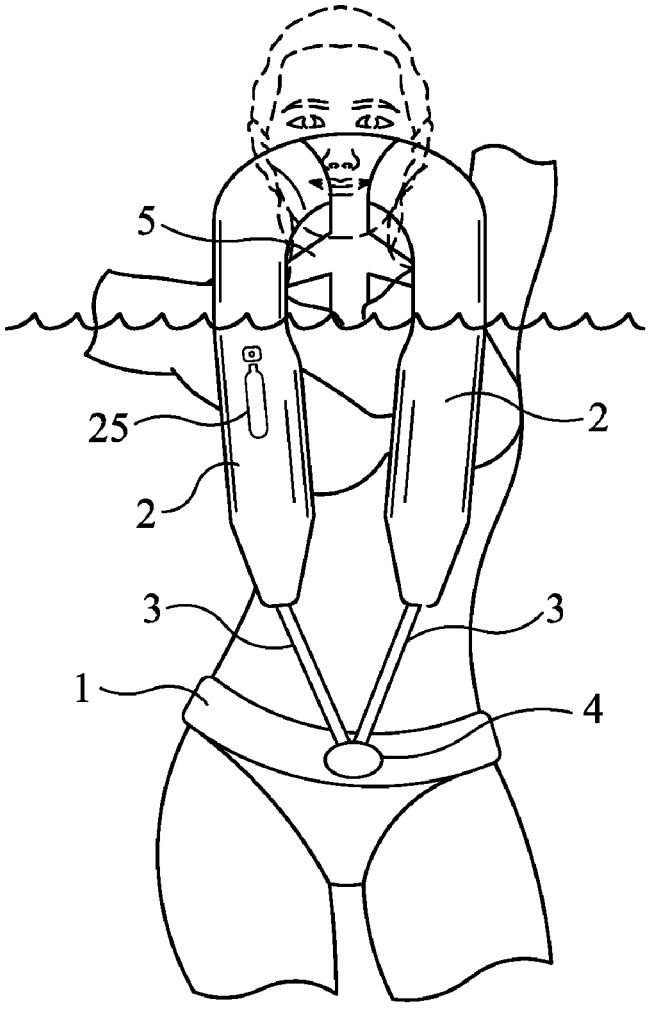
Publication Classification

(51) **Int. Cl.**
B63C 9/15 (2006.01)

(52) **U.S. Cl.**
CPC ***B63C 9/155*** (2013.01); *B63C 9/19* (2013.01)

(57) **ABSTRACT**

An inflatable personal flotation device worn about the waist level as a belt or as incorporated into a swimming garment is disclosed, that is inconspicuous and may be worn over, under or even be incorporated into almost any type of apparel. This waist belt PFD in its uninflated state is practical, comfortable, attractive and inconspicuous. The PFD contains an outer compartment housing a buoyancy component, activated by pressurized gas or other means, and has one or more straps to secure the device to the wearer. Upon inflation the apparatus, being deployed and powered by its own buoyancy, rises above the waterline into a rescue configuration turning and positions a wearer upright with their head above water.



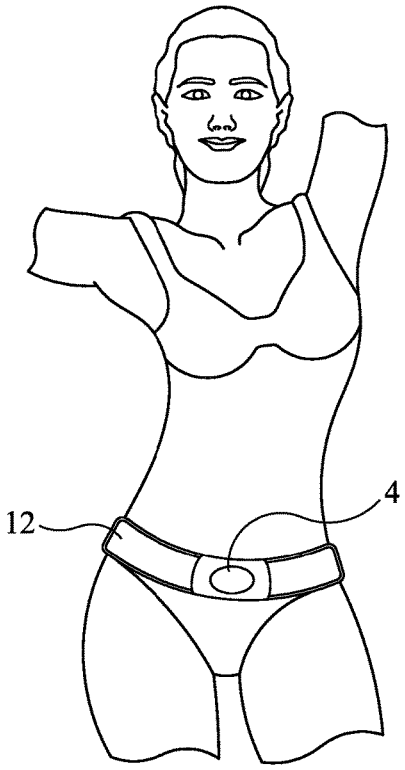


FIG. 1

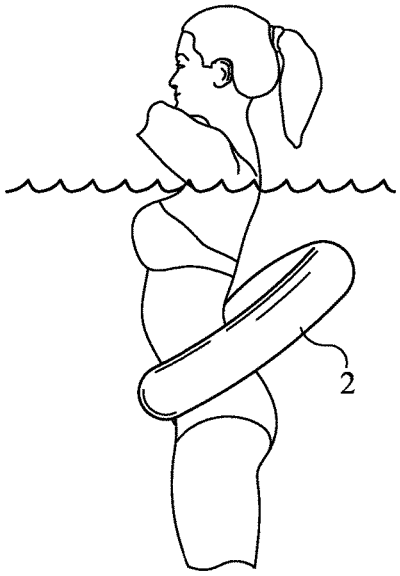


FIG. 2

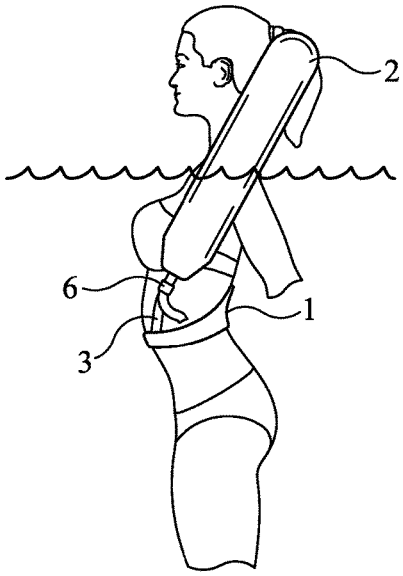


FIG. 3

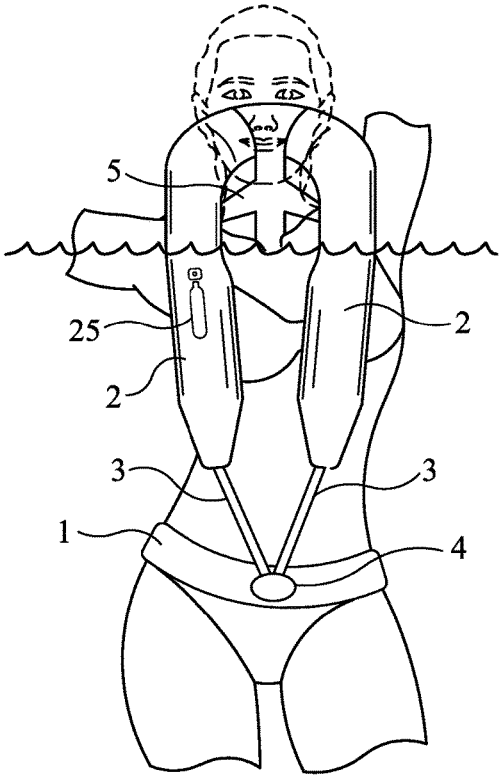


FIG. 4

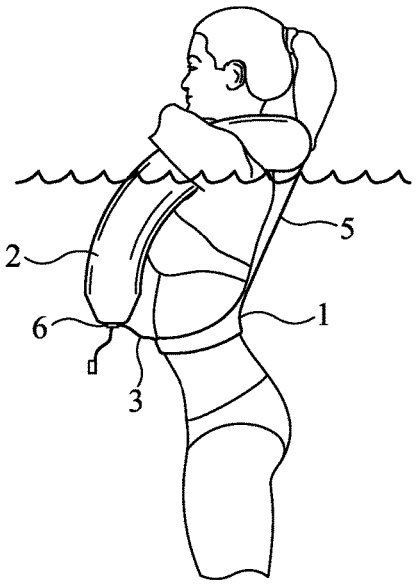


FIG. 5

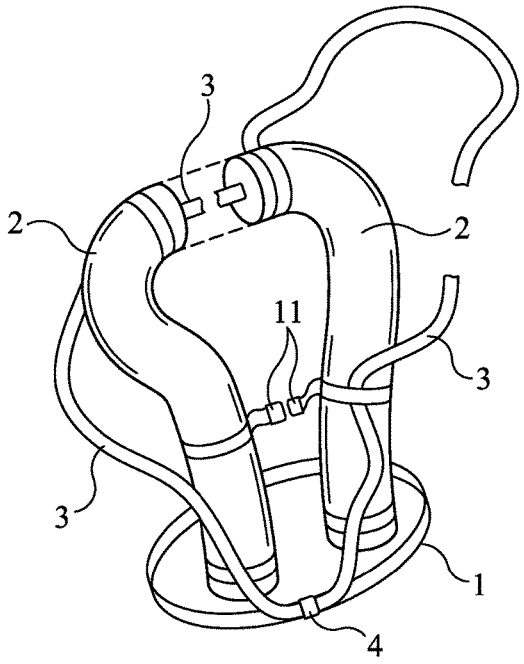


FIG. 6

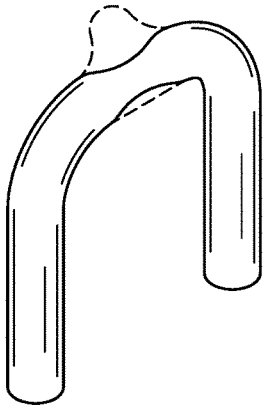


FIG. 7

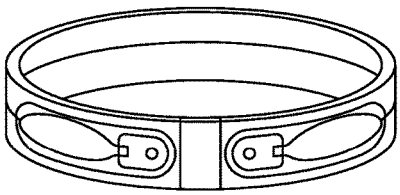


FIG. 8

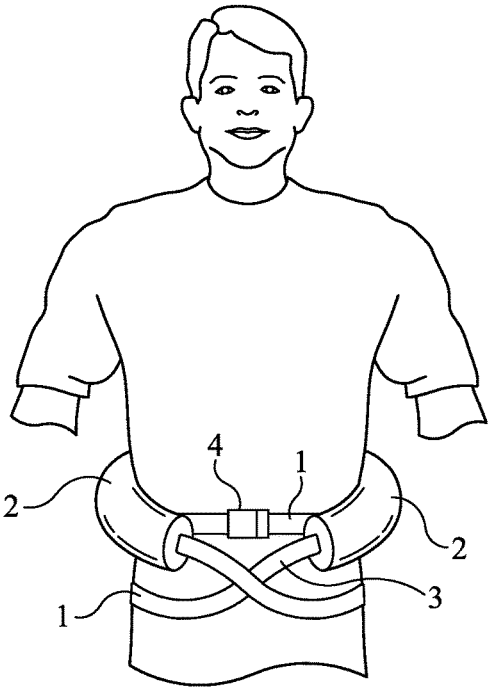


FIG. 9

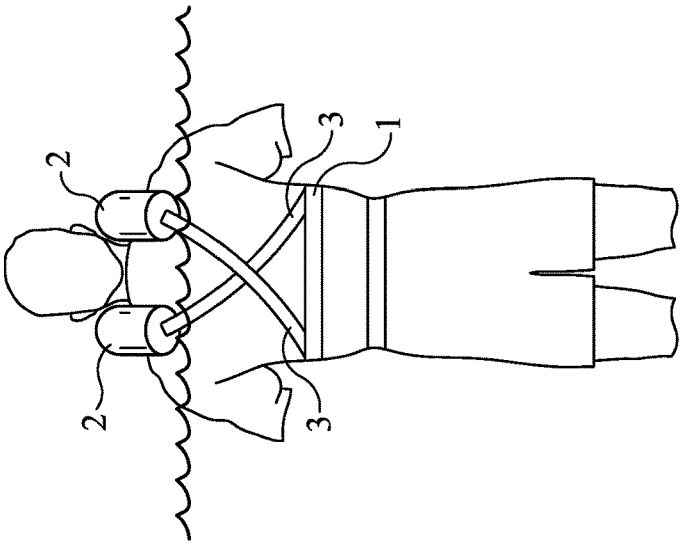


FIG. 12

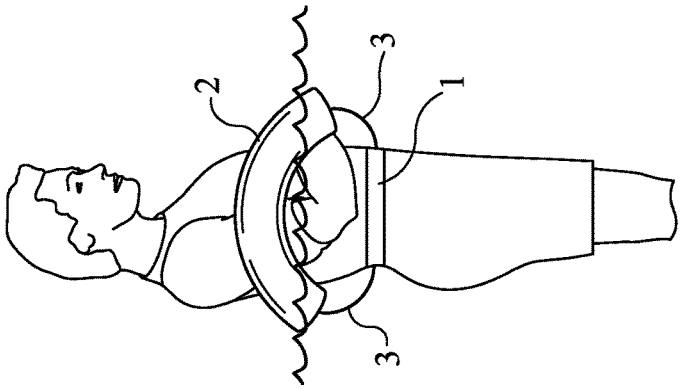


FIG. 11

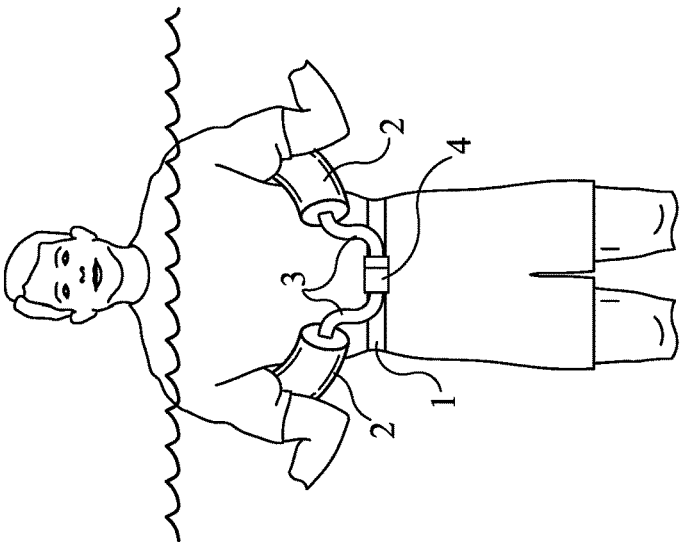


FIG. 10

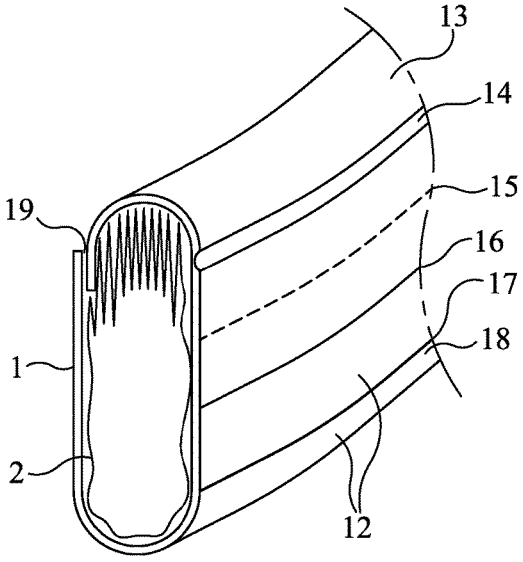


FIG. 13

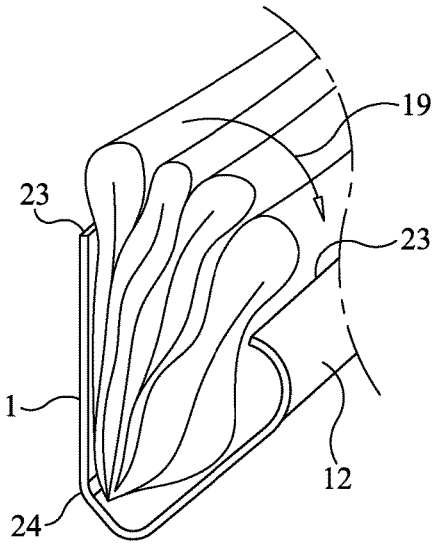


FIG. 14

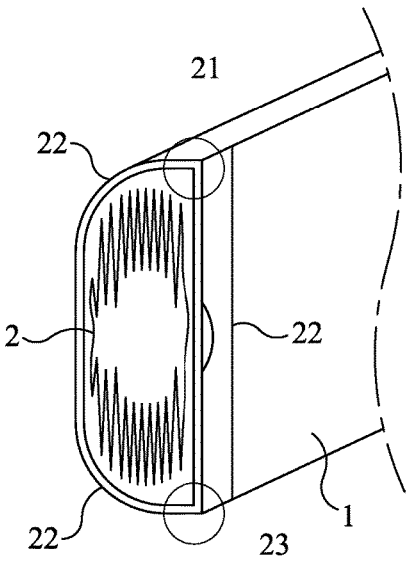


FIG. 15

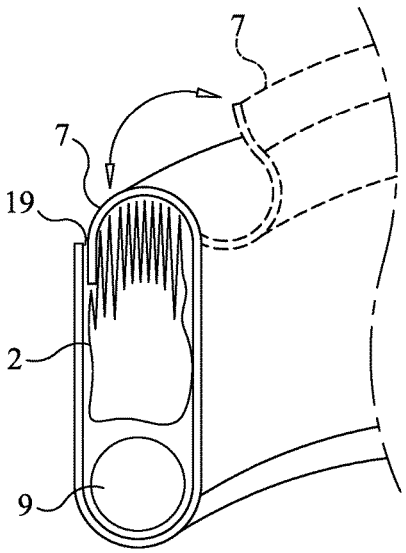


FIG. 16

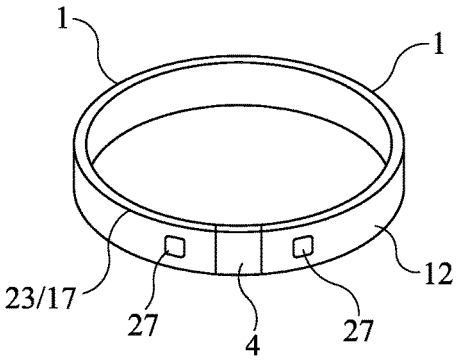


FIG. 17

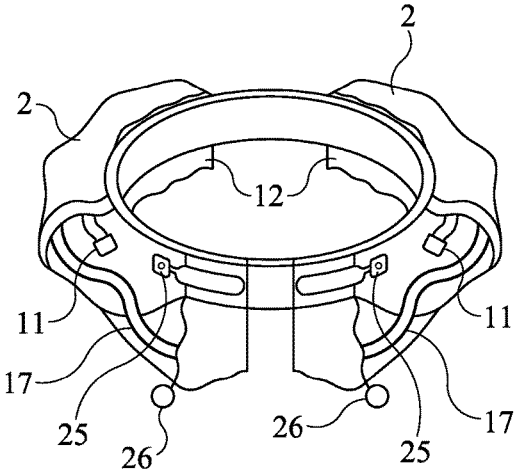


FIG. 18

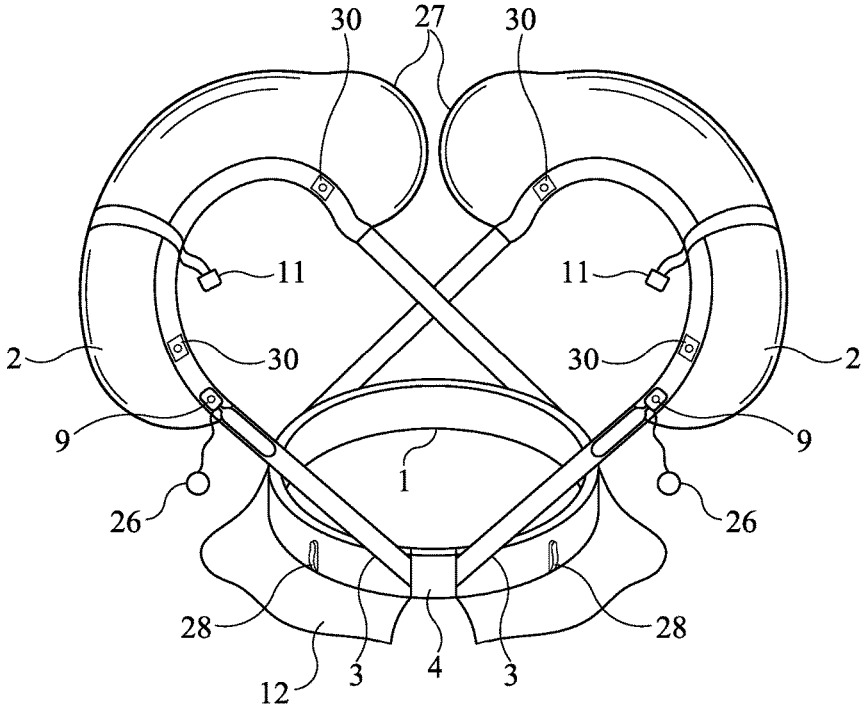


FIG. 19

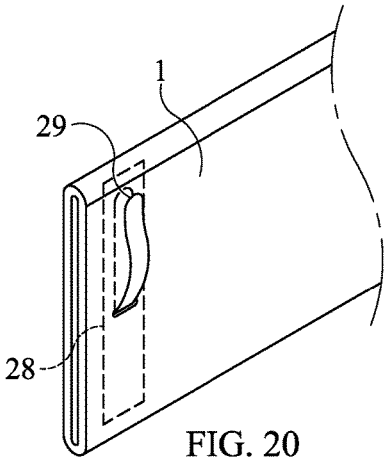


FIG. 20

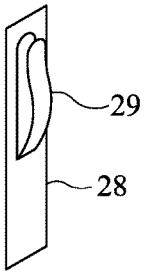


FIG. 21

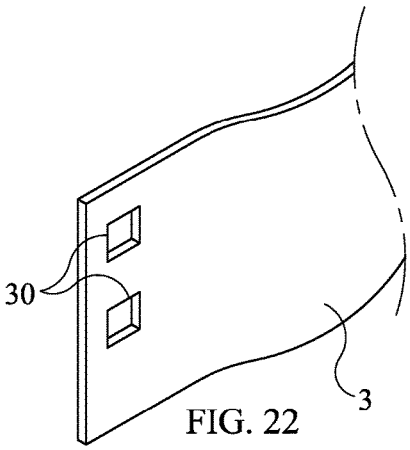


FIG. 22

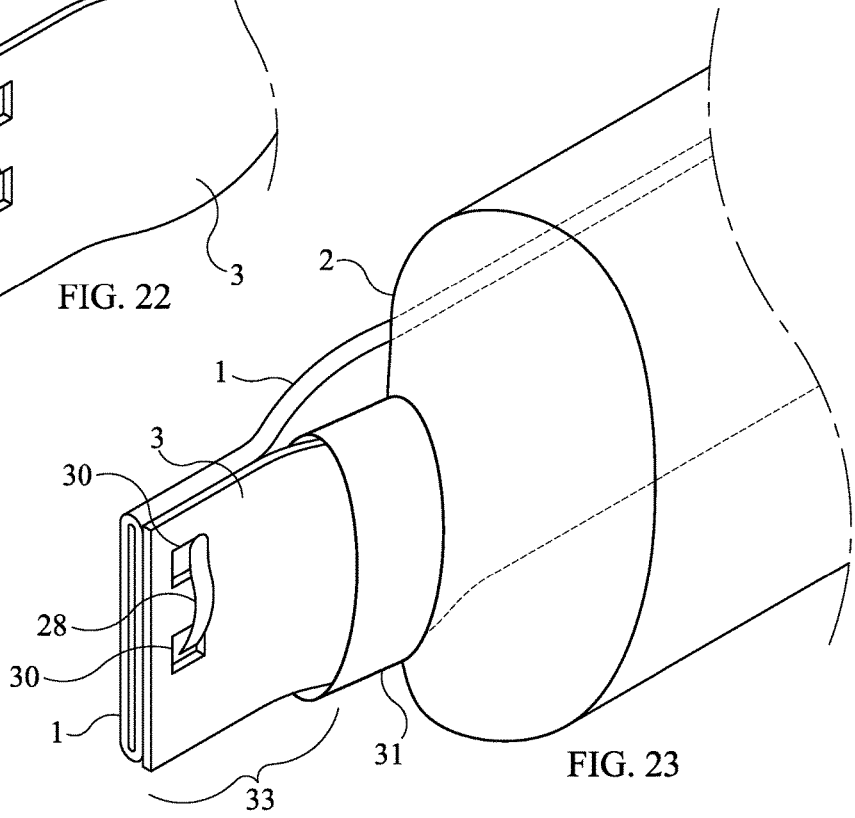


FIG. 23

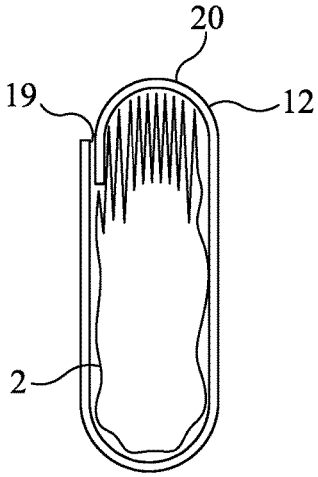


FIG. 24

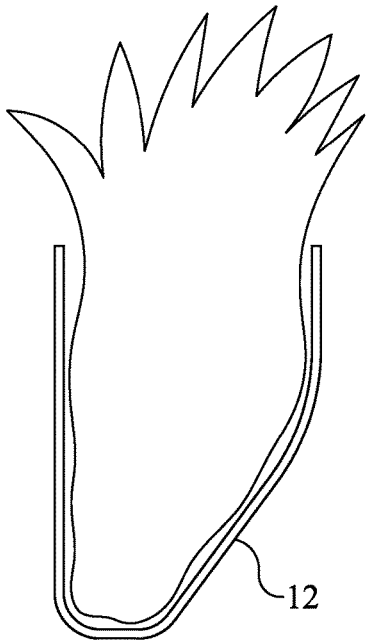


FIG. 25

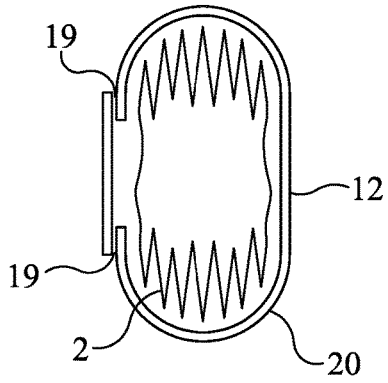


FIG. 26

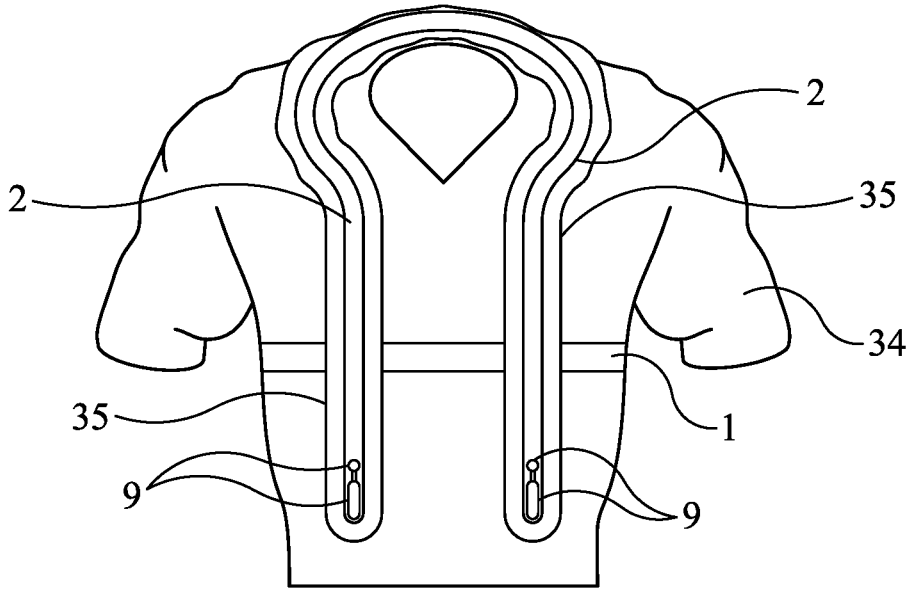


FIG. 27

INCONSPICUOUS FLOTATION APPARATUS

BACKGROUND OF THE INVENTION

[0001] The present invention relates to new and useful improvements in the field of life preservers and personal floatation devices.

[0002] Various US and international laws mandate that inherently buoyant, personal floatation devices (PFDs) in adequate numbers and sizes must at least be readily accessible, or that inflatable versions be continuously worn by, all persons aboard vessels underway in water. Unfortunately, vanity, discomfort and inconvenience all contribute to people not wearing such devices. It is no surprise then that in most boating accidents and drownings in general, the victims were not wearing a personal floatation device when the accidents occurred.

[0003] The current state of the art is comprised of three categories of materials or devices used to provide buoyancy of PFDs. These include: First, inherently buoyant materials, such as synthetic foams, or pouches filled with buoyant matter such as cork or shredded synthetic foam; Second, inflatable devices, which have inflatable chambers to provide buoyancy once inflated with gas, such as from a compressed CO_2 cylinder and/or blow tubes with valves through which the wearer can blow air to inflate the chambers; and Third, hybrid devices, which contain both inherently buoyant material and inflatable chambers.

[0004] The breadth of the prior art in this field of invention is a testament to the ongoing difficulty in mitigating the worldwide pandemic of preventable drownings, and barely addresses the practical needs of swimmers. Unfortunately, virtually all of the effective PFDs found in the prior art are generally cumbersome, unsightly and diminish the senses of freedom of movement, relaxation, comfort and vanity associated with social, recreational and sports activities which take place near, on, or in water.

[0005] The prior art references to inflatable PFDs include various inflatable vests, bladders and belts, such as disclosed by the following: U.S. Pat. Nos. 5,180,321, 5,368,512, 5,702,279 and 6,394,866 to Brown; U.S. Pat. No. 4,379,705 to Saotome; U.S. Pat. No. 5,766,179 to Deforte; U.S. Pat. No. 5,466,179 to Jeffrey, Sr.; U.S. Pat. No. 5,231,411 to Vinay; and U.S. Pat. No. 6,676,467 to Filsouf. None of these prior art patents, either individually or in combination, describe the present invention as claimed.

[0006] These prior art references disclose inventions that are too bulky in their pre-deployment form to be disguised within or upon common modern swimwear, except for some devices of limited utility which can be incorporated onto large and loose-fitting male swimtrunks. Other inventions to wrist bands and hand-held devices provide very temporary, if any, reprieve for a swimmer in distress. Many inventions in the prior art fail to turn an unconscious or exhausted swimmer face up in the water, do not meet other USCG standards and are unsafe. Many inflatable floatation devices disclosed in the prior art, especially those which are minimalist in design, are dangerous and impractical in their execution as they require the distressed user to operate awkward or difficult means of use. Even the most recent market entries of shirt-style PFDs cover most of the skin area over the upper torso with the impermeable, nonbreathing inflation bladder and are likely quite hot, sweaty and uncomfortable especially in warm weather activities when they are most likely to be worn.

[0007] The main problem with PFDs is that people don't wear them. All prior art devices in this field that are practical and safe are also cumbersome, uncomfortable and unattractive in social settings onboard pleasure craft, around pools or on the beach, including most of the latest compact models. A need exists for a PFD that is both practical and safe, while also being, convenient, comfortable, attractive, and not only has novelty and utility but that people will actually use. The present invention meets this need by improving upon the prior art and solving these problems.

[0008] The first object of the present invention is to provide a personal floatation device that is inconspicuous, unobtrusive, physically minimalist and comfortable enough to be worn, even with a skimpy bikini, without detracting from the wearer's appearance or comfort, and not less attractive than other common aquatic-related accessories such as beach towels, sarongs, hats, or sunglasses. This object has the additional benefit of promoting the actual continuous wearing of personal floatation devices, thereby potentially preventing many drownings.

[0009] Another object of the present invention is to provide a PFD having a compact uninflated size that is unburdensome to the wearer.

[0010] Another object of the present invention is to provide a PFD having more reflective surface.

[0011] Another object of the present invention is to provide a PFD that may use the buoyancy force of its floatation component to power automatic upright reconfiguration of the invention on the wearer upon inflation.

[0012] Another object of the present invention is to provide a PFD that can be worn with minimal skin coverage on the wearer prior to inflation.

[0013] Another object of the present invention is to provide a PFD which allows the buoyancy compartment to be tightly folded into a compact volume but still be rapidly inflated via automatic or manual means.

[0014] Another object of the present invention is to provide a PFD having two or more inflation cylinders with attached actuators that are placed remotely from each other on the wearer, such as respectively on the right and left, front and back or upper and lower torso, and are actuated by either a single pull cord or automatically upon submersion in water.

[0015] Another object of the invention is to provide an option which actually adds the qualities of convenience and vanity of a stylish, detachable waist belt which has thin, perhaps waterproof pockets for inconspicuous and convenient carriage of small but necessary valuables such as cash, credit card, key and cell phone so as the give the wearer greater freedom of movement around a beach or recreational area without concern for items left unattended such as on a beach blanket, picnic or lounge area and further incentivizing consumption and usage of the PFD.

[0016] The above and other objects, features, and advantages of the present invention should become more readily apparent to those skilled in the art upon reading of the following detailed description in conjunction with the drawings, wherein there is shown and described illustrative embodiments of the invention.

BRIEF SUMMARY OF THE VARIOUS EMBODIMENTS OF THE INVENTION

[0017] The preferred embodiments and best modes of the invention contemplate an inflatable device worn about the

waist level as a belt or as incorporated into a swimming garment. In either configuration the invention is completely or almost completely inconspicuous and may be worn over, under or even be incorporated into almost any type of apparel. The waist belt embodiment may be inconspicuous even when worn with or incorporated into a skimpy bikini.

[0018] Upon either manual or automatic inflation in water of adequate depth, the waist belt embodiment utilizes its natural buoyancy to immediately and automatically reconfigure itself into the rescue position on the wearer as a practical life vest, which provides adequate buoyancy to the wearer, turning the wearer face-upright, while requiring minimal to no means of manual deployment or adjustment. Inherently buoyant and hybrid embodiments may simulate these means of deployment to any degree possible, but may be far more conspicuous and impractical.

[0019] The inflation compartment of the device preferably incorporates the use of lightweight metallized sheet materials such as nylon, or various polyethylene based or other synthetics. In an undeployed state, the outer appearance of waist belt embodiments of the invention are preferably that of a single narrow contiguous belt. The invention may require zero or very easy manual means of actuating inflation and/or adjustment. Additionally, inflatable and perhaps certain hybrid embodiments of the invention can be inconspicuously incorporated into swimwear, a shirt or other garment or worn gear, for comfortable and convenient use. The swimshirt embodiment is preconfigured in the life vest or rescue position, requiring only inflation, but as with the waist belt embodiments, is folded is a specific manner so to be compact but easily inflatable.

[0020] The present invention contemplates any position or arrangement of attaching the invention to the wearer in any serviceable manner to facilitate the functional results of in-water rescue of the wearer. All the various embodiments described herein include the traditional PFD arrangement of prepositioning a buoyancy component over the back of the neck, upper inner shoulders and along the right and left upper torso.

[0021] The invention may also include other components which provide integrity, points of attachment to swim wear and other gear and other functionality or accessories such as pockets, aesthetics, whistles, lights, electronic and smart devices, not limited to cell and smart phones, EPIRB (emergency position indicating rescue beacon) or PLB (personal location beacon), whether or not further described in detail herein.

[0022] Any materials can be used in any embodiment of the invention to construct its components of the invention, including all prior art means, materials or devices, which may be any flexible, adjustable, semi-flexible, expandable, contractile, stretchable, elastic, rigid, solid, semisolid, liquid or gaseous construct or combinations thereof, and of any material or materials or combinations thereof, and which may be contiguous or separated into multiple segments, including but not limited to a multi-compartment inflation chamber and may be of any or all combinations thereof.

[0023] The buoyancy component of the invention may be any means of buoyancy or combination of which may be incorporated into the invention, such as one or more inflatable, hybrid and/or inherently buoyant compartments, tubes, noodles, cylinders, cushions of synthetic foam or other material, or chambers, compartments, pouches, jackets, vests or the like which can be made of any material and/or filled with synthetic foam, kapok, cork, wood and/or any other inherently buoyant material or combinations thereof, or one or more of any type of inflatable chambers, compartments, tubes, bladders or the like, which can be inflated by any means before, during or after entering the water. Such means of inflation may be by commercially available prior art with pressurized cartridges of CO_2 or other gas which may be discharged manually using a mechanical inflation actuator such as via a pull-cord, or automatically by water contact or submersion, to inflate a buoyancy chamber. Inflation may also be achieved via blow tubes which are also currently common features of commercially available inflatable PFDs, including any incorporated one-way or two-way valves, into which the wearer can blow or pump air to inflate and/or deflate the buoyancy chamber(s). The invention could also be a hybrid apparatus which includes both inflatable and inherently buoyant components.

[0024] This invention includes exclusive claim to the use of lightweight laminates of metallic foil and synthetic sheet materials such as nylon, or various polyethylene materials or derivatives in a personal flotation device or other flotation apparatus as defined herein. The metallic foil component is bonded to and seals pores in the synthetic component, making it relatively impermeable to gas diffusion, so that it can safely and durably maintain the gas inflation pressure and volume needed for reliable flotation of an adult human in water. The foil component would preferably be on the interior and/or between layers so as not to be washed and/or rubbed off by the water, wind and contact with the wearer. Such lightweight metallic foil/synthetic laminate material would be used primarily to achieve functionality of adequate buoyancy and durability, while minimizing the size of the uninflated PFD or floatation aid and to make the device light in weight, attractive and/or minimally apparent and/or comfortable and/or unobtrusive when worn prior to inflation. Such lightweight laminate may also be reinforced with any bonded or non-bonded thin and strong layer of any material such as any fabric, synthetic, silk, synthetic monofilament or other netting, webbing or sheet material to add strength, including resistance to puncture, tearing, inflation pressure rupture or other integrity or aesthetics.

[0025] Each embodiment of the invention shall contain at least one flotation apparatus, the principle purpose of which shall be to provide buoyancy and includes one or more buoyancy components (such as an inflation compartment) (**2**); one or more secondary straps (**3**) which may be adjustable; and means of inflation. The flotation apparatus may be of any shape and may be made of any material or materials or combinations thereof which provide adequate buoyancy and integrity for rescue flotation of the wearer in water of adequate depth and preferably meeting USCG guidelines. The flotation apparatus shall preferably provide most of the buoyancy afforded by the invention but could also work in concert with any supplemental buoyancy which might be provided by certain embodiments of other components of the invention or separately. Such buoyancy components and flotation apparatus can be a contiguous entity, and/or be connected or separate entities, such as for example in the back-loop or suspenders type embodiments described herein. The back-loop and suspenders type embodiments of the invention is automatically powered by its own buoyancy to become displaced into the rescue configuration and position on the wearer when in water of adequate depth.

[0026] The inflation chamber or chambers may have two or more stages of inflation. For instance, the first stage may be a smaller diameter chamber which is not folded or with few folds to facilitate rapid achievement of maximum inflation volume and pressure, perhaps with a stronger wall and higher inflation pressure than the second stage. The first stage may be designed to assist in rupture of the outer covering and its buoyancy would preferably be great enough to facilitate extraction, and thus inflation, of the second stage (and perhaps any other remaining stages) from the outer covering, with the second (and/or other additional) stage to preferably provide most of the inflation volume and buoyancy of the invention.

[0027] The term "secondary strap" may be any strapping or webbing or other materials or mechanisms for providing integrity, adjustment and/or attachment of components of the flotation apparatus; and including but not limited to means of attaching buoyancy components to the waist belt. The term "waist belt", while preferably occurring at the waist, refers to any means of attaching the invention to the wearer, and whether or not this occurs at the waist. The flotation apparatus of any embodiment herein described is thus attached to and/or contiguous with any part or parts of the waist belt as described herein. The flotation apparatus, waist belt or any other part of the invention may also include any materials that add aesthetics, structure, integrity, strength and/or points of attachment, pockets, pouches, instructions, guides, advisements, whistles, other sound or light emitting devices, flags, floats, balloons, kites, advertisements, electronic devices or other accessories not shown in diagrams.

[0028] When the invention is worn in the uninflated state, the outer appearance of the best mode of the invention is that of a single narrow contiguous belt, made up of components herein described and is designed to be practical, comfortable, attractive and inconspicuous. The invention may be made to be virtually or completely unnoticeable, especially when permanently or temporarily incorporated or integrated into wearer's apparel, in any manner. For instance the outer perimeter of the invention may be sewn, zippered or otherwise attached to the hem of a swimming suite bottom, with the breachable aperture on the top of the outer covering. Or, the hem of a swim suit could be the actual breachable covering with the waist belt being its inner wall and containing floatation apparatus inside. Also, the hem may include just the outer covering, which contains the rest of the entire invention, allowing the waist belt of the invention to escape the covering and slide upward on the torso upon deployment.

[0029] The invention can then be immediately deployed into the configuration of or approximating that of a life vest, which preferably meets or approximates US Coast Guard standards for a PFD. The invention shall preferably be capable of automatic inflation when the wearer enters the water, and/or electively deployed by the wearer via manual activation, and with need for no or minimal and simple adjustment.

BRIEF DESCRIPTION OF THE DRAWINGS

[0030] Having generally described the various embodiments of the invention, reference will now be made to the accompanying drawings, which are not necessarily drawn to scale, and wherein:

[0031] FIG. **1** shows the preferred waist belt embodiment of the invention. being worn prior to deployment.

[0032] FIG. **2** shows a side view of the "back-loop" embodiment of the invention.

[0033] FIG. **3** shows a side view of the back-loop embodiment of the invention in the mid-phase of automatic reconfiguration as disclosed by the present invention.

[0034] FIG. **4** shows a front view of the back-loop embodiment of the invention in the post-deployment rescue configuration.

[0035] FIG. **5** shows a side view of the back-loop embodiment of the invention in post-deployment rescue configuration keeping the wearer upright in water of adequate depth.

[0036] FIG. **6** is a schematic showing some but not all variations of embodiment of the invention in an inflated (i.e. post-deployment) state, with optional contiguity indicated with dashed lines.

[0037] FIG. **7** is a schematic of embodiments having a tapered narrow segment or an expanded head rest depicted with dashed lines at the midpoint of the flotation apparatus as defined by the present invention.

[0038] FIG. **8** shows a preferred, waist belt embodiment of the invention. with two separate sets of CO_2 cylinders and inflation actuators, one on each side, but having a single actuator method such as a single pull cord attached to both actuators, for simultaneous inflation.

[0039] FIG. **9** shows the wrap-around waist belt embodiment of the present invention in a post-deployment state.

[0040] FIG. **10** shows a front view of the suspenders-type embodiment of the present invention.

[0041] FIG. **11** shows a side view of the suspenders-type embodiment of the present invention in its mid-deployment state as disclosed by the present invention.

[0042] FIG. **12** depicts a rear view of a suspenders-type embodiment of the present invention in its post-deployment state.

[0043] FIG. **13** is a schematic cross-section of a preferred inflatable embodiment of the invention as contemplated, using a flexible outer covering attached to the waist belt and enveloping the uninflated buoyancy apparatus, showing variations on the means of breaching the outer covering that may be utilized by the various embodiments disclosed herein.

[0044] FIG. **14** is a cross-section of a preferred inflatable embodiment of the invention as contemplated, showing early stage of inflation of flotation apparatus as it breaches the outer covering along a breached containment line.

[0045] FIG. **15** is a cross-section view of an embodiment of the invention as contemplated with a semi-rigid flexible outer shell with clips connecting the housing to the primary waist belt. The clips may be connected to the waist belt by any means known in the art, such as tongue-and-groove or overlapping ridge designs.

[0046] FIG. **16** shows a flexible sheath (**7**) that covers the breach by being attached on one side along the long edge of the breach in the outer covering and the opposite side being tucked between the opposite edge of the breach and the contained, collapsed inflation compartment. This FIG. also shows an option of including the CO_2 cylinder within the covering.

[0047] FIG. **17** is a schematic of the first best mode embodiment of present invention prior to inflation.

[0048] FIG. **18** is a schematic of a preferred embodiment of the invention, in a partially inflated state after breaching the outer housing (with optional dual CO_2 cylinder inflation actuators in place).

[0049] FIG. **19** is a view of the fully inflated state of a preferred suspenders-type embodiment of the invention in a fully deployed state, having CO_2 cylinder inflation actuators.

[0050] FIG. **20** shows an embodiment of the waist belt with optional attached anti-inversion clips as contemplated by the present invention.

[0051] FIG. **21** shows detail of an anti-inversion clip as contemplated by the present invention.

[0052] FIG. **22** shows a secondary strap embodiment of the invention equipped with eye rings for attachment onto anti-inversion clips on the waist belt.

[0053] FIG. **23** shows an embodiment of the connection mechanism for mounting of the floatation apparatus on the waist belt as contemplated by the invention.

[0054] FIGS. **24**, **25** and **26** show cross-sections displaying the method of folding of the inflation compartment.

[0055] FIG. **27** shows another embodiment of the invention, whereby the invention may be worn under, over, or incorporated into a swim top or shirt.

DETAILED DESCRIPTION OF THE VARIOUS EMBODIMENTS OF THE INVENTION

[0056] Reference will now be made in more detail to the preferred embodiments of the invention. While the invention is described more fully with reference to the following examples, the invention in its broader aspects is not limited to these specific details, representative devices, and illustrative examples as shown and described. The description which follows is to be understood as a broad, teaching disclosure directed to persons of ordinary skill in the art and as not limiting upon the invention.

[0057] A first preferred, best mode, embodiment of the invention is an inflatable waist belt as shown in FIGS. **1** and **17**, concealing an inflatable buoyant floatation apparatus. The waist belt can be manufactured to be either overlying, underlying, or otherwise incorporated into a bikini (or swimsuit) bottom. FIGS. **1** and **17** show this waist belt PFD in uninflated (or pre-inflated) state, wherein its various components are mostly hidden from view within an outer covering (**12**). The waist belt PFD can be manufactured to be either overlying the swimwear or integrated into swimwear as shown in FIG. **1**. A second preferred embodiment incorporates the waist belt PFD into other apparel or gear such as a shirt or swim top as shown in FIG. **27**.

[0058] The waist belt embodiments of the invention consist of an elongated or curvilinear inflatable flotation apparatus composed, at minimum, of one or more of the following: one or more buoyancy components (such as an inflation compartment) (**2**) which in its uninflated state may be folded up and concealed within the outer covering (**12**) as in FIGS. **13**, **14**, **15**, **24** and **27** and which may be multicompartmental, each compartment being connected to any prior art means of inflation; at least one secondary strap (**3**) which may be adjustable and connects the buoyancy component (**2**) by any known means of attachment in prior art to a waist belt (**1**). The attachment points of the buoyancy component (**2**) to the waist belt (**1**) shall preferably be at the front of the wearer for the back loop and shirt embodiments and toward the front and back for the suspenders type.

[0059] The flotation apparatus and waist belt may have various forms, but would preferably have a similar arrangement with the flotation apparatus overlying the waist belt (**1**), and with the waist belt snuggly fitted on the wearer. The waist belt (**1**) may be an integrated part of an outer covering (**12**) or the waist belt (**1**) may be contained within the outer covering (**12**), which also covers and conceals the flotation apparatus. In the best mode of the invention, the outer covering forms a water tight compartment housing the floatation apparatus.

[0060] FIG. **17** shows the outer appearance of the preferred embodiment of the invention in a pre-deployment state. The thickness of the invention may vary depending on the final specifications of materials and design. The width of the invention may or may not be uniform and its length may be adjustable. All flotation apparatus components including the buoyancy component(s) (**2**) and secondary straps (**3**) are contained between the primary or waist belt (**1**) and the outer covering (**12**) to achieve a comfortable compact device with no exposed moving parts, save perhaps for attachment means such as ties, buckles, etc. The flotation apparatus and its covering may be detachable from the waist belt by any prior art means and the waist belt may include preferably thin and perhaps waterproof, pockets for securing personal property or small valuables such as cash, credit card, a key and cell phone. Also shown are indicator windows (**27**) to view readiness status of the inflation actuators (**25**) which are known in the art. These indicator windows (**27**) could be of any type of material used in the art and may be placed at any practical position on the invention.

[0061] In-water deployment of the back-loop style PFD embodiment of the invention is shown in FIGS. **2**, **3**, **4** and **5**. In the back-loop embodiment, the buoyancy component (**2**) is roughly U-shaped when inflated with its ends preferably placed at the front side of the wearer and is secured to the waist belt (**1**) by a secondary strap (**3**). The waist belt (**1**) may be longer than the flotation apparatus to allow for length adjustment for proper fit and to join the ends together preferably by a buckle (**4**) (however, any other practical connection means such as known art may be implemented) to snugly secure the device onto the wearer. With the limbs of the inflation compartment (**2**) secured to the front of the waist belt, the unattached segments of the flotation apparatus are now free to move up the back and sides of the wearer under the power of its own buoyancy with the wearer upright in water of adequate depth. The flotation apparatus then continues to be forced up to the back of the neck and then can go over the shoulders with minor manual manipulation where the device finally rests in a suitable PFD configuration, as shown in FIGS. **4** and **5**.

[0062] FIG. **2** shows the back-loop embodiment as it begins deployment after inflation. Shoulder straps (not shown) may also be attached to the invention. FIG. **3** shows the back-loop embodiment in the mid-phase of its automatic reconfiguration, whereby once inflated, the buoyancy force caused by being in water of adequate depth powers and directs the device to deploy upward along the back side of the wearer toward the final, "rescue configuration," keeping the wearer upright and face up in the water. A secondary strap connected to the front side of the waist belt keeps the device in place and guides the limbs of the buoyancy component over the wearer's arms and shoulders to the front side of the wearer. FIG. **4** shows a front view of the invention in the final, post-deployment rescue configuration keeping

the wearer upright and their head above water of adequate depth. As seen in FIGS. **3** and **5**, upon deployment the waist belt may ride up higher on the torso, but the buoyancy component remains secured to the wearer by the waist belt and secondary strap (**3**).

[0063] Also for the back loop PFD embodiment, one or more straps, bands or webbing of any material may extend from the central curved segment of the back-loop type buoyancy component to the back of the waist belt, or in any practical arrangement across the boundaries of the gap between the limbs of the inflation compartment and/or the waist belt, to form a means of preventing the buoyancy component from passing over the wearer's head from back to front upon inflation. This webbing (**5**) as shown in FIGS. **4** and **5** would preferably be as wide and long enough at the middle, upper curve, of the buoyancy component when located at the back of the wearer's head and neck so as to prevent the wearer's head from passing under the loop of the buoyancy component, so as to also hold the head face up above the water surface, but also short enough to allow easy placement of the limbs of buoyancy component over the wearer's arms and shoulders, from back to front. As such, the webbing (**5**) shall preferably be wider at the upper, curved part of the inflation compartment than its tether down the midline to waist belt as in FIGS. **4** and **5**.

[0064] Secondary straps (**3**) shown in this or any of the embodiments discussed herein secure the waist belt to the buoyancy component, and may be elastic and/or adjustable and include manual or auto-locking clips known in the art. In the waist belt embodiments of the invention, the adjustable secondary straps are long enough to allow reconfiguration of the device at least loosely into the rescue or PFD configuration. The attachment points of the secondary strap may occur at any practical location on the buoyancy component and waist belt and are not limited to those shown in the drawings.

[0065] Different variations of the back-loop embodiment are also contemplated and shown in FIG. **6**. These variations include: different points of connection to secondary strap (**3**) attachments; variation in the floatation component being one contiguous body or separate components having a connection point; at least one secondary strap (**3**) means of connecting the buoyancy component to the waist belt (**1**); and an optional strap and buckle or other mechanism (**11**) known in the art for connecting the two limbs of the buoyancy apparatus at about the mid-torso level. Webbing (**5**) is not shown in FIG. **6**. FIG. **7** shows additional variations on the floatation component, including a tapered narrow mid-segment and a widened segment to support the back of the head. The variations shown and described are not to be considered limiting, and other obvious variations are anticipated.

[0066] The waist belt embodiment as shown in FIG. **8** features an inflation compartment that is inflated by two or more CO_2 cartridges (**9**) and actuators (**25**), specifically designed for the waist belt, and being similar but smaller versions than are currently available for PFDs, said CO_2 cartridges being actuated simultaneously via a single pull cord (**8**).

[0067] FIG. **9** shows a second "Wrap Around Waist Belt" embodiment of the invention. At least one secondary strap or straps (**2**) may run along the length of the buoyancy components (**2**), either outside and/or through their interior, or are attached directly to the ends of the buoyancy component. Instead of the ends attaching to a separate waist belt, they are crossed over each other and then wrapped completely around the waist in opposite horizontal directions to form the waist belt (**1**), and the ends are then fastened in any manner such as buckling (**4**) to securely attach to the wearer. The Wrap Around waist belt embodiment may need to be secured in place, such as by belt loops or other mechanism, to be prevented from potentially unwrapping during violent rolling or spinning over in water.

[0068] Yet another embodiment of the invention is the Suspenders-Type PFD, as shown in FIGS. **10**, **11**, **12** and **19**. The Suspenders-Type design includes: the waist belt (**1**); front buckle or fastening means (**4**); the buoyancy components consisting of two separate inflation apparatus (**2**); and the secondary straps (**3**). In FIG. **10** the device shown being worn while submerged in water of adequate depth. The separate flotation apparatus (**2**) begin their upward deployment caused by the buoyancy force of the water. FIG. **11** shows the buoyancy lifting the inflated suspender-type inflation apparatus. The wearer sticks his arms under the inflation apparatus as they rise to shoulder-level. The front and back ends of each inflation apparatus are tethered to the waist belt with a secondary straps (**3**). FIG. **12** is a rear view of the fully deployed device in the suspenders-style configuration, keeping the wearer's body upright and head above water. This embodiment of the invention may also include a headrest feature not shown in the drawings.

[0069] FIG. **19** shows the Suspenders-type embodiment of the invention in an almost fully deployed state, with optional inversion clips (**28**, **30**) with the sleeve or belt loop means of attachment shown in FIGS. **19**, **20**, **21** **22** and **23**. All prior art means of attachment are anticipated. Inflation means such as CO_2 cartridges with attached actuators (**9**) and pull cords (**26**) or blow tubes to achieve inflated state may be used.

[0070] The ends of the waist belt (**1**), flotation apparatus (**2**), the chosen segments for attachment of the waist belt and secondary straps (**3**), may or may not be contiguous. These components may be made contiguous or be connectable, disconnectable or adjustable by any mechanism (**11**) in the prior art, preferably connecting the two front sides of the buoyancy apparatus at the mid-torso level. Optional head rest expansions (**27**) of the suspenders type buoyancy components may afford head and neck support.

[0071] FIGS. **13**, **14**, **15** and **16** show the breachable outer covering component of the invention (**12**) preferably of durable material used to protect the inner inflation compartment (**2**).

[0072] FIG. **13** depicts a cross section view of the waist belt PFD embodiment of the invention. The outer covering of the waist belt contains a collapsed and folded inflatable buoyancy component (**19**) which may be partially unfolded (**2**) to facilitate inflation. This breachable outer covering (**12**) which envelopes the flotation apparatus (**2**) and may be contiguous with, attached to or envelops the waist belt (**1**) provides structural integrity and protection to the entire invention while also greatly facilitating ease of use and appearance. Whether or not for the purpose of incorporating invention into a swimsuit, the waist belt (**1**) may be within and unattached to the outer covering (**12**), which may allow the inflatable buoyancy component and waist belt to escape the covering and otherwise deploy as in FIGS. **2**, **3**, **4** and **5**; or as in FIGS. **10**, **11** and **12** for the suspenders style PFD embodiment.

[0073] Upon inflation of the device, the outer covering (**12**) is expanded, torn, ruptured, kicked off or otherwise breached open by design, either automatically by inflation pressure or manually. The outer covering shown in FIG. **13** depicts various means which may be incorporated to make the outer covering breachable allowing inflation of the device, including: an adhesive; Velcro (**13**); hook and loop line (**14**); perforation line (**15**); groove (**16**); rip thread or rip cord (**17**); inherently burstable segments (**18**); or any other means in prior art may be used to achieve any such intentionally breachable rupture segment (**19**).

[0074] FIG. **14** shows a cross section view of any partially opened embodiment from FIG. **13** wherein the buoyancy component (**2**) is beginning to inflate and has ruptured through any intentionally weak connecting strip (**23**) or breachable rupture line (**19**) such as those shown in FIG. **13** (**13-18**), of the outer jacket. Any other segment could also be rupturable, or there could be a separate flexible connecting strip (**24**) elsewhere between the waist belt and the outer shell. The connecting strip (**24**) acts like a hinge that allows any flexible or rigid outer shell (**12**) to rotate outward (**91**) once any containment line (**19**) is ruptured under inflation pressure or manually. The breachable rupture line (**19**) or flexible line (**24**), could occur at any level along the outer jacket or shell.

[0075] FIG. **15** is a cross section view of an embodiment of the invention in which any rigid or semi-rigid outer shell (**22**) is clipped onto the waist belt by overlapping ridges (**21**), or tongue and groove (**23**) joints. Other prior art means of breachable connection are contemplated. The outer covering may include thinner, more flexible segments (not shown) to facilitate splaying open and kicking off the outer shell either by the inflation pressure of the internal buoyancy component (**2**) or via manually rupturing the covering.

[0076] FIG. **16** shows a flexible sheath (**7**) that covers a built-in breach line (**19**) in the outer covering (**22**) by being attached along the long one edge of the breach line (**19**) in the outer covering (**22**) and its free edge (**71**) is tucked between the opposite edge of the breach (**19**) and the contained, collapsed inflation compartment (**2**). FIG. **16** also shows an option of including at least one CO_2 cylinder (**9**) with inflation actuator within the covering as means of inflation.

[0077] FIG. **18** shows the preferred waist belt embodiment of the invention (**1**) with the inflation compartments (**2**) in the act of inflating, and have ruptured through the outer covering (**12**), but may expose any optional inflation actuators (**25**) and CO_2 cartridges (**9**). The optional rip-thread or rip-cord to initiate outer jacket rupture and inflation is shown (**17**), extending from the pull cords (**26**) have already assisted in breaching the outer shell, and as depicted also could be attached to inflatable buoyancy components (**2**) to assist their unfolding during deployment.

[0078] FIGS. **20**, **21**, **22** and **23** show the detail of embodiment of the connection means for the flotation apparatus on the waist belt using anti-inversion clips as disclosed by the invention to prevent inversion of the flotation apparatus toward the wearers feet by a strong current or if the wearer is inverted (head down-feet up) in the water upon inflation deployment of the device. The waist belt (**1**) may include any number of hooks or clips (**28**) which are open at the upper side of the waist belt (**29**) and closed or contiguous at the lower side of the belt. These "anti-inversion clips" (**28**) would accommodate attachment points, such as rigid eye rings (**30**) or other means, on any secondary strap or elsewhere on the flotation apparatus, to slide or be hung into place from above via the open end of the inversion clips (**29**). Any prior art means of attachment are anticipated. If the wearer becomes positioned upside down (inverted) in the water, the anti-inversion clips would prevent the buoyancy belt from floating up in the water toward the feet of the inverted wearer, but would still float the wearer to the water surface. At any point that the wearer becomes upright in the water, which is the natural tendency due to instinctive swimming to the surface, the flotation apparatus will automatically detach from the waist belt by floating out of the open upper ends of the anti-inversion clips and automatically deploy as designed into the rescue position. The inverted wearer may also facilitate reversion to upright position by simply pulling the sides of the flotation apparatus toward her or his head, which will quickly flip wearer upright and cause the invention to fully self-deploy.

[0079] FIG. **20** shows an embodiment of the anti-inversion clip component (**28**) embedded into or otherwise attached to the waist belt (**1**) as contemplated by the present invention which prevents the buoyancy belt from becoming displaced toward the feet of a wearer if deployment occurs with the wearer inverted in the water.

[0080] FIG. **21** shows an embodiment of an anti-inversion clip (**28**) separate from the waist belt (**1**) as contemplated by the present invention. Open upper end of clip is shown (**29**).

[0081] FIG. **22** shows rigid eye ring components of the anti-inversion clip (**30**) mounted onto or into a secondary strap, but could occur elsewhere on the flotation apparatus, to slide or be hung into place from above onto an anti-inversion clip via its open end (**29**).

[0082] FIG. **23** is a cross section view through an inflated flotation apparatus attached to the waist belt showing secondary strap (**3**) attached to the outer wall of the buoyancy component (**2**) of the flotation apparatus. An embodiment of the connection point between a hollow inflatable buoyancy component (**2**) and the waist belt (**1**), using sleeve (**31**) with fenestrations (**33**) or separate belt loop-like segments (**31**) attached or integrated (**32**) on the outside of the buoyancy component (**2**) by any prior art means. The secondary strap (**3**) can be rigged for anti-inversion clip (**28**) attachment with eyelets (**30**) and inserted onto the anti-inversion clips between the belt loops or fenestrations (**33**) in the sleeve (**31**). (**3**) The spaces between belt loops or apertures (**33**) in the sleeve (**31**) expose attachment points such as rigid eye rings (**54**) in the secondary strap (**3**), to hang the flotation apparatus on the anti-inversion clips (**28**) as disclosed in the present invention. All prior art means of attachment are contemplated.

[0083] FIGS. **24** and **25** shows a cross section through the invention to display the folding technique which allows compact folding but easy inflation. One or more segments of the wall of the inflation compartment (**2**) (in this case one segment) is folded as an accordion or paper fan like fashion to an optimal length and thickness so that it fits into the outer covering (**12**), leaving enough unfolded space within the inflation compartment to pressurize so that the inflation pressure will push or displace the folded portion out of the waist belt cover at the weakly covered aperture (**20**) via a provided breach containment line (**19**). The chamber will rapidly inflate to its capacity and displace itself out of the belt cover in the waist belt embodiments.

[0084] FIG. **26** shows folding of two wall segments, with two apertures to further shorten the width of the compartment and may be more ideal for the shirt embodiment.

[0085] FIG. **27** is a second-best mode embodiment in which the invention is incorporated into a shirt or swim top (**34**) which includes an expandable or breachable compartment or pocket (**35**) which accommodates the inflation compartment and CO_2 cylinder or cylinders with attached actuator or actuators. The inflation compartment is folded in the manner shown in FIGS. **25**, **26** and **27** so as to cover the minimum possible amount of skin surface with its impermeable, non-breathing material. The expandable pocket for the inflation compartment positions the inflation compartment in the rescue position used for most PFDs, i.e. over the back of the neck and adjacent shoulder areas and down each side of the upper torso. The shirt or swim top will also include a waist belt, preferably at mid to lower chest level and a secondary strap. It may also include a back side webbing as defined herein, and possibly an extra layer of highly breathable material such as synthetic fabric between the skin and inflation compartment.

[0086] When worn under, or incorporated into a shirt, specifically designed shirts and/or swim tops or other gear may be provided which are interchangeable and accommodate inflation so as to prevent choking by the shirt collar, such as any v-neck or other open collar design or expandable or breachable compartments that are separate from, or do not pull on, the collar material. Other possible features for such shirts are also anticipated including openings for pull cords and service access to the inflation cylinder and actuator as well as to belt and strap adjustment points.

[0087] When incorporated into a shirt or swim top, the shirt may be designed with pockets or compartments which accommodate the inflation compartment and may be expandable or breachable to allow inflation. Because of the folding technique as shown in FIGS. **24**, **25** and **26**, the inflation compartment has only a very narrow contact or coverage area over the skin of the wearer upper torso. The inflation compartment also includes substantially same or analogous attachments and straps as the waist belt embodiment but prepositioned over the back of the neck and adjacent upper shoulders and down the right and left sides of the front upper torso.

[0088] It is to be understood that while the preferred embodiments of the invention are illustrated, it is not to be limited to the specific form or arrangement of parts herein described and shown. It will be apparent to those skilled in the art that various changes may be made without departing from the scope of the invention and that the invention is not to be considered limited to what is shown and described in the specification and drawings.

1. An inconspicuous personal floatation apparatus, being in the form of a waist belt, and comprising:

An outer covering having a breach line;

A buoyancy component being an inflatable compartment having an uninflated state and inflated state, whereby in said uninflated state the inflatable compartment is folded in an accordion-like fashion and concealed within said outer covering;

inflation means; and

a secondary strap running along the length of and bonded to said waist belt and said buoyancy component;

whereby the appearance of the personal floatation apparatus in an uninflated state is that of a narrow contiguous belt and upon inflation, the apparatus being deployed and powered by its own buoyancy rises above the waterline into a rescue configuration turning and positioning a wearer upright with their head above water.

2. The inflation means of claim **1** being blow tubes.

3. The inflation means of claim **1** being one or more CO_2 cartridges having inflation actuators that are activated by a pull-cord.

4. The personal floatation apparatus of claim **1** wherein said outer covering has at least one breach line allowing the buoyancy component to breach the outer covering of said waist belt to achieve said inflated state.

5. The personal floatation apparatus of claim **1** wherein said outer covering has one or more windows for viewing the operating status of said inflation actuators.

6. The personal floatation apparatus of claim **1** wherein the outer covering is a rigid or semi-rigid shell having at least one breach line, said breach line being an area about the circumference of said outer covering that upon inflation of the apparatus breaks away to allow the buoyancy component to deploy into the inflated state.

7. The buoyancy component of claim **1** being one or more inflatable, hybrid, or inherently buoyant compartments, tubes, cushions, chambers, compartments, pouches, jackets, or vests.

8. The buoyancy component of claim **1** being of any inherently buoyant material or material filled with synthetic foam, kapok, cork, or wood biproduct, or capable of being filled with a gas.

9. The buoyancy component of claim **1** having a first layer and a second layer bonded together, the first layer composed of a laminate of lightweight, durable, reflective metallized or synthetic polymer sheet materials being impermeable to gas diffusion; said second layer composed of a thin fabric, synthetic, silk, netting, webbing, or sheet material.

10. The inflatable compartment of claim **1** having more than one inflation compartment forming the floatation apparatus that are inflated by a single pull-cord CO_2 actuator means.

11. The personal floatation apparatus of claim **1** wherein inflation being initialized, an inflation compartment expands under high pressure to rupture said outer covering, and a second stage of inflation whereby said means of inflation causes said personal floatation apparatus to deploy into its inflated state.

12. The personal floatation apparatus of claim **1**, wherein said secondary strap is adjustable in length;

13. The personal floatation apparatus of claim **1**, wherein said secondary strap is secured over the shoulders when in an inflated state.

14. The personal floatation apparatus of claim **1**, wherein said waist belt fits snug around a torso by at least one buckling means.

15. The personal floatation apparatus of claim **1**, further having a rip cord for manual means of breaching the outer covering during inflation.

16. The personal floatation apparatus of claim **1** wherein said apparatus is incorporated into a swimming garment.

17. The personal floatation apparatus of claim **1** wherein the outer covering has a flexible sheath attached along length of and covering the breach line and tucked between the opposite edge of the breach line and the inflation component.

18. The personal floatation apparatus of claim **1**, whereby the buoyancy component is folded compactly in an accor-

dion-like manner to an optimal length and thickness fitting within said outer covering and leaving an unfolded space within the inflation compartment to allow pressurization that may break through a breach line and outer covering upon deployment.

19. The personal floatation apparatus of claim **1** wherein said buoyancy component is a U-shaped inflation compartment having a midpoint curvature and two limbs that deploys from the back and sides of said waist belt to achieve said inflated state, said limbs being secured to the front side of the waist belt by at least one secondary strap.

20. The personal floatation apparatus of claim **1** having a webbing connecting the midpoint curvature of the inflation compartment to the back of said waist belt, being wider at the point of attachment to the inflation compartment and narrowing down at the point of attachment to said waist belt, whereby said webbing prevents said buoyancy component from passing over the head when deployed.

21. The buoyancy component of claim **1**, having a fastening means connecting the two limbs of the U-shaped inflation compartment at about the waistline to mid-torso level.

22. The midpoint curvature of the U-shaped inflation compartment of claim **1** being narrowly shaped to support the neck;

23. The midpoint curvature of the U-shaped inflation compartment of claim **1** being wider to support the back of the head.

24. The personal floatation apparatus of claim **1**, whereby secondary straps attached to the ends of the buoyancy component are crossed over each other and wrapped around the waist and then fastened to complete the waist belt.

25. The personal floatation apparatus of claim **1**, wherein the buoyancy component comprising two independent inflatable compartments that are connected to each other, and whereby upon inflation, said inflatable compartments rise to shoulder level allowing the apparatus to be worn in a suspenders-like configuration.

26. The personal flotation apparatus of claim **1** further having anti-inversion clips attached to said waist belt, being generally hook-shaped clips open at the upper side of the waist belt and closed at the lower side, connected to attachment points along the secondary strap; said anti-inversion clips preventing the personal floatation apparatus from floating towards the feet of a wearer who is upside down in water, and upon the wearer rotating upright, the anti-inversion clips slide off allowing the personal floatation apparatus to fully deploy upright with the head above water.

* * * * *