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(54) **FLOTATION BODY ARMOR SYSTEM**

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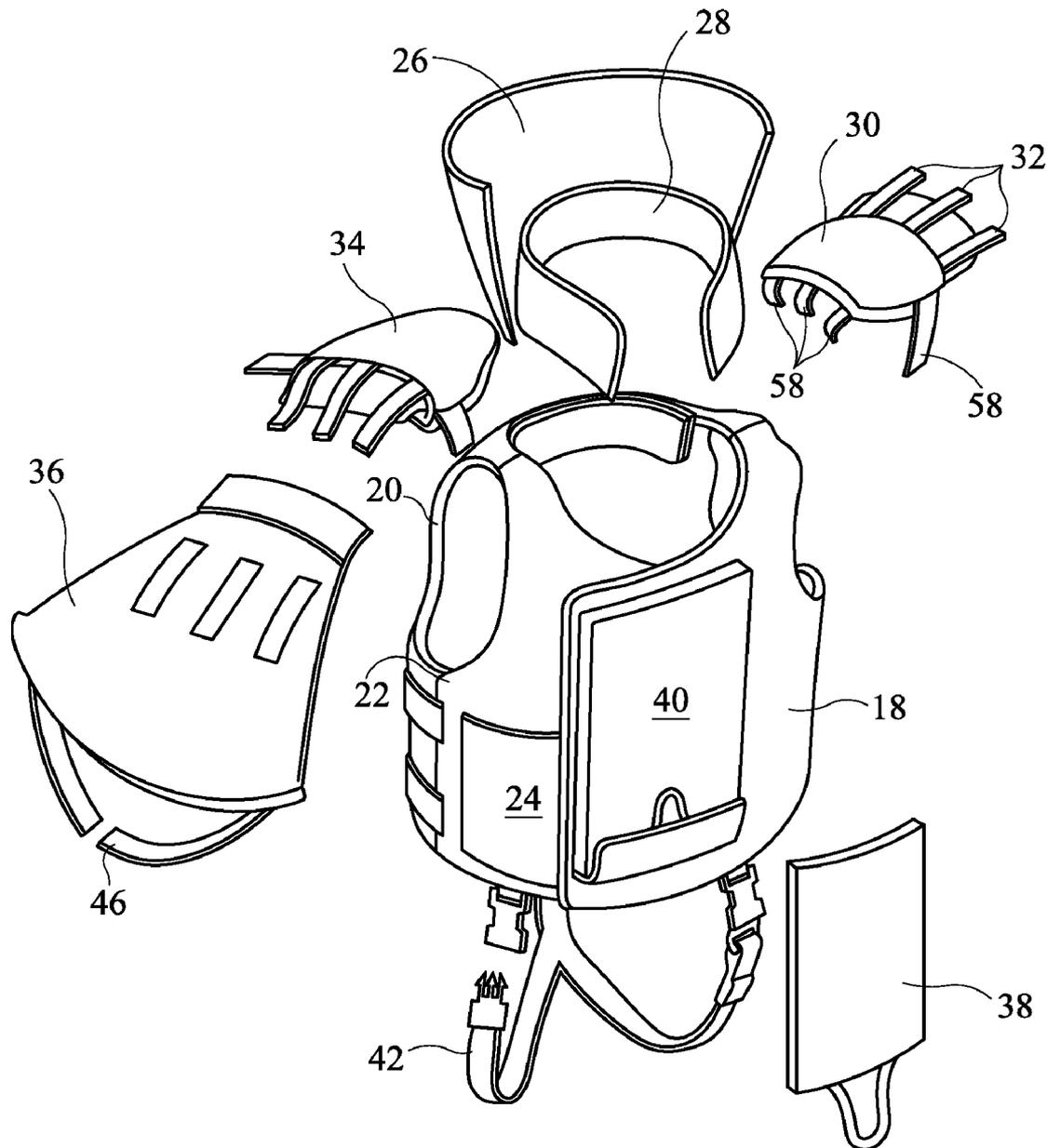
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(57) **ABSTRACT**

A body armor system for protective use against harmful projectiles, more specifically a ballistic garment which is integrated with a layer of flotation foam, allowing the wearer to float to the surface upon being immersed in water. Military and law enforcement personnel are primary users of interest.

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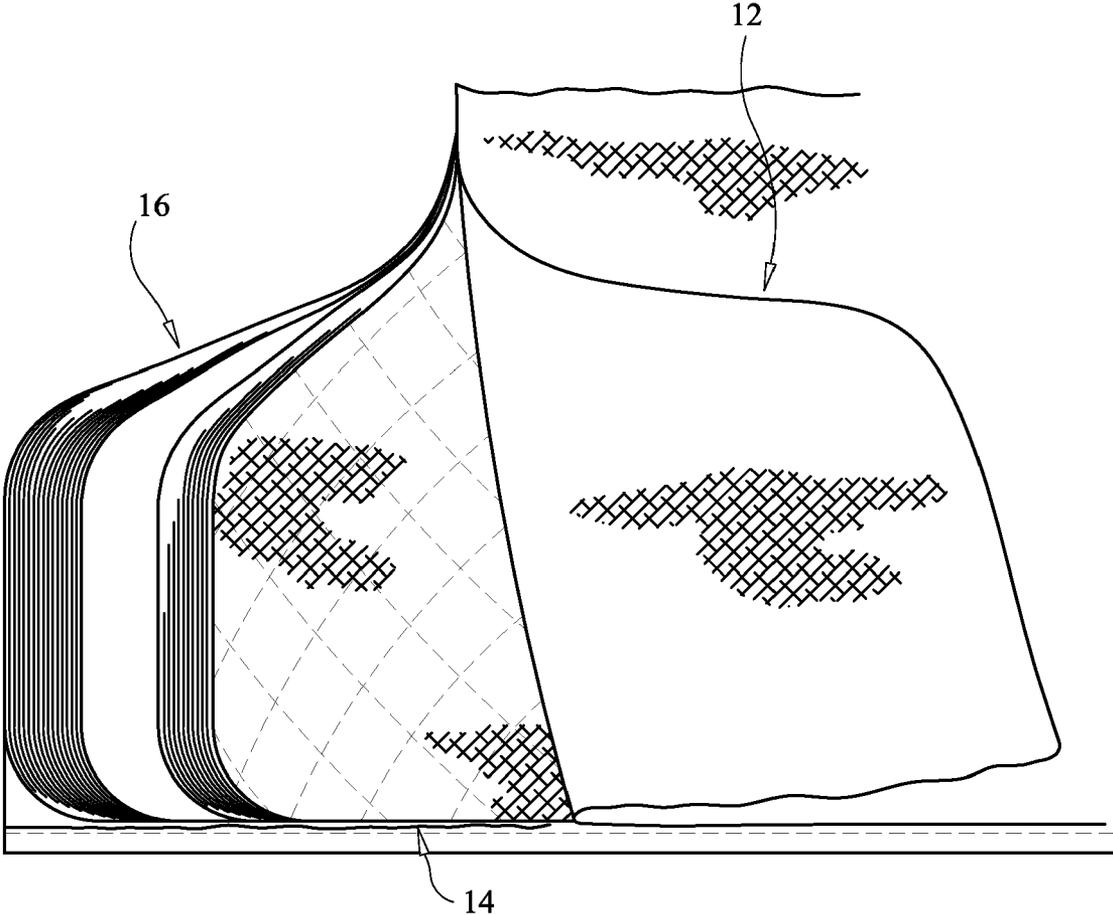


FIG. 1

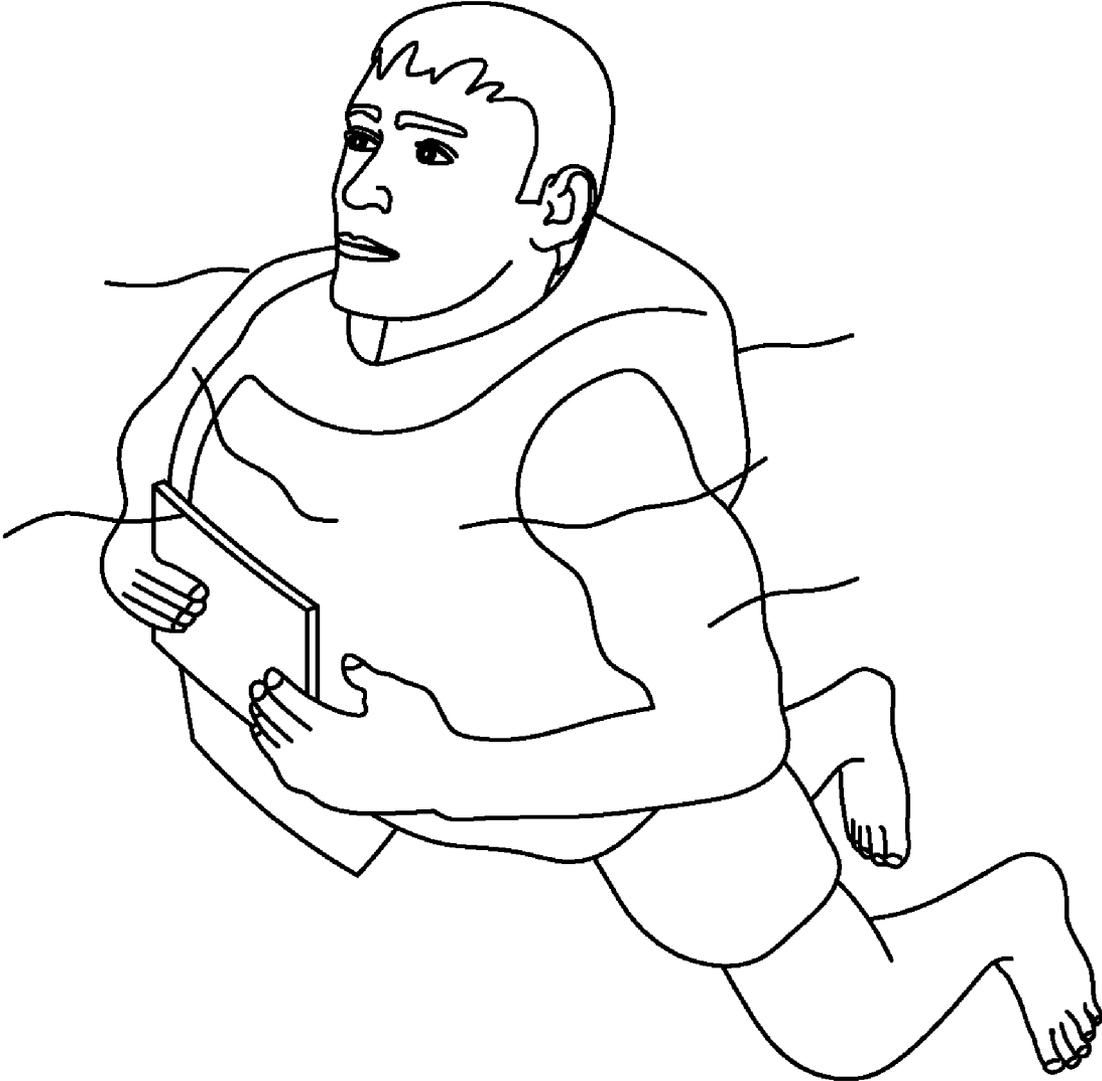


FIG. 2

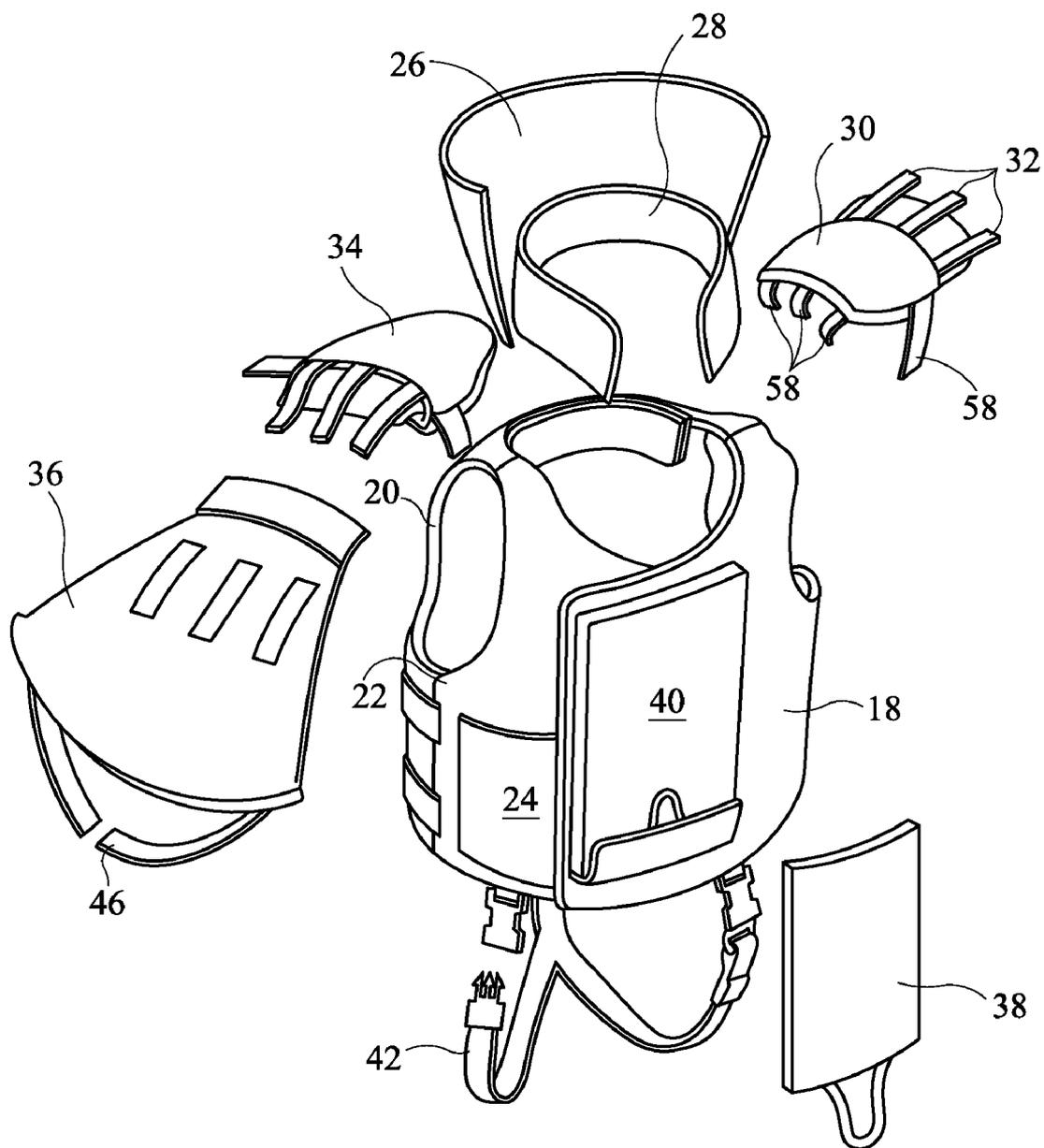


FIG. 3

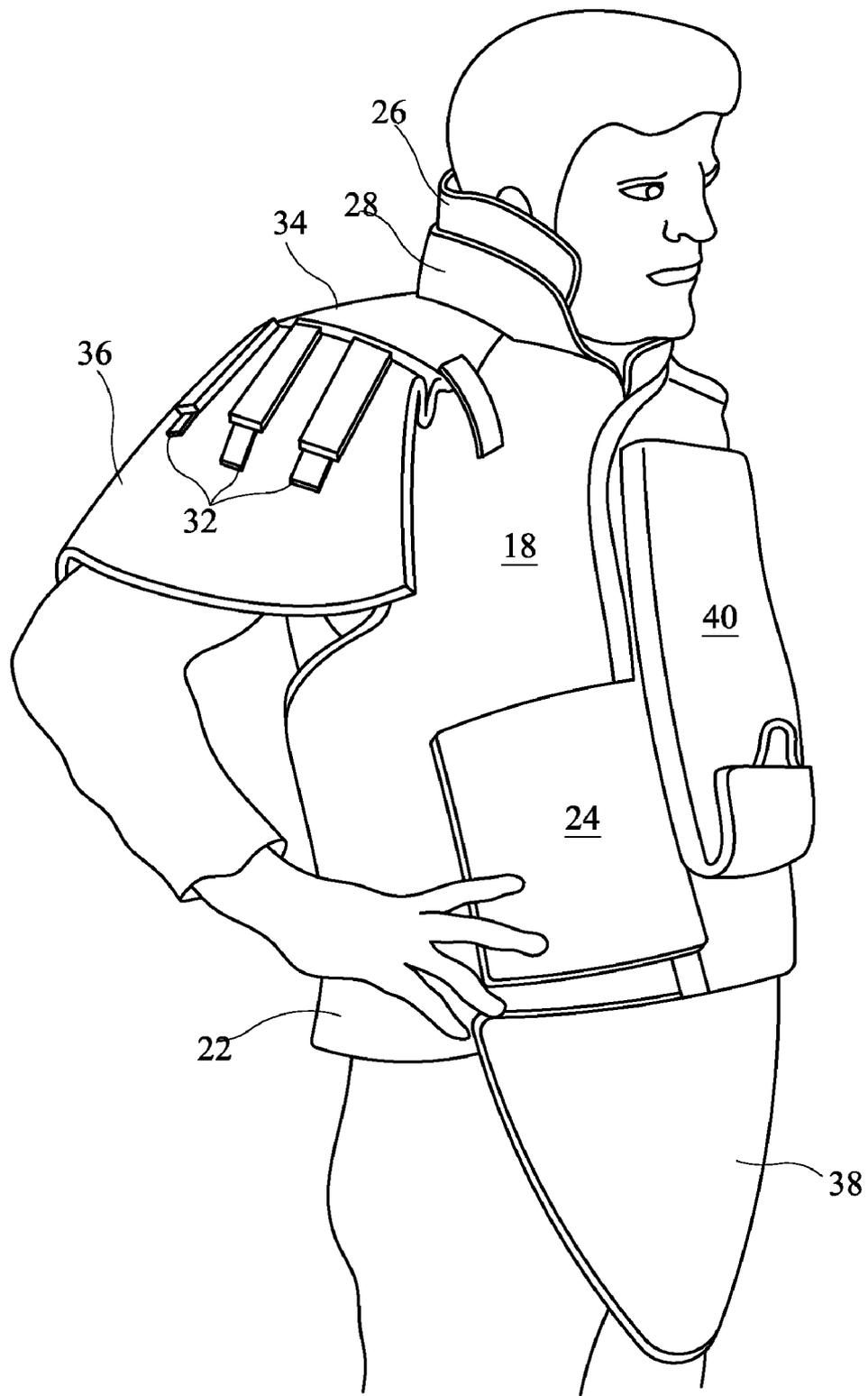


FIG. 4

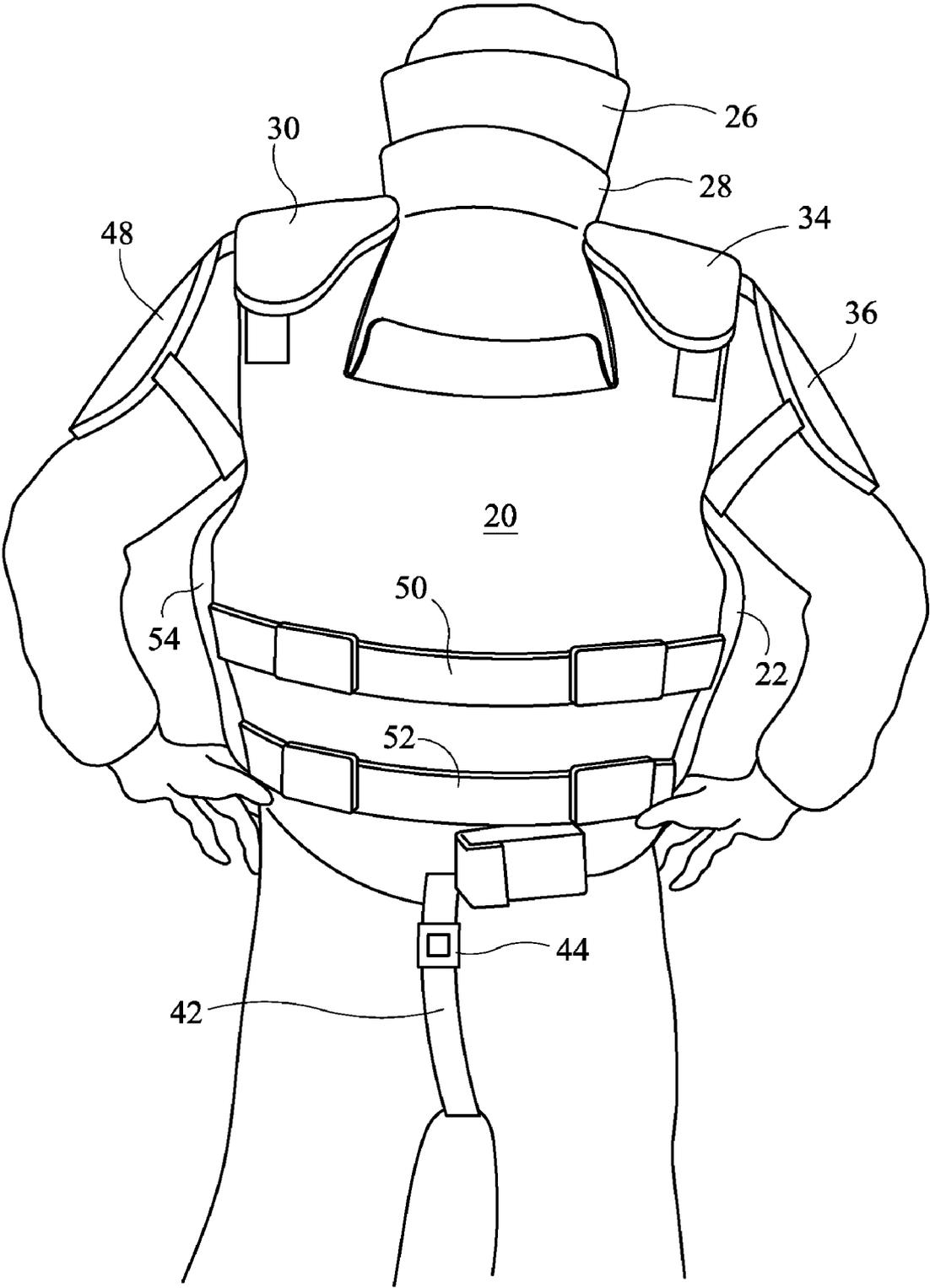


FIG. 5

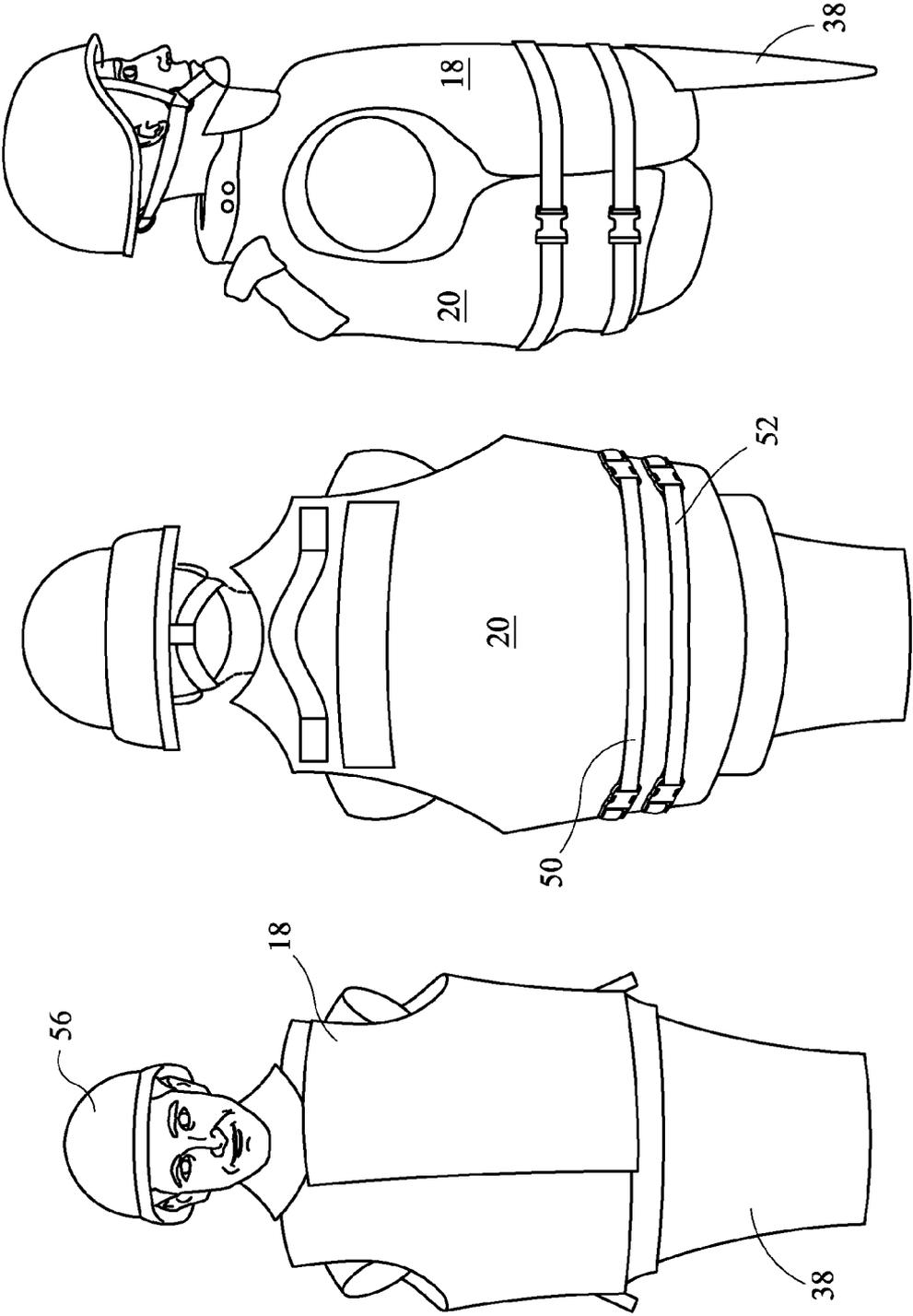


FIG. 6

**FLOTATION BODY ARMOR SYSTEM**

**CROSS REFERENCE TO RELATED APPLICATIONS**

[0001] Not applicable.

**STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT**

[0002] No federal government funds were used in researching or developing this invention.

**NAMES OF PARTIES TO A JOINT RESEARCH AGREEMENT**

[0003] Not applicable.

**REFERENCE TO A SEQUENCE LISTING**

[0004] Not applicable.

**BACKGROUND**

[0005] 1. Field of the Invention

[0006] The field of the invention is a body armor system for protective use against harmful projectiles, more specifically a ballistic garment which is integrated with a layer of flotation foam, allowing the wearer to float to the surface upon being immersed in water. Military and law enforcement personnel are primary users of interest.

[0007] 2. Background of the Invention

[0008] Body Armor

[0009] Body armor generally consists of protective clothing used to absorb the impact from firearm-fired projectiles and shrapnel fragments from explosions. The most basic component of armor usually consists of a vest for protection of the torso. The armor contained in such clothing can be either "soft", meaning interwoven or laminated fibers, or "hard", meaning metal or ceramic plates, either alone or in combination with fibrous material. Body armor may contain soft or hard components, or both. In the event both hard and soft armor are integrated, the hard plates will usually overlap the underlying soft ballistic material.

[0010] For instance, U.S. Pat. No. 5,179,244, to Zufle, discloses reinforced soft and hard body armor utilizing a plurality of layers or plies of dissimilar ballistic material in combination with a reinforcing panel positioned inwardly of the multiple plies of ballistic material with the reinforcing panel being constructed of a work hardenable material to reduce penetration of a projectile thereby reducing blunt trauma injury. The multiple plies of ballistic material include a unique arrangement of multiple plies of an aramid fiber available under the trademark "Kevlar" or "TWARON" and multiple plies of a non-woven ballistic material available under the trademark "Spectra Shield" and the reinforcing panel is a polycarbonate material such as available under the trademark "Lexan".

[0011] U.S. Pat. No. 3,867,239 to Alesi, et al., U.S. Pat. No. 4,198,707 to Haupt, et al., and U.S. Pat. No. 4,633,756 to Rudoi, disclose armor panels comprising multi-hardened plates arranged in multiple layers on a fabric backing.

[0012] Buoyancy and Movement Problems with Body Armor

[0013] A major disadvantage inherent in armored clothing is that armored plates, both soft and hard, tend to be more cumbersome and heavy than regular clothing, adversely

affecting the buoyancy of the wearer when immersed in water. The addition of modular attachments (such as through the MOLLE or PALS webbing systems) can further increase the weight of the vest, as can the use of attachments providing armored coverage for the neck, groin and extremities. Further, soft armor comprised of woven fibers retains water, adding to the weight of a garment upon immersion.

[0014] Bulky body armor garments and attachments for protecting extremities can also inhibit the movement of arms and legs to make swimming or treading water more difficult.

[0015] The problem of weight in the use of body armor is illustrated by U.S. Pat. No. 6,651,543 to Park, which discloses a ballistic panel for being incorporated into a light-weight soft body-armor product adapted for covering an area of the body. The ballistic panel includes an assembly of woven fabric plies with warp and fill yarns formed of bundled aramid fibers. Without the addition of heavier hard armor plates, the plies have only a collective areal density of no greater than 1.30 pounds per square foot, and a V50 ballistic limit of no less than 1925 feet per second using a .22 caliber, 17 grain FSP at 0 degrees obliquity.

[0016] Another disadvantage in the design of both soft and hard body armor clothing is that such clothing, inclusive of armor panels, tends to be bulky to the point of limiting the wearer's ability to wear a standard flotation device concurrently with the armor.

[0017] U.S. Pat. No. 5,060,314 to Crye, discloses personal body armor with hard armor plates on the front and back of the wearer which extend between a left vest section and a right vest section formed of soft armor. Foam pads are affixed to the interior of the vest sections which space the soft armor and the hard armor plates from the wearer's body and define multiple vertically extending air channels for cooling between the wearer and the hard armor plates and the interior of the soft armor. The hard armor plates are configured in an attempt to avoid interference with the usual range of motion of the wearer. The patent also addresses the buoyancy issue by stating that the closed cell foam of the pads adds flotation to the wearer should it be necessary to enter a body of water. Not only do the pads counter the added weight of the body armor 20, but the pads will usually represent a net buoyancy, helping to keep the wearer afloat.

[0018] U.S. Pat. No. 5,060,314 to Lewis shows a body armor jacket formed of flexible ballistic cloth having internal pockets for receiving hard armor inserts. Add-on shoulder pads have flotation pads, apparently intended to provide limited buoyancy in water.

[0019] What is needed is a body armor system which provides full combat-level ballistic protection (NIJ Level IIIA or higher) yet which also provides the wearer with total protection against drowning upon immersion in water, as one would expect from a standard life preserving floating vest without ballistic protection, despite the weight and movement restrictions imposed by the integrated body armor.

**BRIEF SUMMARY OF THE INVENTION**

[0020] In one preferred embodiment, a body armor system is provided, comprising: a garment providing protection for one or more of the following body areas: torso, neck, shoulders and extremities, such garment comprising one or more

soft armor panels, said panels comprising a plurality of layered sheets made from material consisting of interwoven fibers and/or laminated fibers, said panels meeting or exceeding NIJ Level I armor standard and providing front and back coverage, and wherein the soft armor panels have an integrated layer of flotation foam.

**[0021]** In another preferred embodiment, there is provided the body armor system wherein the flotation foam consists of one or more of polyethylene foam, polyurethane foam, or polystyrene foam, sufficient to provide flotation capacity for personnel weighing up to 240 pounds.

**[0022]** In another preferred embodiment, there is provided the body armor system wherein the fibers used are either interwoven para-aramid fibers or laminated UHMWPE fibers.

**[0023]** In another preferred embodiment, there is an armor panel formed from the soft armor of claim 1, wherein sufficient layers of para-aramid or UHMWPE fibers are used to meet or exceed the NIJ Stab Resistance Standard—0115.00.

**[0024]** In another preferred embodiment, there is provided the body armor system wherein the garment is adjustable for height and girth.

**[0025]** In another preferred embodiment, there is provided the body armor system wherein the garment comprises front, rear and/or side integrated pockets to contain one or more hard armor plates, or otherwise contains one or more hard armor plates in addition to the soft armor panels and flotation foam.

**[0026]** In another preferred embodiment, there is provided the body armor system wherein an elastic waist band is integrated into the garment.

**[0027]** In another preferred embodiment, there is provided the body armor system wherein the garment comprises a modular composition configured with pouches, pockets and/or holsters.

**[0028]** In another preferred embodiment, a helmet comprised of soft armor comprising a plurality of layered sheets made from material consisting of interwoven para-aramid fibers and/or laminated UHMWPE fibers.

#### BRIEF DESCRIPTION OF THE DRAWINGS

**[0029]** FIG. 1 is a line drawing showing the overlapping layers of (i) nylon cover material, (ii) soft ballistic plates, and (iii) flotation foam.

**[0030]** FIG. 2 is a drawing showing a subject floating in water while wearing the armored vest, with notation arrows pointing out the location of hard antiballistic plates integrated with the front and rear of the vest.

**[0031]** FIG. 3 is a line drawing showing an exploded view of MTV-style vest components with neck, biceps and groin attachments.

**[0032]** FIG. 4 is a line drawing showing an assembled MTV-style vest with attachments, as well as pockets for insertion of hard armor plates.

**[0033]** FIG. 5 is a line drawing showing a rear view of MTV-style vest showing groin adjustment strap and MOLLE attachments.

**[0034]** FIG. 6 is a series of three (3) line drawings showing the front, rear and side views of the invention, respectively, and evidencing the MOLLE system webbing along each surface.

#### DETAILED DESCRIPTION

**[0035]** Definitions

**[0036]** The following definitions are provided as an aid to understanding the detailed description of the present invention.

**[0037]** The phrase “body armor” (without limitation, inclusive of the commonly used terms ballistic vest, bulletproof vest or bullet-resistant vest) refers to a garment made of armored or protective material that absorbs the impact from firearm-fired projectiles and shrapnel fragments from explosions. This protection can apply to any part of the body: torso, head, or extremities. Soft ballistic materials are made from many layers of woven or laminated fibers and protect wearers from projectiles fired from certain handguns, shotguns, and small fragments from explosives such as hand grenades.

**[0038]** “MOLLE” (pronounced MOLLY as in the female name) is an acronym for MODular Lightweight Load-carrying Equipment. It is used to define the current generation of load-bearing equipment and rucksacks utilized by the United States Army. The system’s modularity is derived from the use of PALS webbing, rows of heavy-duty nylon stitched onto the vest as to allow for attachment of various MOLLE-compatible pouches and accessories. This method of attachment has become a de facto standard for modular tactical gear, replacing the click and stick system used in the earliest modular vest systems (which is still in use with most Western police departments).

**[0039]** “NIJ Level IIIA” refers to the U.S. National Institute of Justice (NIJ) ballistic standard for armor with the following capabilities: “New armor protects against 8.1 g (125 gr) .357 SIG FMJ Flat Nose (FN) bullets at a velocity of 448 m/s±9.1 m/s (1470 ft/s±30 ft/s) and 15.6 g (240 gr) .44 Magnum Semi Jacketed Hollow Point (SJHP) bullets at a velocity of 436 m/s (1430 ft/s±30 ft/s). Conditioned armor protects against 8.1 g (125 gr) .357 SIG FMJ Flat Nose (FN) bullets at a velocity of 430 m/s±9.1 m/s (1410 ft/s±30 ft/s) and 15.6 g (240 gr) .44 Magnum Semi Jacketed Hollow Point (SJHP) bullets at a velocity of 408 m/s±9.1 m/s (1340 ft/s±30 ft/s). It also provides protection against most handgun threats, as well as the threats mentioned in NIJ Levels I, IIA, and II. As used in this application, the term is also inclusive of the newer NIJ 0101.06 level of protection.

**[0040]** “Modular Tactical Vest” (MTV) is a new American body armor, originally adopted by the United States Marine Corps in 2006. The MTV was designed as a solution to shortcomings in the current, decade-old Interceptor body armor and was selected after a rigorous proposal and examination process by the Marine Corps. The MTV provides better protection levels than the Interceptor system, although it uses the same Small Arms Protective Insert (SAPI) plates. The MTV weighs 30 pounds; three more than an Interceptor, but is designed to more effectively distribute its weight throughout the wearer’s torso. (See FIG. 1 for photograph) When metal or ceramic plates are used with a soft vest, it can also protect wearers from shots fired from rifles. In combination with metallic components or tightly-woven fiber layers, soft armor can offer some protection to the wearer from stab and slash from a knife. Soft vests are commonly worn by police forces, private citizens and private security guards or bodyguards, and hard-plate reinforced vests are mainly worn by combat soldiers in the armies of various nations as well as police tactical units and hostage rescue teams.

**[0041]** Modern body armor garments may combine a ballistic vest with other attachments or items of protective cloth-

ing, such as a helmet, sleeves, leggings, neck and groin protection. Ballistic garments intended for police and military use may also include ballistic shoulder, groin and side protection armor components. Bomb disposal officers wear heavy armor and helmets with face visors and spine protection.

**[0042]** In the embodiment of FIG. 1, the layers comprising ballistic panel 10 are separated to show the integrated layers of cloth made of or similar to Nylon Supplex-3ply™ vest cover material 12, multiple layers of UHMWPE, para-aramid or similar material comprising the soft body armor plate 14, and (iii) the multiple layers of flotation foam 16. In the preferred embodiment, multiple layers of antiballistic material are integrated using a proprietary chemical and thermal process to produce a multilayer plate 14. In a preferred embodiment, there are at least 40 layers.

**[0043]** It is contemplated within the present invention that garments have from about 10 to about 60 layers, and more preferably from about 20 to about 50 layers. In preferred garments for stab resistance, the garment will have from about 5 to about 25 layers, and more preferably from about 10 to about 20 layers. In preferred garments for NIJ Level IIIA ballistic resistance, the garment will have at least about 40 layers.

**[0044]** It is also contemplated within the present invention to prepare a hard armor plate comprising multiple hundreds of layers of UHMWPE, said layers being chemically and/or heat fused in combination with ceramic and/or steel plate. In a preferred embodiment, the hard armor UHMWPE plate comprises from about 200 to about 500 layers, and more preferably about 300 layers. In a preferred embodiment, the plate is no thicker in cross-section than about 1.5 cm and weighs no more than about 2 kilograms. It is contemplated as within the scope of this inventive claims that the plate is from about 1 cm to about 3 cm thick and from about 1 kg to about 3 kg.

**[0045]** In the preferred embodiment, multiple layers of flotation foam material are integrated using glue, tape or a similar bonding process to form a single integrated foam layer 16. The integrated layers of antiballistic material and flotation foam are then placed back-to-back, with the antiballistic plate on the outside and the foam on the inside, and sewn between two pieces of cloth made of or similar to Nylon Supplex-3ply™ to form the complete ballistic panel 10.

**[0046]** The ballistic panel cover material is comprised of a water resistant material such as Nylon Supplex-3ply™, a breathable and water resistant synthetic fabric that provides both comfort for the wearer and protection against the elements for the antiballistic and flotation foam materials.

**[0047]** The foam layer integrated to the soft armor plates within the cover material of the vest is comprised of one or more layers of a flotation foam compound, including but not limited to: polystyrene foam, urethane or polyurethane foam, or polyvinyl chloride foam. Although the embodiment of FIG. 1 shows the foam layer as being located inside the ballistic plate, alternate embodiments may also place the foam layer outside the ballistic plate, or integrated within the ballistic plate.

**[0048]** As illustrated in a line drawing in, for example, FIG. 2, the integrated foam system, comprised in a full ballistic vest or alternate garment, allows a person weighing up to 240 pounds full flotation without physical effort by the wearer to maintain such flotation.

**[0049]** Ultra high molecular weight polyethylene (UHMWPE), also known as high-modulus polyethylene (HMPE) or high-performance polyethylene (HPPE), is a subset of the thermoplastic polyethylene. It has extremely long chains, with molecular weight numbering in the millions, usually between 2 and 6 million. The longer chain serves to transfer load more effectively to the polymer backbone by strengthening intermolecular interactions. This results in a very tough material, with the highest impact strength of any thermoplastic presently made.

**[0050]** UHMWPE is a type of polyolefin, and, despite relatively weak Van der Waals bonds between its molecules, derives ample strength from the length of each individual molecule. It is made up of extremely long chains of polyethylene, which all align in the same direction. Each chain is bonded to the others with so many Van der Waals bonds that the whole can support great tensile loads.

**[0051]** When formed to fibers, the polymer chains can attain a parallel orientation greater than 95% and a level of crystallinity of up to 85%. In contrast, Kevlar derives its strength from strong bonding between relatively short molecules.

**[0052]** The weak bonding between olefin molecules allows local thermal excitations to disrupt the crystalline order of a given chain piece-by-piece, giving it much poorer heat resistance than other high-strength fibers. Its melting point is around 144 to 152 degrees Celsius, and, according to DSM, it is not advisable to use UHMWPE fibers at temperatures exceeding 80 to 100° C. for long periods of time. It becomes brittle at temperatures below -150° C.

**[0053]** The simple structure of the molecule also gives rise to surface and chemical properties that are rare in high-performance polymers. For example, the polar groups in most polymers easily bond to water. Because olefins have no such groups, UHMWPE does not absorb water readily, but it also does not get wet easily, which makes bonding it to other polymers difficult. For the same reasons, skin does not interact with it strongly, making the UHMWPE fiber surface feel slippery. In a similar manner, aromatic polymers are often susceptible to aromatic solvents due to aromatic stacking reactions, an effect to which aliphatic polymers like UHMWPE are immune. Since UHMWPE does not contain chemical groups (such as esters, amides or hydroxilic groups) that are susceptible to attack from aggressive agents, it is very resistant to water, moisture, most chemicals, UV radiation, and micro-organisms.

**[0054]** To anneal UHMWPE, the material should be heated to 135° C. to 138° C. in an oven or a liquid bath of silicone oil or glycerine. The material must then be cooled down at a rate of 5° C./h to at least 65° C. Finally, the material should be wrapped in an insulating blanket for 24 hours to bring to room temperature.

**[0055]** Ballistic fabrics are made of UHMWPE.

**[0056]** Dyneema (R) and Spectra (R) are commercially available forms of UHMWPE. They are spun through a spinneret to form oriented-strand synthetic fibers of UHMWPE, which have yield strengths as high as 2.4 GPa and density as low as 0.97 kg/l (for Dyneema SK75). High strength steels have comparable yield strengths, and low carbon steels have yield strengths much lower (around 0.5 GPa). Since steel has a density approximately equal to 7.8 kg/l, this gives strength/weight ratios for these materials in a range from 10 to 100 times higher than for steel. Strength to weight ratios for Dyneema are about 40% higher than for Aramid.

**[0057]** UHMWPE fibers are used in ballistic material, ballistic helmets and ballistic vehicle protection, cut resistant gloves, bow strings, climbing equipment, fishing lines, spear lines for spearguns, high-performance sails, suspension lines on sport parachutes and paragliders, rigging in yachting, kites, and kites lines for kites sports. Spectra is also used as a high-end Wakeboard line.

**[0058]** For body armor, the fibers are, in general, aligned and bonded into sheets, which are then layered at various angles to give the resulting composite material strength in all directions. Recently-developed additions to the US Military's Modular Tactical Vest designed to offer arm and leg protection, are said to utilize a form of Spectra or Dyneema fabric. Dyneema provides puncture resistance to protective clothing.

**[0059]** The soft armor plates contained in the vest comprise one of the following materials, or a material similar thereto: (i) UHMWPE, and (ii) para-aramid synthetic fibers.

**[0060]** In one embodiment, the invention is comprised of a fully adjustable ballistic garment including full body coverage including torso, neck, shoulders, and all extremities, including soft armor plates (NIJ Level I or higher) with overlapping coverage and front and rear integrated pockets for additional hard armor protection.

**[0061]** In another embodiment, the invention is comprised of a fully adjustable "Modular Tactical Vest"-style ballistic vest including soft armor plates (NIJ Level I or higher) with overlapping coverage and front and rear integrated pockets for additional hard armor protection. The vest adjusts for height and girth, and features an inner support elastic waist band to support the weight of the vest with maximum comfort for the wearer.

**[0062]** In the embodiment detailed in the preceding paragraph, the invention allows for the use of optional armored attachments providing antiballistic protection for portions of the wearer's anatomy other than the torso, such as the neck, shoulders, biceps and groin.

**[0063]** As illustrated with a line drawing in, for example, FIG. 2, the vest includes a generally contiguous (in coverage) front ballistic panel 18. Like front ballistic panel 18, rear ballistic panel 20 can be formed from one section or a plurality of separate sections of ballistic fabric. Front ballistic panel 18 includes sides section 22 adapted to extend around the side of a user and connect to rear panel 20 using a fastening material such as Velcro™ or a similar material. Front ballistic panel 18, includes front overlap 24, again fastened to the panel with Velcro™ or a similar material, which allows the user to open the vest with one hand.

**[0064]** As illustrated in a line drawing in, for example FIG. 3, the front ballistic panel 18 is attached to the rear ballistic panel 20 using girth adjustment straps 50 and 52. Hard armor pocket 40 is sewn to the front of front ballistic panel 18, and ceramic or metal hard armor plates can be inserted into said pocket. Groin attachment 38 and shoulder attachments 34 and 30 each attach to the front panel. Rear neck attachment 26 attaches to the rear panel 20. Front neck attachment 28 attaches to each of the front panel 18 and rear panel 20, to fully encircle the neck with protective coverage. Shoulder attachments 34 and 30 also attach to each of the front panel 18 and rear panels 20 with shoulder attachment straps 58, and also attach to the biceps attachment 36 using biceps attachment straps 32. The adjustment straps extend from the rear panel 20 through the groin area to the two adjustment strap clips 44, attached to two locations at the bottom of front panel

18. In the preferred embodiment, all attachments are attached to the base panels using a fastening material such as Velcro™ or a similar material.

**[0065]** As illustrated in a line drawing in, for example, FIG. 4, the panels and attachments referenced in paragraphs 15 and 16 above, when fully assembled, provide full armor protection for the wearer from the groin, around the full torso, and over the neck, shoulders and biceps regions.

**[0066]** As illustrated in a line drawing in, for example, FIG. 5, the vest also includes a generally contiguous (in coverage) rear ballistic panel 20. Like front ballistic panel 18, rear ballistic panel 20 can be formed from one section or a plurality of separate sections of ballistic fabric. Also pictured are side sections 22 and 54, which extend from front ballistic panel 18 around the sides of the user's torso and attach to rear ballistic panel 20 using a fastening material such as Velcro™ or a similar material. Girth adjustment straps 50 and 52 allow for size adjustment of the invention and also comprise MOLLE webbing for attachment of MOLLE-compatible accessories. Adjustment strap extends through the groin area to adjust the vest according to the user's height, and is engaged with adjustment strap clip 44.

**[0067]** The invention provides full compatibility with the U.S. Armed Forces' MOLLE and PALS Webbing systems on its front, back and sides, enabling the wearer to attach a variety of pouches, pockets, holsters and other items in keeping with MOLLE system.

**[0068]** As illustrated in the three line drawings comprising FIG. 6, the fully assembled front ballistic panel 18 and rear ballistic panel 20 provide full wrap-around ballistic coverage of each side of a wearer's torso. Further head protection is provided by ballistic helmet 56.

**[0069]** In another embodiment, the invention comprises an armored helmet using ballistic material integrated with flotation foam allowing the helmet to rise to the surface upon immersion in water.

**[0070]** While the methods and systems of the present invention may be embodied in a variety of different forms, the specific embodiments shown in the figures and described herein are presented with the understanding that the present disclosure is to be considered exemplary of the principles of the invention, and is not intended to limit the invention to the illustrations and description provided herein.

**[0071]** The references recited herein are incorporated herein in their entirety, particularly as they relate to teaching the level of ordinary skill in this art and for any disclosure necessary for the commoner understanding of the subject matter of the claimed invention. It will be clear to a person of ordinary skill in the art that the above embodiments may be altered or that insubstantial changes may be made without departing from the scope of the invention. Accordingly, the scope of the invention is determined by the scope of the following claims and their equitable Equivalents.

What is claimed is:

1. A buoyant body armor system comprising: a garment providing protection for one or more of the following body areas: torso, neck, shoulders and extremities, said garment comprising one or more soft armor panels, said panels comprising a plurality of layered sheets made from material consisting of laminated fibers, said panels meeting or exceeding NIJ Level I armor standard and providing front and back coverage, and wherein the soft armor panels have an integrated layer of flotation foam.

2. The buoyant body armor system of claim 1, further comprising wherein the flotation foam is selected from the group consisting essentially of polyethylene foam, polyurethane foam, and polystyrene foam.

3. The buoyant body armor system of claim 1, further comprising wherein the flotation foam provides flotation capacity for personnel weighing up to 240 pounds.

4. (canceled)

5. An armor panel formed from the soft armor of claim 1, further comprising wherein the fibers used are laminated UHMWPE fibers.

6. An armor panel formed from the soft armor of claim 1, further comprising wherein the plurality of layered sheets of or UHMWPE fibers comprise at least 40 layers of sheets.

7. An armor panel formed from the soft armor of claim 1, further comprising wherein the plurality of layered sheets of or UHMWPE fibers meet or exceed the NIJ Stab Resistance Standard—0115.00.

8. An armor panel formed from the soft armor of claim 1, further comprising wherein the plurality of layered sheets of UHMWPE fibers meet or exceed the NIJ Level IIIA Ballistics Resistance Standard—0101.06.

9. The armor panel of claim 8, further comprising wherein the plurality of layered sheets of UHMWPE fibers is about 2 cm in thickness.

10. The body armor system of claim 1, further comprising wherein said garment is adjustable for height and girth.

11. The body armor system of claim 1, further comprising wherein said garment further comprises front, rear and/or side integrated pockets to contain one or more hard armor plates.

12. The body armor system of claim 1, further comprising wherein said garment contains one or more hard armor plates in addition to the layers of soft armor and flotation foam.

13. The body armor system of claim 1, further comprising an inner support elastic waist band integrated into the garment.

14. The body armor system of claim 1, further comprising wherein said garment comprises a modular composition configured with pouches, pockets and/or holsters.

15. (canceled)

16. (canceled)

17. (canceled)

18. A buoyant body armor system comprising: a garment providing protection for one or more of the following body areas: torso, neck, shoulders and extremities, such garment comprising one or more soft armor panels, said panels comprising a plurality of layered sheets made from material consisting of laminated UHMWPE fibers, said panels meeting or exceeding NIJ Level I armor standard and providing front and back coverage, wherein the soft armor panels have an integrated layer of flotation foam consisting of one or more of polyethylene foam, polyurethane foam or polystyrene foam sufficient to provide flotation capacity for personnel weighing up to 240 pounds, wherein said garment further comprises front, rear and/or side integrated pockets to contain one or more hard armor plates or wherein said garment contains one or more hard armor plates in addition to the layers of soft armor and flotation foam, further comprising an inner support elastic waist band integrated into the garment, and wherein said garment comprises a modular composition configured with pouches, pockets and/or holsters.

19. A hard armor plate, comprising in combination a plurality of layers of UHMWPE, said layers being chemically and/or heat fused in combination with ceramic and/or steel plate.

20. The hard armor plate of claim 19, further comprising wherein the plurality of layers of UHMWPE are from about 200 to about 500 layers.

21. The hard armor plate of claim 20, further comprising wherein the plate is no thicker in cross-section than about 1.5 cm and weighs no more than about 2 kilograms.

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