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(54) **COMBINED NECK AND UPPER BODY PROTECTIVE GARMENT**

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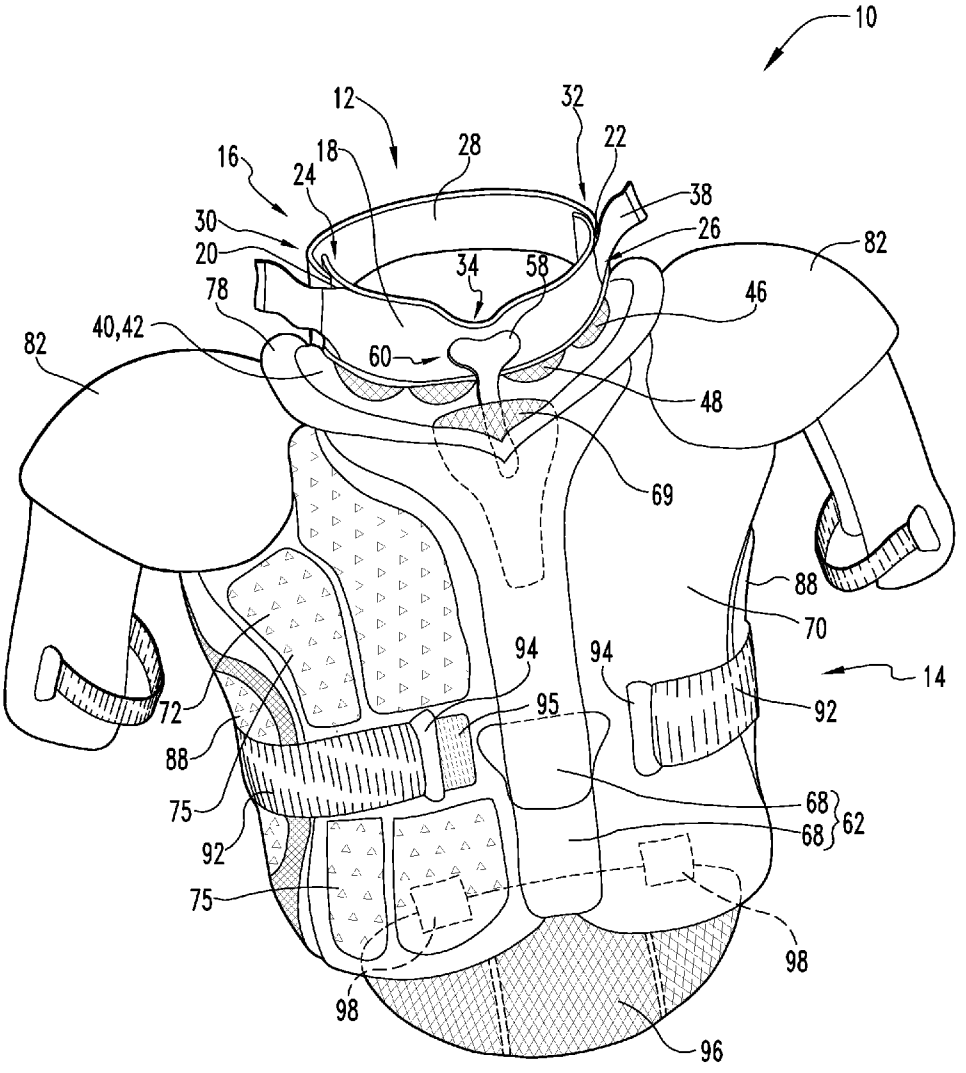
(57) **ABSTRACT**

A neck protector comprising a collar sized and shaped to provide a continuous closure around a neck of a wearer. The collar has a first pair of opposed ends, with one end having a first tongue and the other a first groove. The first tongue fits into the first groove to form a first tongue and groove interlock, which is maintained with a closure. Also, an upper body protector which may be used in combination with the neck protector. The upper body protector comprises a body portion and a spine protector shield system, and/or a chest protector shield system attached to the body portion. Both shield systems comprise at least two overlapping shield sections sized, shaped and positioned to cover at least a portion of the wearer's spine or sternum, while permitting flex, freedom of movement, and venting.



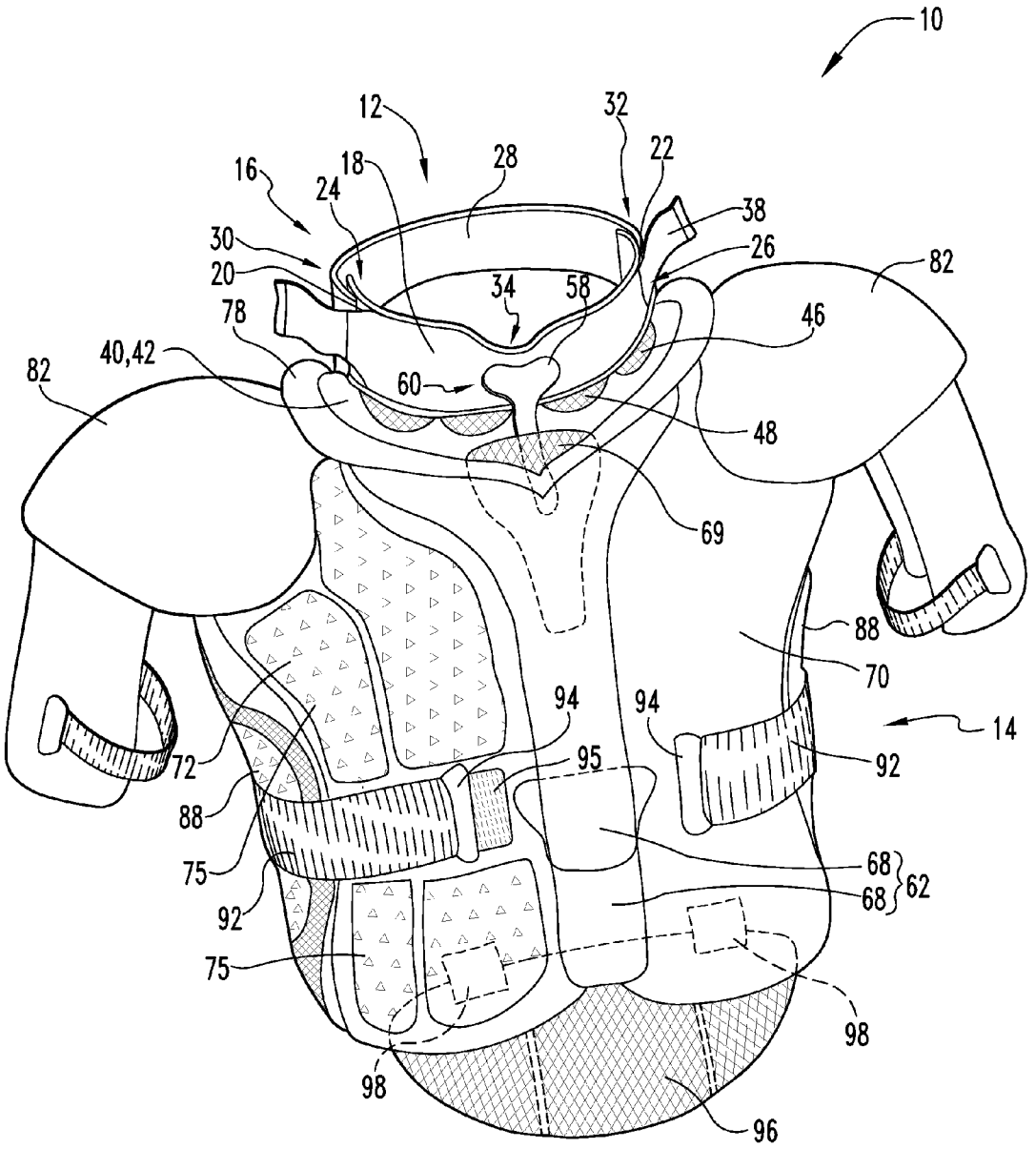

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Fig. 1

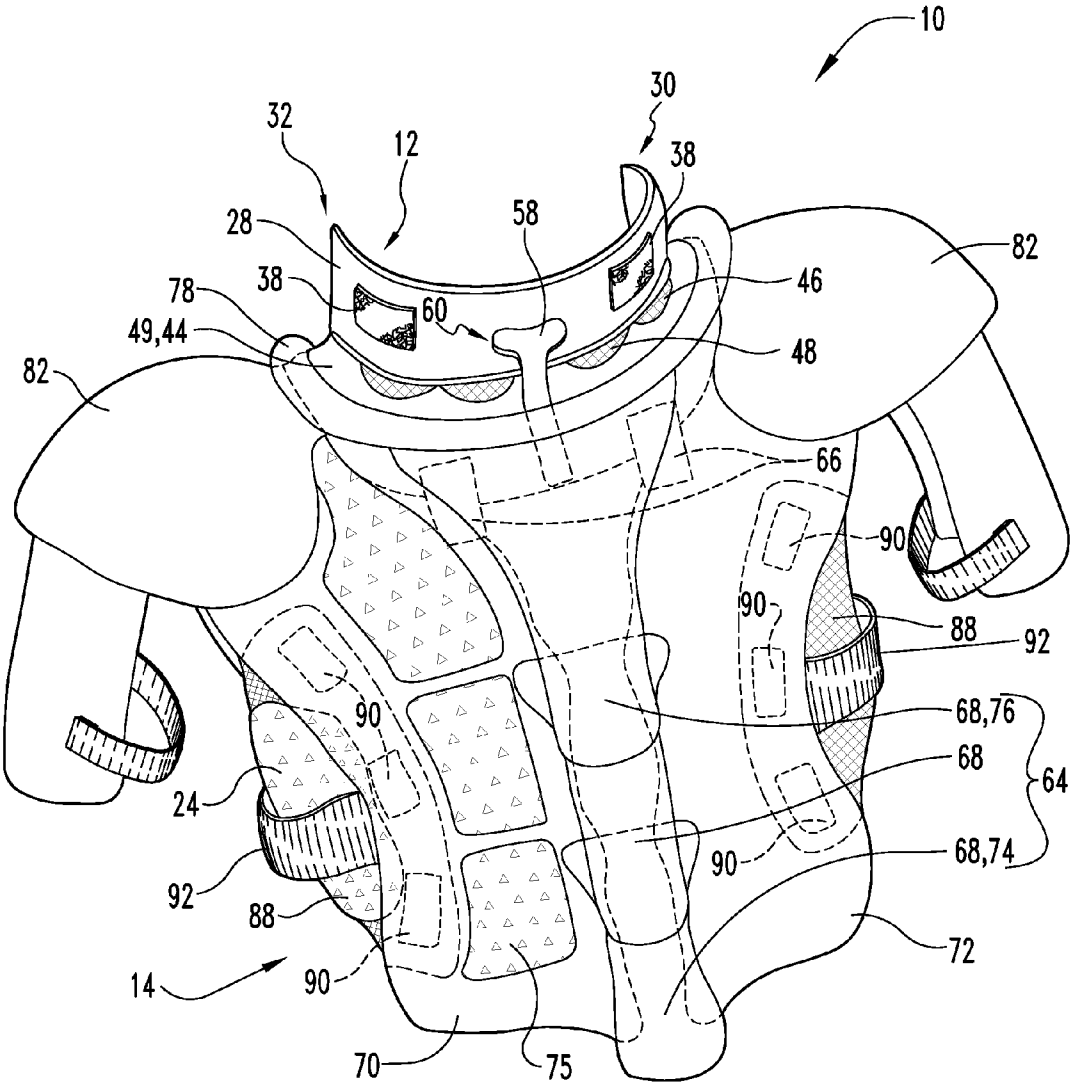
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Fig. 2

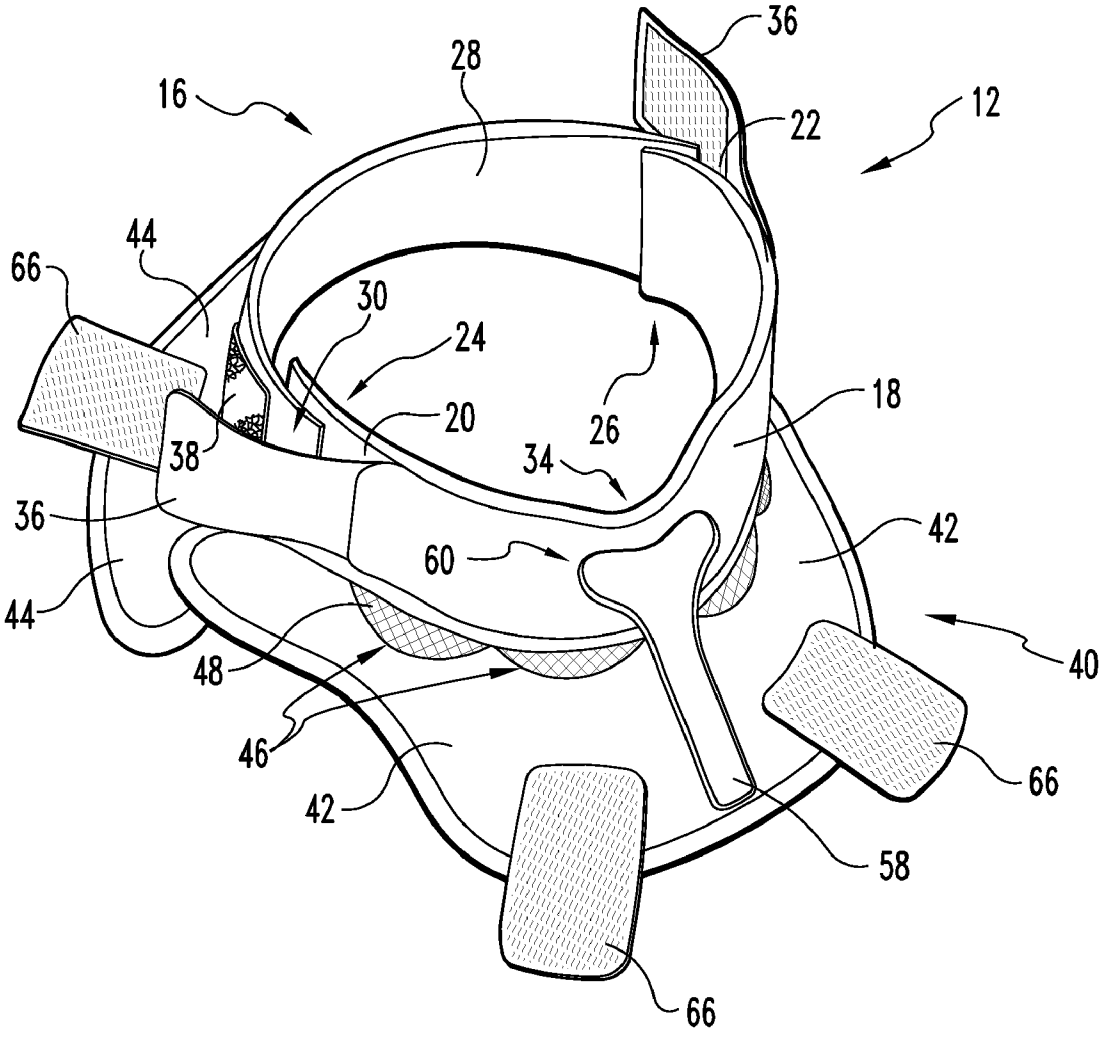
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Fig. 3

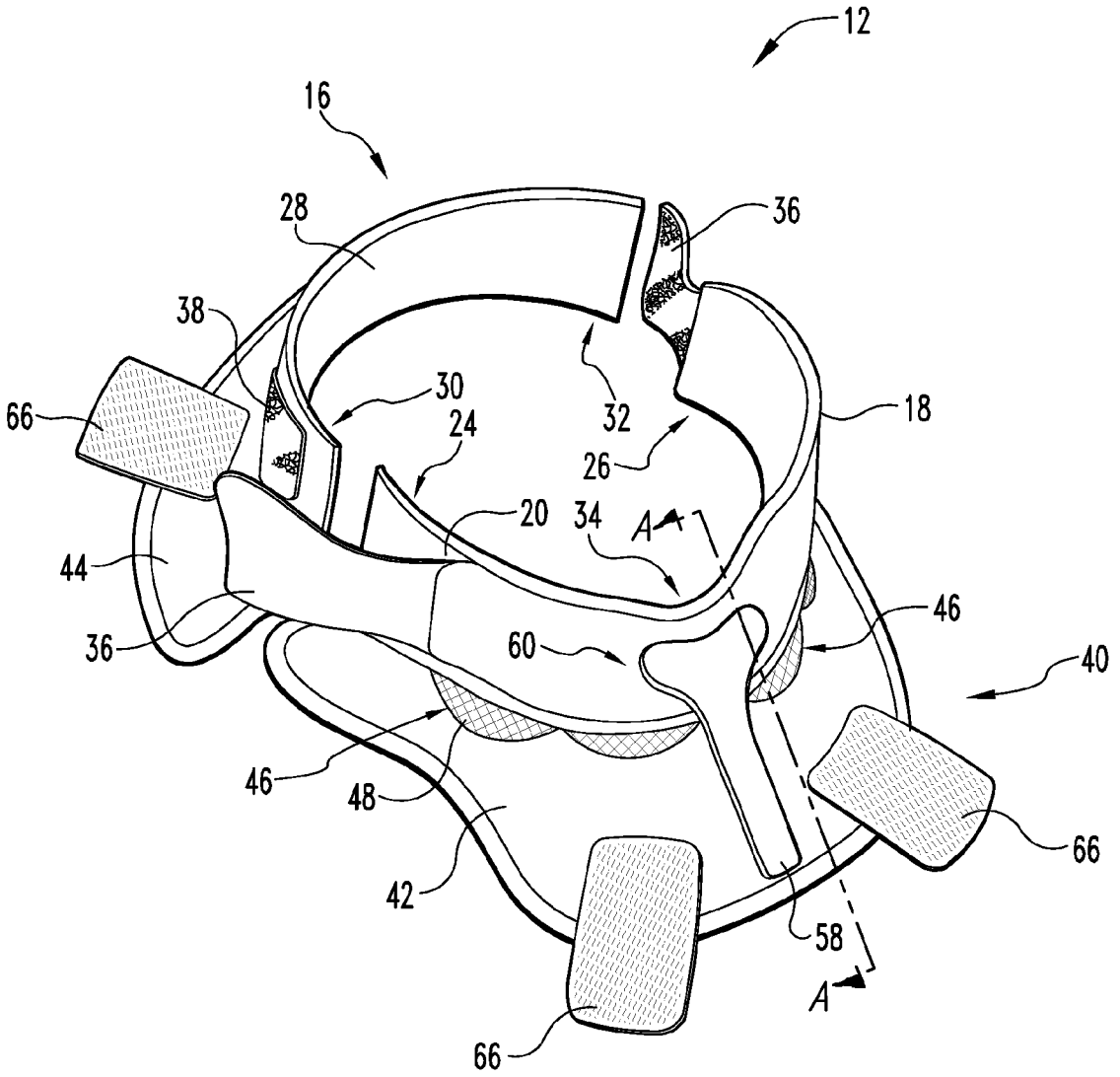
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Fig. 4

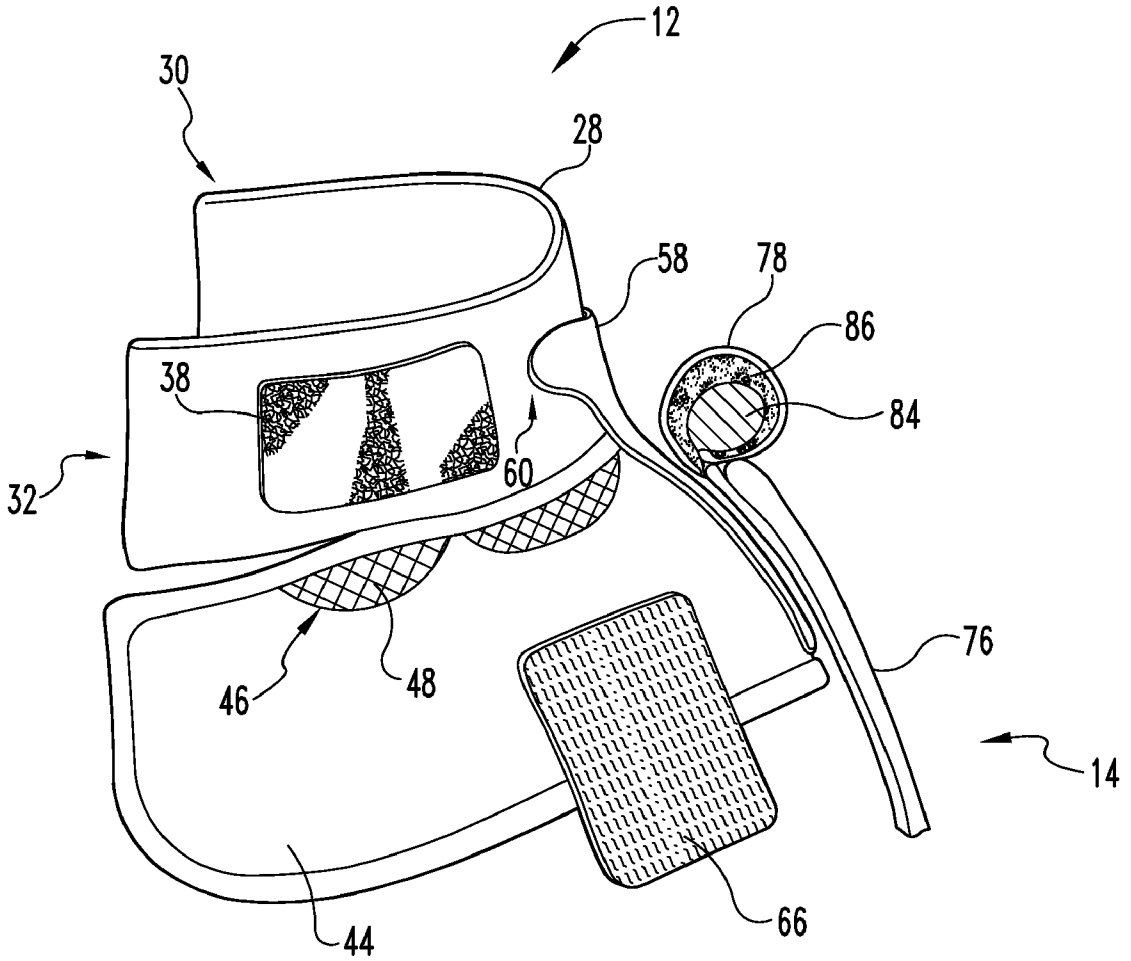


Fig. 5

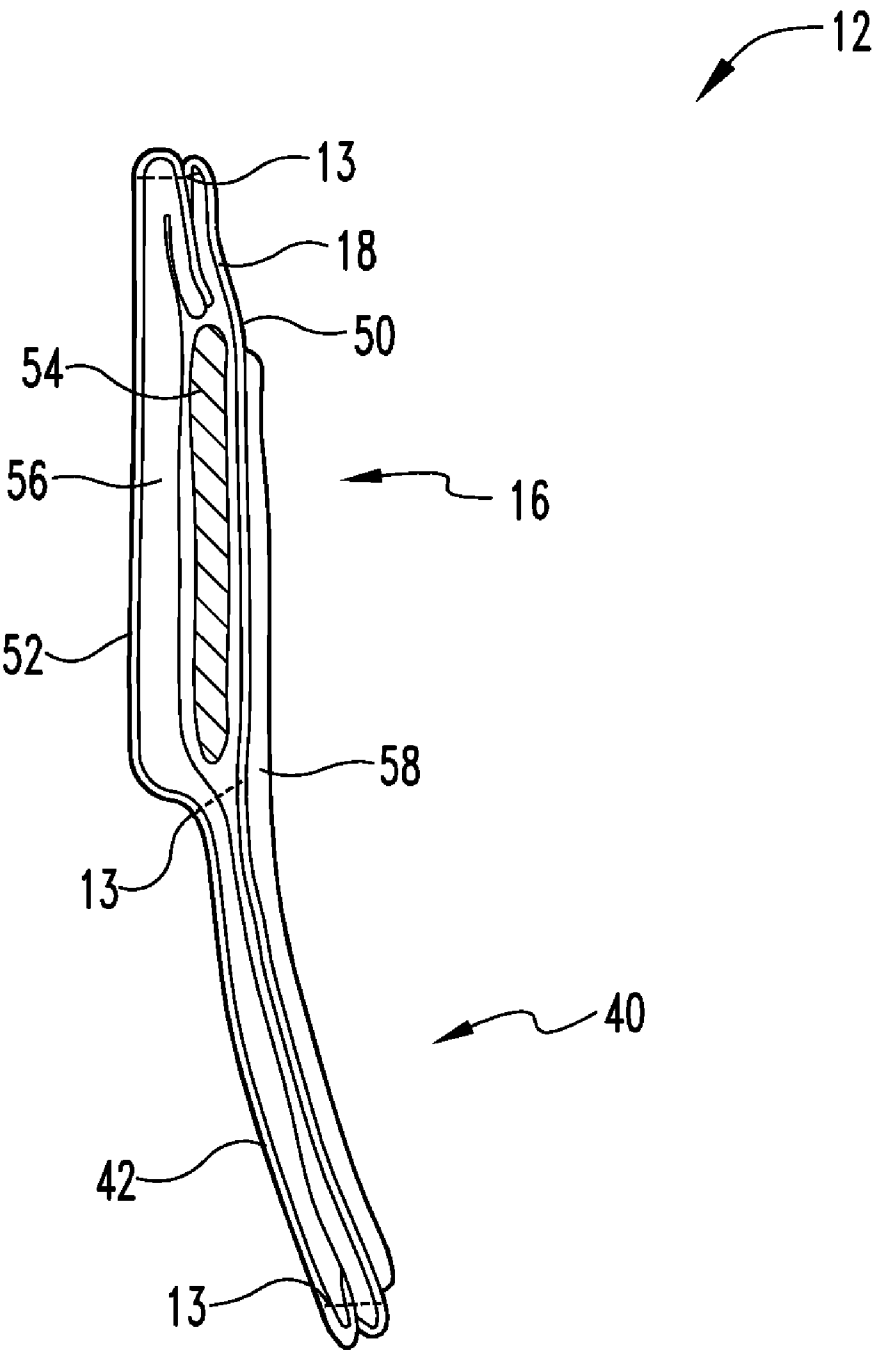


Fig. 6

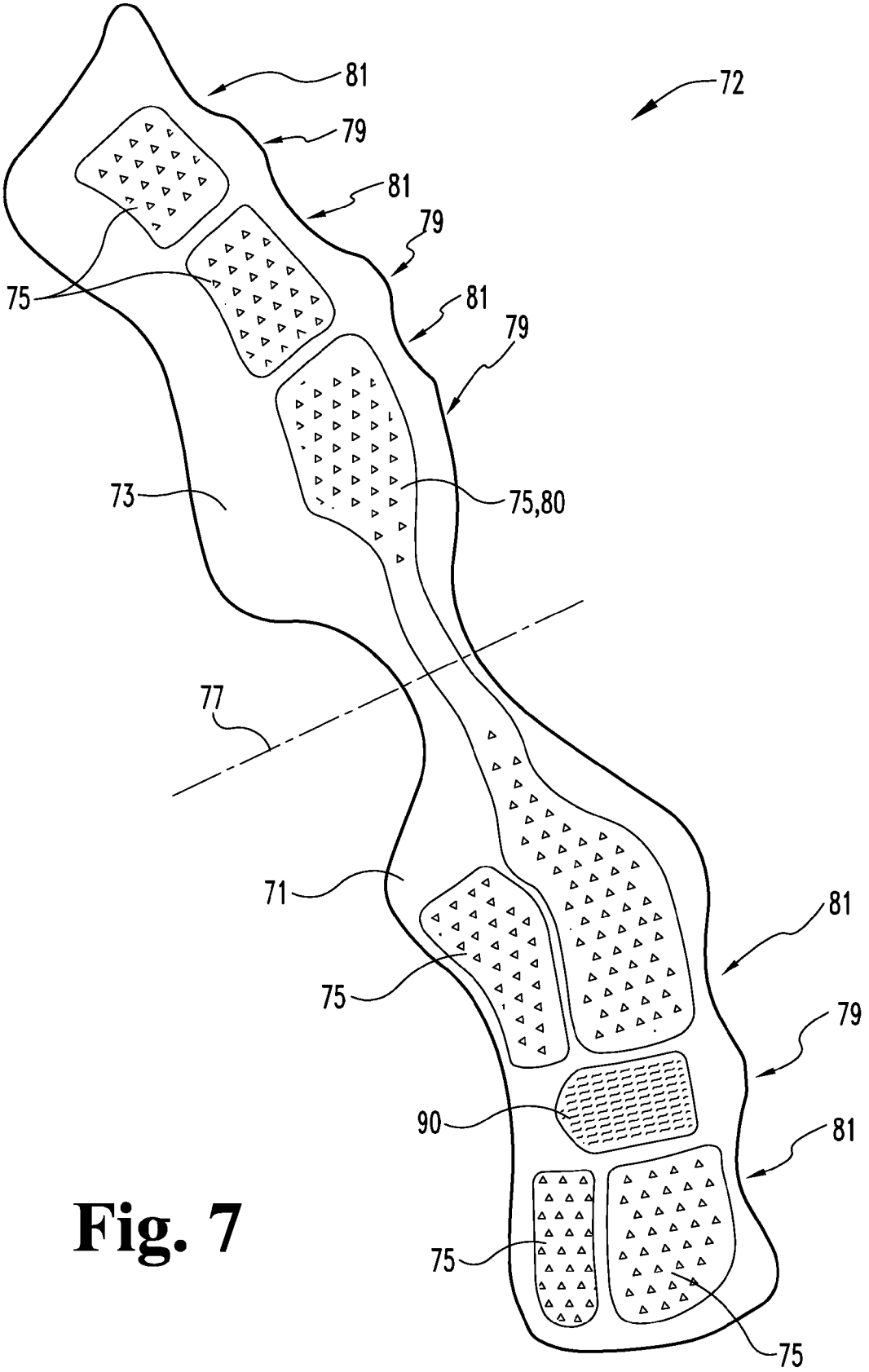


Fig. 7

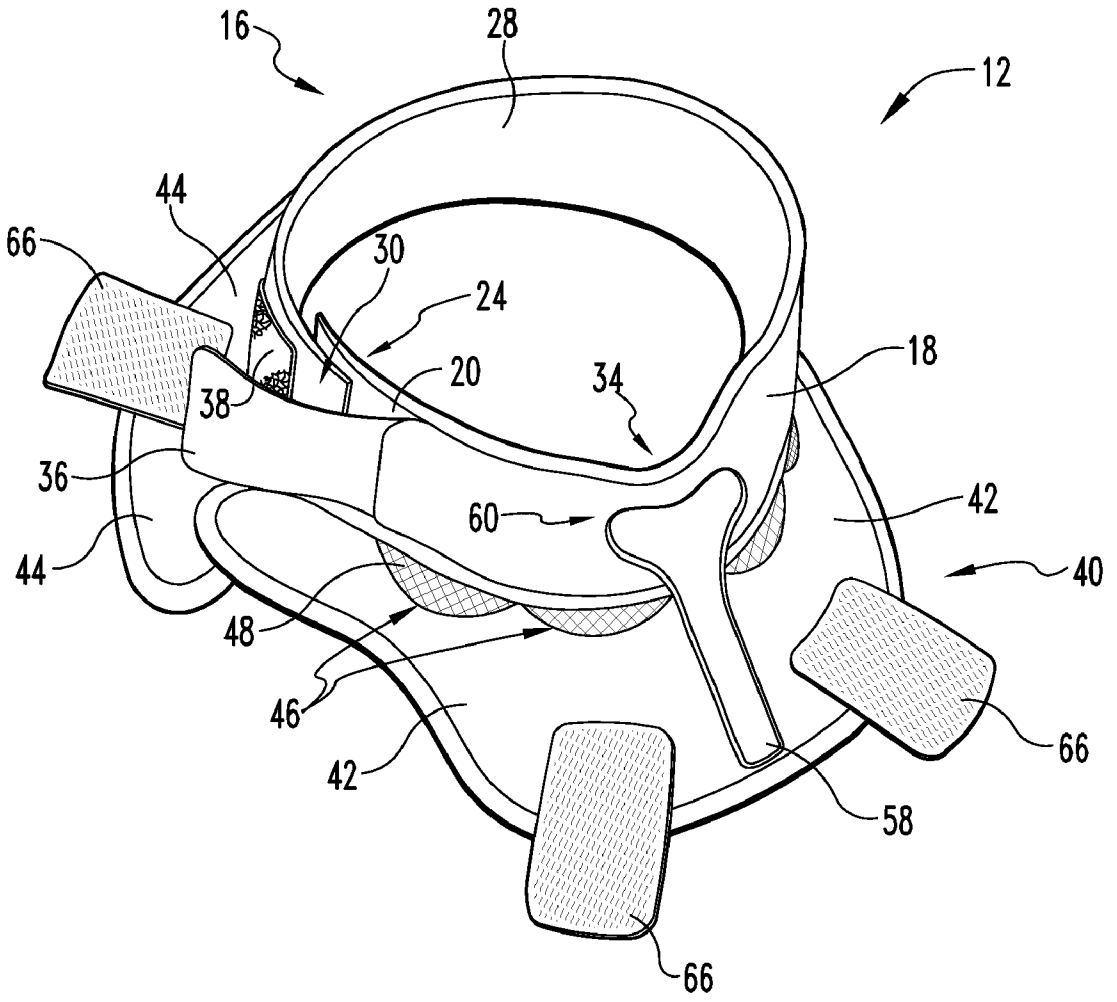


Fig. 8

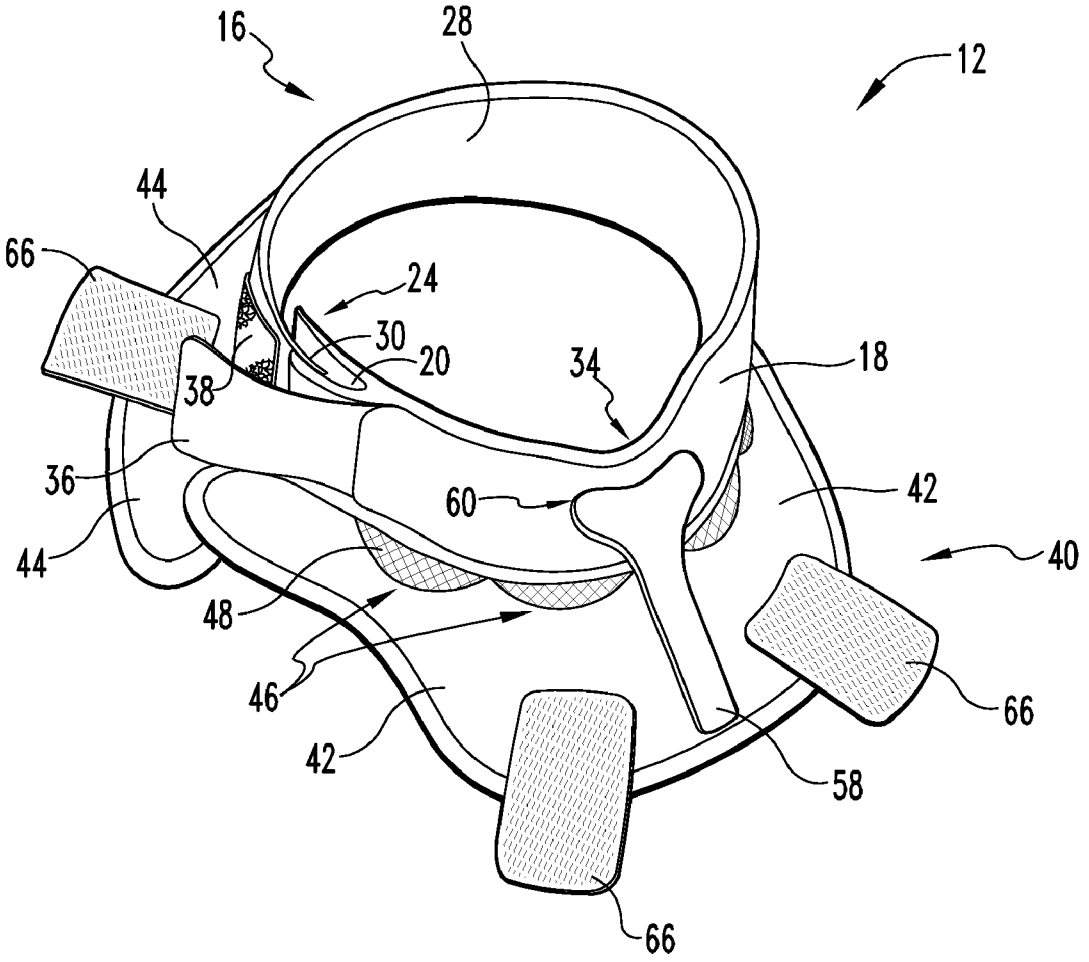


Fig. 9

# COMBINED NECK AND UPPER BODY PROTECTIVE GARMENT

## FIELD OF THE INVENTION

**[0001]** The present invention relates to protective equipment. In particular, the present invention relates to protective equipment for reducing or eliminating neck and upper body injuries ordinarily associated with various activities, including but not limited to contact sports such as lacrosse, ice hockey, ringette, football and action sports such as dirt biking, mountain biking, ski and sea-doo activities.

## BACKGROUND OF THE INVENTION

**[0002]** Neck and upper body injuries are fairly common for players of contact sports such as lacrosse, ice hockey, ringette and football. Ice hockey, in particular, is a sport where sharp skate blades pose a risk of dangerous lacerations to the players, and therefore, it has become generally mandatory for ice hockey players to wear neck protection which inhibits lacerations in the neck area that can cause life-threatening injuries. Blunt force contact can also cause injury in hockey and other sports. Advances in the field of protective equipment have led to protective garments that include neck protectors, and spine and sternum shields, among other protective elements.

**[0003]** Known neck protectors generally comprise a collar type arrangement with a short bib section in which the collar is wrapped around the neck of the wearer and fastened at the rear. These known neck protectors are generally awkward and uncomfortable for the wearers.

**[0004]** For example, U.S. Pat. No. 4,449,251 to Gauthier discloses a lightweight sports neck protector comprising a combined bib and upstanding collar to protect the clavicles and throat of the wearer. The bib of the Gauthier neck protector only covers a portion of the wearer's front to permit easier donning by connecting the hook and loop fasteners of the collar in the back. In use, the overlapping ends of the collar create an awkward and uncomfortable bulky region. The overlapping hook and loop interlock becomes somewhat less secure over time with use and may be prone to opening during use.

**[0005]** U.S. Pat. No. 6,195,802 to Armellino discloses a tactical vest with a partitioned collar to form an armadillo-like protection of the neck area. The partitioned collar comprises at least one rear panel and at least two side panels. The front of the wearer's neck is left exposed. The stated purpose of this design is to selectively provide either 1) complete neck protection for the wearer with the rear panel in position, or 2) detachment of the rear panel when the wearer is in a prone position to prevent discomfort and poor seating of a helmet. Two hook and loop straps are provided on the Armellino neck protector only to selectively secure the rear panel to the two side panels.

**[0006]** Known spine and sternum shields generally comprise compression molded foam elements positioned in the wearer's sternum or spine area.

**[0007]** For example, U.S. Pat. No. 7,103,924 to Morrow discloses an upper body protective garment for cushioning blows imparted upon the wearer's body, and includes a chest protector portion. The chest protector portion includes a middle chest protector portion, which is intended to be positioned in the sternum area of the chest, formed of one or more compression-molded foam elements.

**[0008]** U.S. Pat. No. 5,007,108 to Laberge discloses sports player protective equipment comprising a system of protective padding members over the front sternum and rear spine portions. A protective garment with similar features is described in U.S. Pat. App. Pub. No. 2003/0167560 of LaShoto.

## SUMMARY OF THE INVENTION

**[0009]** Therefore, what is desired is a neck protector which can be combined with upper body protective equipment to shield a wearer's neck and upper body from impact forces and potential injury due to impact and laceration, yet which is adjustable, easy to don, provides adequate venting and is comfortable to wear.

**[0010]** An embodiment of the invention combines the neck protector with a shoulder protector portion, a back protector portion, and a chest protector portion to form a single integral unit and protect against laceration and impact from skate blades, sticks, pucks and other threatening elements.

**[0011]** An embodiment of the combined neck and upper body protective equipment of the present invention shields a wearer's neck and upper body from impact forces and potential injury due to impact and laceration, yet is adjustable, easy to don, provides adequate venting and is comfortable to wear.

**[0012]** An embodiment of the invention comprises an embodiment of a neck protector that shields a wearer's neck from impact forces and potential injury due to impact and laceration, yet is adjustable, easy to don, provides adequate venting and is comfortable to wear.

**[0013]** An embodiment of the invention comprises an embodiment of an upper body protector that shields a wearer's upper body from impact forces and potential injury due to impact and laceration, yet is adjustable, easy to don, provides adequate venting and is comfortable to wear.

**[0014]** Furthermore, in its preferred embodiment, the present invention offers convenience and greatly increased protection by combining the otherwise separate, neck protector and the upper body protector (which are also separately comprehended by the invention) to make one integral protective garment. The preferred embodiment of the present invention takes advantage of modern methods of molding and bonding technologies and greatly improves protection from impact by incorporating medium density foams and external plastic membranes to high impact areas of the garment.

**[0015]** Accordingly, there is provided in one aspect of the present invention a neck protector comprising:

**[0016]** a collar sized and shaped to provide a continuous closure around a neck of a wearer, when in a closed configuration;

**[0017]** said collar having a first pair of opposed ends;

**[0018]** said collar having a first tongue at one of the ends and a first groove at the other of the ends, wherein said first tongue is adapted to fit into said first groove to form a first tongue and groove interlock; and

**[0019]** a closure for maintaining the first tongue and groove interlock and keeping the collar in said closed configuration.

**[0020]** Optionally, the collar of the neck protector comprises a first part and a second part, each of said first and second parts having a first end and a second end;

**[0021]** the first pair of opposed ends (referred to above) comprising the first end of the first part and the second end of the second part;

[0022] the collar further comprising a second pair of opposed ends comprising the second end of the first part and the second end of the second part;

[0023] said collar having one of a second tongue and a second groove at said second end of said first part and the other of said second tongue and said second groove at said first end of said second part;

[0024] wherein said second tongue is adapted to fit into said second groove to form a second tongue and groove interlock.

[0025] According to another aspect of the present invention there is provided a combined neck and upper body protector comprising:

[0026] an upper body protector;

[0027] a neck protector detachably attached to said upper body protector, the neck protector comprising:

[0028] a collar sized and shaped to provide a continuous closure around a neck of a wearer, when in a closed configuration;

[0029] said collar having a first pair of opposed ends;

[0030] said collar having a first tongue at one of the ends and a first groove at the other of the ends, wherein said first tongue is adapted to fit into said first groove to form a first tongue and groove interlock;

[0031] a closure for maintaining the first tongue and groove interlock and keeping the collar in said closed configuration;

[0032] a bib depending from the collar;

[0033] at least one neck shield member attached to the collar and to the bib, the at least one neck shield member being positioned over a throat area of the wearer, wherein the neck shield member is adapted to break initial impact and distribute impact forces between the collar and the bib; and

[0034] said upper body protector having a chest protector shield system, the at least one neck shield member being sized, shaped, and positioned to underlie the chest protector shield system to provide uninterrupted protection of at least a portion of the wearer's throat, larynx, sternum and chest.

[0035] According to another aspect of the present invention there is provided a combined neck and upper body protector comprising:

[0036] an upper body protector;

[0037] a neck protector detachably attached to said upper body protector, the neck protector comprising:

[0038] a collar sized and shaped to provide a continuous closure around a neck of a wearer, when in a closed configuration;

[0039] said collar having a first pair of opposed ends;

[0040] said collar having a first tongue at one of the ends and a first groove at the other of the ends, wherein said first tongue is adapted to fit into said first groove to form a first tongue and groove interlock; and

[0041] a closure for maintaining the first tongue and groove interlock and keeping the collar in said closed configuration;

[0042] a bib depending from the collar;

[0043] at least one neck shield member attached to the collar and to the bib, the at least one neck shield member being positioned over a spine area of the wearer, wherein the neck shield member is adapted to break initial impact and distribute impact forces between the collar and the bib; and

[0044] said upper body protector having a spine protector shield system, the at least one neck shield member is sized and shaped to underlie the spine protector shield system to provide uninterrupted protection of the wearer's spine.

[0045] According to another aspect of the present invention there is provided a neck protector comprising:

[0046] a collar sized and shaped to provide a continuous closure substantially around a neck of a wearer;

[0047] a bib depending from said collar; and

[0048] at least one neck shield member attached to the collar and to the bib, wherein the neck shield member is adapted to break initial impact and distribute impact forces between the collar and the bib.

[0049] According to another aspect of the present invention there is provided an upper body protector comprising:

[0050] a body portion having a front and a back;

[0051] a spine protector shield system attached to the back of the body portion, said spine protector shield system comprising:

[0052] at least two shield sections sized, shaped and positioned to cover a wearer's spine when the upper body protector is worn by the wearer;

[0053] each of the at least two shield sections having a top end and a bottom end, the top end of each shield section being attached to the body portion;

[0054] the bottom end of at least one shield section overlapping a top end of an adjacent shield section, the bottom end of the at least one shield section being free;

[0055] whereby the spine protector shield system is adapted to protect at least a portion of the length of the wearer's spine while permitting flex and freedom of movement, as well as venting in the region of overlap.

[0056] According to another aspect of the present invention there is provided an upper body protector comprising:

[0057] a body portion having a front and a back;

[0058] a chest protector shield system attached to the front of the body portion, said chest protector shield system comprising:

[0059] at least two shield sections sized, shaped and positioned to cover at least the wearer's sternum when the upper body protector is worn by the wearer;

[0060] each of the at least two shield sections having a top end and a bottom end, the top end of each shield section being attached to the body portion;

[0061] the bottom end of at least one shield section overlapping a top end of an adjacent shield section, the bottom end of the at least one shield section being free;

[0062] whereby the chest protector shield system is adapted to protect at least a portion of the wearer's sternum, while permitting flex and freedom of movement, as well as venting in the region of overlap.

## BRIEF DESCRIPTION OF THE DRAWINGS

[0063] Reference will now be made to the preferred embodiments of the present invention with reference, by way of example only, to the following drawings in which:

[0064] FIG. **1** is a front view of the combined neck and upper body protective garment according to an embodiment of the present invention;

[0065] FIG. **2** is a rear view of the combined neck and upper body protective garment of FIG. **1**;

[0066] FIG. **3** is a perspective view of a neck protector of the combined neck and upper body protective garment of

FIG. **1**, the neck protector having a two-part collar and bib members shown in a closed position with elasticised fastening straps in an open position;

**[0067]** FIG. **4** is a perspective view of the neck protector of FIG. **3** with the two-part collar and bib members shown in an open position;

**[0068]** FIG. **5** is a perspective view of the rear, second part of the collar attached to a rear, second bib member of FIG. **4**, and a cross-sectional view of a back portion of the upper body portion of the combined neck and upper body protective garment of FIG. **1**;

**[0069]** FIG. **6** is a cross-sectional view of FIG. **4** along line A-A;

**[0070]** FIG. **7** is a top view of a right chest and back protector portion shown lying flat;

**[0071]** FIG. **8** is a perspective view of a neck protector having a one piece collar according to an embodiment of the present invention; and

**[0072]** FIG. **9** is a perspective view of a neck protector having a one piece collar according to another embodiment of the present invention.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

**[0073]** The present invention is described in more detail with reference to exemplary embodiments thereof as shown in the appended drawings. In the figures, like elements are given like reference numbers. For the purposes of clarity, not every component is labelled in every figure, nor is every component of each embodiment of the invention shown where illustration is not necessary to allow those of ordinary skill in the art to understand the invention.

**[0074]** FIGS. **1** and **2** show front and rear views of the combined neck and upper body protector garment (indicated generally at **10**) according to an embodiment of the present invention. The combined neck and upper body protector garment **10** comprises a protector **12** and an upper body protector **14**.

**[0075]** As best seen in FIGS. **3** and **4**, the neck protector **12** preferably comprises a two-part collar **16** which is sized and shaped to provide a continuous closure (i.e. continuous protection when the collar is closed) all the way around the neck of a wearer. Accordingly, in the preferred embodiment the two-part collar **16** leaves no space or gap for an object to strike portions of the wearer's neck which are protected by the collar **16**. The first part **18** of the two-part collar **16**, which is adapted to cover a front of the wearer's neck, has a groove **20**, **22** at each end **24**, **26**. The second part **28** of the collar **16**, which is adapted to cover the rear of the wearer's neck, has tongues **30**, **32** at each end which are adapted to fit into the respective grooves **20**, **22** to form tongue and groove interlocks. Preferably, the tongues **30**, **32** of the second part **28** of the two-part collar **16** are tapered in thickness to provide a two-part collar having a relatively uniform thickness along its circumference. For added comfort to the wearer, the first part **18** of the two-part collar **16** preferably includes a recess **34** in the wearer's chin area.

**[0076]** Preferably, the two-part collar **16** is also provided with a closure for keeping the collar **16** closed in a tongue and groove interlocking fashion. In the embodiment shown in FIGS. **3** and **4**, the closure comprises fastening straps **36** with hook and/or loop fastening pads **35** extending from the ends **24**, **26** of the first part **18** and coupling to complementary hook and/or loop fastening pads **38** attached adjacent the tongues **30**, **32** of the second part **28**. Fastening straps **36** are preferably made from an elasticized material. In alternate embodiments the fastening straps **36** may only have portions which are elasticised. However, less preferred embodiments in which the fastening straps **36** are not elasticised are also contemplated. When in use, the fastening straps **36** hold the tapered tongues **30**, **32** of the second part in the grooves **20**, **22** of the first part **18** in a tongue and groove fashion thereby securing the neck protector **12** in place around the wearer's neck. The grooves **20**, **22** are preferably formed between portions of the fastening straps **36** and adjacent portions of the collar **16**, as shown for example, in FIGS. **1**, **3**, **4**, and **8**, or entirely in the collar **16**, as shown for example, in FIG. **9**. Combinations of these two configurations are also contemplated. The tongue and groove interlocking of the two-part collar **16** provides seamless protection around the entire circumference of the wearer's neck. Furthermore, providing the tongues **30**, **32** with a tapered thickness ensures that the collar **16** will have a relatively uniform thickness along its circumference, as mentioned above. The uniform thickness of the collar **16** provides improved comfort as compared with bulky overlapping sections which press on the wearer's neck.

**[0077]** Preferably, the tongue and groove interlocking of the two-part collar **16** is configured to allow for an adjustment of the perimeter of the neck protector **12** to accommodate for different neck sizes, as well as allowing the neck protector **12** to be opened and the entire garment **10** donned by sliding over the wearer's head. The perimeter adjustment is achieved by positioning the tongues **30**, **32** more or less deeply in the grooves **20**, **22**.

**[0078]** It should be noted that although utilizing a two-part collar in the neck protector **12** is preferred, it is also contemplated that in some instances a one piece collar, as shown for example in FIG. **8**, may be used in place of the two-part collar. As can be seen, the one piece collar has a tongue **30** at one end and a groove **20** at the other end and the tongue **30** is adapted to fit into the groove **20** in a tongue and groove interlocking fashion.

**[0079]** Accordingly, it will now be understood that in the preferred embodiment, the tongues **30**, **32** of one part of the two-part collar **16** detachably interlock with grooves **20**, **22** on the other part and that the tongue and groove interlock is secured with fastening straps **36** on the other part. The fastening straps **36** detachably attach to fastening pads **38** on the first part.

**[0080]** As shown in FIGS. **3** and **4**, a bib **40** depends directly, or indirectly, from the two-part collar **16**, and the collar **16** extends from the bib **40** in a free standing manner. The bib **40** is adapted to attach to the inside of the upper body protector **14** to provide coverage of the wearer's neck, larynx and throat. Like the two-part collar **16**, the bib **40** is preferably formed with two members **42**, **44**. The first member **42** of the bib **40** depends from the first part **18** of the collar **16**, and the second member **44** of the bib **40** depends from the second part **28** of the collar **16**. In the preferred embodiment, the first and second members **42**, **44** of the bib **40** overlap to cover the wearer's inner shoulder, inner clavicles, and base of the neck thereby providing complete protection in the area of the wearer's neck. Accordingly, as mentioned above, the two-part collar **16** preferably leaves no space for an object to strike portions of the wearer's neck which are protected by the collar **16**. The overlapping portions are also sized, and shaped to underlie the top portions of the upper body protector **14** to cover the space in the head opening of the upper body pro-

tector **14** into which the neck protector **12** may be inserted, as discussed in more detail below.

**[0081]** A venting section **46** may be provided between the two part collar **16** and the bib **40** to allow air, heat, and water vapour to pass therethrough. The venting section **46** can be a simple aperture or an aperture covered with a mesh **48** or a material which allows air, heat, and water vapour to pass therethrough. Preferably a plurality of venting sections **46** are be provided between the collar **16** and the bib **40** along the circumference of the collar **16** as illustrated in the figures.

**[0082]** FIG. **6**, which is a cross-section of a front of the neck protector **12** (i.e. second part **28** of the collar **16** and second member **44** of the bib **40**) shows the preferred construction of the neck protector **12**. As shown, the neck protector **12** is preferably constructed with a laceration-resistant material **50** on the outside and a wicking material **52** on the inside. Sandwiched between the exterior materials is a thin, perforated medium density foam **54** that is bonded to a porous, breathable polyester foam lining **56**. In the preferred embodiment, the perforated medium density foam **54** is sandwiched between the exterior materials so that it does not extend to the very top of the collar, thus providing added comfort to the wearer. Most preferably, the perforated medium density foam **54** will only extend to within half of an inch from the top of the collar. The polyester foam lining **56** descends to the bottom of the bib **40** of the neck protector **12**. The materials of the neck protector **12** may be joined by known methods including stitching **13**, bonding, etc.

**[0083]** Referring now to FIGS. **4** and **5**, there is shown a neck shield member **58** attached to a front exterior of the neck protector **12**, extending from a front center of the collar **16** to a front center of the bib **40**. Neck shield members **58** are preferably long and thin, semi-rigid plastic members, which are pre-molded, to have a curve or bend of about 170°, to permit the bib **40** to extend outwardly from an axis of the wearer's neck by about 10°. However, good results may be obtained by pre-molding the neck shield members **58** to have a bend of between 175° and 165°. The neck shield members **58** are adapted to break initial impact forces and distribute them between the collar **16** and the bib **40**. It has been found that the neck shield members **58** provide improved protection of the C1-C4 vertebrae when positioned at the back of the wearer and similarly, the jugular and larynx when positioned at the front of the wearer. It is believed that the neck shield members **58** break initial impact forces and distribute them into the foam cores of the collar **16** and bib **40** of the neck protector **12**. The neck shield members **58** can be attached to neck protector **12** by any means known in the art including but not limited to stitching or bonding. Furthermore, although the preferred embodiment has the neck shield members **58** attached to the exterior of the collar **16** and bib **40**, this need not be so, and it will be understood that the neck shield members may be attached underneath the exterior materials.

**[0084]** According to the preferred embodiment, two neck shield members **58** are attached to the neck protector **12**. In particular, one is attached to the front center of the neck protector **12** over the wearer's throat and the other is attached to the rear center of the neck protector **12** over the wearer's spine. Good results have been obtained by positioning the neck shield members **58** within an inch of the top of the collar **16** of the neck protector **12** and within an inch of a bottom of the bib **40**. The neck shield members **58** are preferably preformed to fit the natural curve of the wearer's neck at the junction of the collar **16** and bib **40**.

**[0085]** To reduce hindering or intrusive points of contact, the exposed tops **60** of the neck shield members **58** may be made thinner than their bottoms (which will be covered by the upper body protector **14**) by forming them with a splay. Accordingly, the splayed tops **60** stick out less from the collar **16** while providing the same level of protection from impact forces as the thicker bottoms.

**[0086]** The splayed tops **60** are also useful in distributing impact forces over a larger area on the collar **16**. In other words, the greater surface area of the splayed tops **60** of the neck shield members **58** helps distribute impact forces more widely over that area and reduces the probability of large point forces that can cause injury. While the preferred embodiment of the present invention is described with two neck shield members **58**, it will be understood that more or less, or even none may be provided on the neck protector **12**. Also, the neck shield members **58** may take a different form than the preferred embodiment described here.

**[0087]** As shown in FIG. **1**, when the neck protector **12** is used in combination with an upper body protector **14** the bottom of the front neck shield member **58** descends into the upper body protector **14** under the chest protector shield system **62**, which is discussed in more detail below. Similarly, as shown in FIG. **2**, the bottom of the rear neck shield member **58** descends into the upper body protector **14** under the spine protector shield system **64**, which is also discussed in more detail below. The overlapping of the front neck shield member by the chest protector shield system **62** forms an integral shield system that preferably covers the length of the wearer's front from the throat and larynx down the sternum to the stomach. Similarly, the overlapping of the back neck shield members **58** by the spine protector shield system **64** forms an integral shield system that preferably covers the length of the wearer's spine from the neck down to the lower back. The integral shield systems thus distribute impact forces, thereby eliminating or reducing the concentration of impact forces to vital areas covered by the shield systems.

**[0088]** The attachment of the bib **40** to the upper body protector **14** is preferably achieved by corresponding hook and/or loop fasteners. For example, FIG. **3** shows two hook and/or loop fastener pads **66** on the first member **42** of the bib **40**, and one of two hook and/or loop fastener pads **66** on the second member **44** of the bib **40**. Referring now to FIG. **2**, it can be seen that the neck protector **12** is attached to the upper body protector **14** by inserting the neck protector **12** into and underneath the upper body protector **14** and connecting the corresponding hook and/or loop fastener pads **66** to the upper body protector **14**. This method of attachment advantageously permits overall adjustment of the height of the neck protector **12** relative to the upper body protector **14**, because the pieces can be easily detached, moved slightly, and reattached. It also allows convenient removal of the neck protector **12** from the upper body protector **14** for cleaning purposes. This adjustment is achieved by adjusting the degree and position of the overlap of the fastener pads **66** on the upper body protector **14** and the fastener pads **66** on the bib **40**. The overlapping of the bib members **42**, **44** mentioned above, in combination with the overlapping of the upper body protector **14** over the bib **40** provides total coverage of the wearer's neck, larynx and throat and eliminates entry points for foreign objects that may cause injury to the wearer. In other words, attaching the neck protector **12** to the upper body protector **14** in this manner permits the garment **10** to function as a single unit. Accordingly, there are no seams or external

loops that can provide a hold for an opponent or otherwise allow for the opponent's equipment, such as a hockey stick, to be caught thereon and displace the protective equipment and expose vitals. Furthermore, this method of attachment helps prevent the position of the neck protector **12** from shifting and exposing vitals to the dangers of impact from skate blades, sticks, blades, pucks or other foreign elements.

**[0089]** Attaching the neck protector **12** to the upper body protector **14** and attaching the neck shield members **58** to the foam cores of the collar **16** allow the neck protector **12** to remain upright without relying on constant contact with the wearer's neck. This freestanding nature of the neck protector **12** provides spaces between the wearer's neck and the neck protector **12** which effectively dissipates heat from beneath the garment. This is an improvement over prior art neck protectors which require tight wrapping around the wearer's neck in order to stand upright, and create a thermal barrier preventing efficient dissipation of heat from beneath the garment. Combined with the venting sections **46**, discussed above, which further increases heat dissipation from beneath the garment, the freestanding nature of the neck protector **12** improves the comfort level and ability of the wearer to participate in various contact sports.

**[0090]** Referring now to FIG. **2**, the preferred spine protector shield system **64** can be seen extending the length of the back of the upper body protector **14** in three separate and overlapping shield sections **68** to protect at least a portion of, and most preferably all of, the wearer's spine while allowing for flex and freedom of movement of the wearer. The shield sections **68** are preferably constructed of vented, pliable, semi-rigid plastic bonded to perforated medium density foam encased in the breathable external fabric. However, in an alternate embodiment the shield sections **68** may be constructed by bonding the plastic to the perforated medium density foam and encasing the entire structure with the breathable external fabric. The shield sections **68** are sized, shaped and positioned to cover the wearer's spine when the upper body protector **14** is worn by the wearer. The tops of the shield sections **68** are splayed to permit attachment to a left chest and back protector portion **70** and a right chest and back protector portion **72** of the upper body protector **14**.

**[0091]** It has been found that this method of attaching the shield sections **68** to the upper body protector **14** allows for the shield sections **68** to retain their position to protect vital areas of the wearer's body, while floating freely at their bottom ends, which permits flex, and allows for venting between the left and right back protector portions **70**, **72**, and the spine protector shield system **64**, and between the region of overlap of the shield sections **68** themselves. In other words, the bottom ends of the shield sections **68** are free to slide over the top ends of the adjacent shield sections **68** in a side to side or top to bottom direction. This permits the wearer to bend his or her upper body a certain amount forwards, backwards, and side to side, as well as to twist his or her upper body a certain amount. Since the top of the underlying shield section **68** supports the bottom of the overlying shield section **68**, there is still full coverage of the wearer's vital areas, as well as a distribution of impact forces.

**[0092]** The top and bottom of the bottommost spine shield section **74** are attached to the left and right chest and back protector portions **70**, **72**. Preferably, to provide total coverage of the wearer's back, the bottommost spine shield section **74** is also sized and shaped to extend past the bottom of the upper body protector **14** and descend within the padded belts of the wearer's protective pants (not shown). The top end of the uppermost spine shield section **76** is preferably splayed and attached to a collar ring **78** to provide improved shoulder to shoulder protective integrity of the protective garment **10** and to help intercept or interrupt the paths of objects deflected off the tops of the shoulder pads **82** of the upper body protector **14** towards the wearer's neck. The attachment of the top end of the uppermost spine shield section **76** to the collar ring **78** is best seen in FIG. **5**. While FIG. **2** shows the spine protector shield system **64** as consisting of three spine shield sections **68**, it will be understood that it is contemplated that two or more spine shield sections **68** may be used with suitable results.

**[0093]** Referring now to FIG. **1**, the chest protector shield system **62** can be seen extending the length of the front of the upper body protector **14** in two separate and overlapping shield sections **68** providing uninterrupted protection of at least a portion of the wearer's front while allowing for flex and freedom of movement of the wearer. Similar to the spine protector shield system **64**, the shield sections **68** of the chest protector shield system **62** are preferably constructed of vented, pliable, semi-rigid plastic bonded to perforated medium density foam encased in the breathable external fabric. The shield sections **68** are sized, shaped and positioned to cover at least a portion of, and most preferably all of, the wearer's sternum when the upper body protector **14** is worn by the wearer. The tops of the shield sections **68** are splayed to permit attachment to the left chest and back protector portion **70** and the right chest and back protector portion **72** of the upper body protector **14**. It has been found that additional protection may be incorporated into the chest shield system **62** by providing a larynx protector shield **69** over the wearer's larynx region between the neck shield member **58** and the uppermost sternum shield section **68**.

**[0094]** This method of attaching the shield sections **68** of the chest protector shield system **62** to the upper body protector **14** allows for the shield sections to retain their position while floating freely at their bottoms. As in the case of the spine protector shield system **64**, discussed above, this method of attachment permits flex, and allows for considerable venting between the left and right chest and back protector portions **70**, **72** and the chest protector shield system **62**, and between the region of overlap of the shield sections **68** themselves. The top end of the uppermost sternum shield section **68** is preferably splayed and attached to the collar ring **78** to provide improved shoulder to shoulder protective integrity of the protective garment **10**. While FIG. **1** shows the chest protector shield system **62** as consisting of two sternum shield sections **68**, it will be understood that it is contemplated that more sternum shield sections **68** may be used with suitable results.

**[0095]** FIG. **7** shows a right chest and back protector portion **72**. The front of the right chest and back protector portion **72** is indicated at **71**. The rear of the right chest and back protector portion **72** is indicated at **73**. The left chest and back protector portion **70** is a mirror image of the right chest and back protector portion **72**. The right and left chest and back protector portions **72**, **70** are preferably manufactured with vented, pliable, semi-rigid plastic armor plates **75** that are attached to perforated medium density foam all of which is encased in the breathable external fabric of the garment. Good results have been obtained by manufacturing the right and left chest and back protector portions **72**, **70** as one unit. The centre (shoulder) line of the integral right chest and back

protector portion **72** is indicated at **77**. The left and right chest and back protector portions **70**, **72** include an uppermost plastic armor shield **80** in the shoulder area, which is pre-molded to hold the curvature of this area and to aid in the overall structure of the protective garment **10**.

**[0096]** Preferably, the left and right chest and back protector portions **70**, **72** are provided with protruding areas **79**, which protrude inward toward the middle of the wearer's chest and abdomen, for attaching the shield sections **68** of the chest and spine protector shield systems **62**, **64**. Furthermore, recessed areas **81** may be provided to facilitate venting under the shield sections **68** of the chest and spine protector shield systems **62**, **64**.

**[0097]** It can now be understood that when the neck protector **12** is used in combination with an upper body protector **14**, the arrangement of overlapping shields preferably provides uninterrupted protection over at least a portion of, but most preferably all of, the length of the wearer's throat, larynx, sternum, chest and spine while still permitting flex and free range of motion of the wearer's head, shoulders, arms and torso. In contrast, prior art garments tend provide either uninterrupted protection or flex and freedom of motion, but not both. For example, a garment employing unitary, rigid, sternum and spine shields might to provide protection from impact and laceration forces but would generally be lacking in flex and freedom of motion for the wearer. On the other hand, prior art garments employing unitary, soft, sternum and spine shields might provide flex and freedom of motion for the wearer, but could lack adequate protection from impact and laceration forces. Preferably, the present invention provides the overlapping arrangement of rigid or semi-rigid shields to protect against impact and laceration forces while still permitting flex and free range of motion of the wearer's head, shoulders, arms and torso.

**[0098]** As best seen in FIGS. **1** and **2**, the collar ring **78** encircles the circumference of the opening in the upper body protector **14** for the wearer's head, or head hole. As best seen in FIG. **5**, the collar ring **78** is preferably constructed with pre-formed dual density foam. Most preferably the collar ring **78** is constructed as a pre-formed high density foam core **84** surrounded by a low density foam **86**. The collar ring **78** provides integrity to the circumference of the opening for the wearer's head and the shoulder to shoulder portion of the upper body protector **14**. Shoulder cups **82** are preferably attached to a significant section of the collar ring **78** to stabilize and prevent displacement of the shoulder cups **82** due to impact forces. The collar ring **78** also acts to intercept or interrupt the motion of objects after having been deflected off the tops of the shoulder pads **82** towards the wearer's neck. The attachment of the shoulder cups **82** to the collar ring **78** prevents the jamming of the shoulder cups **82** into the wearer's neck or head during moments of impact. It is believed that the foam of the collar ring **78** and the integrity provided by the hard plastic of the shoulder cups **82**, and the splayed tops of the spine and chest shield sections **68** help stabilize the shoulder cups **82** and distribute the forces due to impact through the collar ring **78**. It has been found that this distribution of impact forces reduces the dangers of common injuries to the wearer's shoulder and clavicle areas.

**[0099]** As best seen in FIGS. **1** and **2**, the upper body protector **14** of the protective garment **10** includes wrap-around rib protectors **88** for shielding the wearer's sides and rib cage from impact forces. The rib protectors **88** are preferably constructed with perforated, medium density foam and are overlain with thin pre-molded, vented and pliable plastic armor. The rib protectors **88** are preferably pre-formed to fit the curved contours of the wearer. According to an embodiment of the present invention, complementary hook and/or loop fastener pads **90**, located on inner surfaces of chest protector portions **70**, **72**, are used to affix the rib protectors **88** to the left and right back and chest protector portions **70**, **72** of the upper body protector **14**. Preferably, the complementary hook and/or loop fastener pads are sized, shaped and positioned to allow for adjustment of the perimeter of the upper body protector **14** to accommodate varying body types. Most preferably, the adjustability of the rib protectors **88** permits the wearer to snug the rib protectors **88** up against the left and right back and chest protector portions **70**, **72** to provide seamless protection of the entire circumference of the wearer's mid-section. Furthermore, the wearer will have the option of removing the rib protectors **88** in certain circumstances. Alternately, in other embodiments of the present invention, the rib protectors **88** may be omitted from the protective garment **10** altogether.

**[0100]** As shown in FIGS. **1** and **2** body straps **92** are preferably provided on the upper body protector **14** to secure the protective garment **10** to the wearer's mid-section. According to a preferred embodiment, the body straps **92** are made adjustable with hook and/or loop fasteners **94**. The body straps **92** attach at the backs of the left and right back and chest protector portions **70**, **72** and wrap around to attach with hook and/or loop fasteners **94** to complementary hook and/or loop fastener pads **95** on the fronts of the left and right back and chest protector portions **70**, **72**. The body straps **92** are preferably made from an elasticized material. In alternate embodiments the body straps **92** may only have portions which are elasticised. However, less preferred embodiments in which the body straps **92** are not elasticised are also contemplated.

**[0101]** FIG. **1** also shows an adjustable stomach shield **96** attached on inside, front, bottom of each of the left and right chest protector portions **70**, **72**, according to an embodiment of the present invention. The stomach shield **96** is preferably attached using hook and/or loop fastener pads **98**. The hook and loop fastener pads **98** are preferably adapted to permit adjusting a height of the stomach shield **96** relative to the upper body protector **14** to accommodate varying body types as well as varying heights of padded belts found in protective pants (not shown) which may used by the wearer in combination with the protective garment **10**.

**[0102]** While reference has been made to various preferred embodiments of the invention other variations are comprehended by the broad scope of the appended claims. Some of these have been discussed in detail in this specification and others will be apparent to those skilled in the art. All such variations and alterations are comprehended by this specification are intended to be covered, without limitation.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

**1**. A neck protector comprising:

a collar sized and shaped to provide a continuous closure around a neck of a wearer, when in a closed configuration;

said collar having a first pair of opposed ends;

said collar having a first tongue at one of the ends and a first groove at the other of the ends, wherein said first tongue is adapted to fit into said first groove to form a first tongue and groove interlock; and

a closure for maintaining the first tongue and groove interlock and keeping the collar in said closed configuration.

**2**. The neck protector according to claim **1**, wherein said first tongue and said first groove are sized, shaped and positioned so that the first tongue and groove interlocking permits perimeter adjustment of the collar.

**3**. The neck protector according to claim **1**, further comprising a bib depending from the collar.

**4**. The neck protector according to claim **3**, wherein the bib is sized, shaped and adapted to attach to and be overlapped by an upper body protector to provide coverage of the wearer's neck, larynx and throat.

**5**. The neck protector according to claim **4**, wherein the bib includes hook and/or loop fasteners for attaching to corresponding hook and/or loop fasteners on the upper body protector.

**6**. The neck protector according to claim **5**, wherein the hook and/or loop fasteners are positioned and arranged on the bib to permit overall height adjustment of the neck protector relative to the upper body protector.

**7**. The neck protector according to claim **3**, wherein the collar depends from the bib in a freestanding manner.

**8**. The neck protector according to claim **3**, further comprising at least one venting section between the collar and the bib.

**9**. The neck protector according to claim **3**, further comprising at least one neck shield member attached to the collar and to the bib, wherein the neck shield member is adapted to break initial impact and distribute impact forces between the collar and the bib.

**10**. The neck protector according to claim **9**, wherein the at least one neck shield member is positioned over a throat area of the wearer.

**11**. The neck protector according to claim **9**, wherein the at least one neck shield member is positioned over a spine area of the wearer.

**12**. The neck protector according to claim **9**, wherein said at least one neck shield member has a top end which is splayed to prevent any hindering or intrusive points of contact and to further distribute the impact forces.

**13**. The neck protector according to claim **9**, wherein the at least one neck shield member is a semi-rigid plastic member.

**14**. The neck protector according to claim **1**, wherein the closure comprises:

a strap having a first end and a second end, the first end of the strap being attached to the collar adjacent to one of said first tongue and said first groove;

one of a hook and a loop fastener being attached adjacent to the other of said first tongue and said first groove; and

the other of the hook and the loop fastener being attached adjacent to the second end of the strap.

**15**. A neck protector according to claim **1**, wherein said collar comprises a first part and a second part, each of said first and second parts having a first end and a second end;

the first pair of opposed ends comprising the first end of the first part and the second end of the second part;

the collar further comprising a second pair of opposed ends comprising the second end of the first part and the second end of the second part;

said collar having one of a second tongue and a second groove at said second end of said first part and the other of said second tongue and said second groove at said first end of said second part;

wherein said second tongue is adapted to fit into said second groove to form a second tongue and groove interlock.

**16**. The neck protector according to claim **15**, further comprising a bib depending from the collar, wherein the bib comprises first and second members, the first member being attached to the first part of the collar, and the second member being attached to the second part of the collar.

**17**. A combined neck and upper body protector comprising:

an upper body protector; and

a neck protector according to claim **11**, detachably attached to said upper body protector, said upper body protector having a chest protector shield system, the at least one neck shield member being sized, shaped, and positioned to underlie the chest protector shield system to provide uninterrupted protection of at least a portion of the wearer's throat, larynx, sternum and chest.

**18**. A combined neck and upper body protector comprising:

an upper body protector; and

a neck protector according to claim **11**, detachably attached to said upper body protector, said upper body protector having a spine protector shield system, the at least one neck shield member is sized and shaped to underlie the spine protector shield system to provide uninterrupted protection of at least a portion of the wearer's spine.

**19**. A neck protector comprising

a collar sized and shaped to provide a continuous closure substantially around a neck of a wearer;

a bib depending from said collar; and

at least one neck shield member attached to the collar and to the bib, wherein the neck shield member is adapted to break initial impact and distribute impact forces between the collar and the bib.

**20**. An upper body protector comprising:

a body portion having a front and a back;

a spine protector shield system attached to the back of the body portion, said spine protector shield system comprising:

at least two shield sections sized, shaped and positioned to cover a wearer's spine when the upper body protector is worn by the wearer;

each of the at least two shield sections having a top end and a bottom end, the top end of each shield section being attached to the body portion;

the bottom end of at least one shield section overlapping a top end of an adjacent shield section, the bottom end of the at least one shield section being free;

whereby the spine protector shield system is adapted to protect at least a portion of the wearer's spine while permitting flex and freedom of movement, as well as venting in the region of overlap.

**21**. The upper body protector according to claim **20**, wherein the at least two shield sections are constructed of vented, semi-rigid plastic bonded to perforated medium density foam encased in a breathable external fabric.

**22**. An upper body protector comprising:

a body portion having a front and a back;

a chest protector shield system attached to the front of the body portion, the chest protector shield system comprising:

at least two shield sections sized, shaped and positioned to cover at least the wearer's sternum when the upper body protector is worn by the wearer;

each of the at least two shield sections having a top end and a bottom end, the top end of each shield section being attached to the body portion;

the bottom end of at least one shield section overlapping a top end of an adjacent shield section, the bottom end of the at least one shield section being free;

whereby the chest protector shield system is adapted to protect at least a portion of the wearer's sternum, while permitting flex and freedom of movement, as well as venting in the region of overlap.

**23**. The upper body protector according to claim **22**, wherein the at least two shield sections are constructed of vented, semi-rigid plastic bonded to perforated medium density foam encased in a breathable external fabric.

**24**. A combined neck and upper body protector comprising:

an upper body protector comprising:

a body portion having a front and a back;

a spine protector shield system attached to the back of the body portion, the spine protector shield system comprising:

at least two shield sections sized, shaped and positioned to cover the wearer's spine when the upper body protector is worn by the wearer;

each of the at least two shield sections having a top end and a bottom end, the top end of each shield section being attached to the body portion;

the bottom end of at least one shield section overlapping a top end of an adjacent shield section, the bottom end of the at least one shield section being free;

whereby the spine protector shield system is adapted to protect at least a portion of the length of the wearer's spine while permitting flex and freedom of movement, as well as venting in the region of overlap; and

a neck protector detachably attached to said upper body protector, said neck protector comprising:

a collar sized and shaped to provide a continuous closure around a neck of the wearer, when in a closed configuration;

said collar having a first pair of opposed ends;

said collar having a first tongue at one of the ends and a first groove at the other of the ends, wherein said first tongue is adapted to fit into said first groove to form a first tongue and groove interlock; and

a closure for maintaining the first tongue and groove interlock and keeping the collar in said closed configuration.

**25**. The combined neck and upper body protector according to claim **24**, wherein the neck protector further comprises a bib depending from the collar, said bib being detachably attached to and overlapped by said upper body protector.

**26**. The combined neck and upper body protector according to claim **24** further comprising:

a chest protector shield system attached to the front of the body portion, the chest protector shield system comprising:

at least two shield sections sized, shaped and positioned to cover at least the wearer's sternum when the upper body protector is worn by the wearer;

each of the at least two shield sections having a top end and a bottom end, the top end of each shield section being attached to the body portion;

the bottom end of at least one shield section overlapping a top end of an adjacent shield section, the bottom end of the at least one shield section being free;

whereby the chest protector shield system is adapted to protect at least a portion of the wearer's sternum, while permitting flex and freedom of movement, as well as venting in the region of overlap.

**27**. The combined neck and upper body protector according to claim **26**, wherein the neck protector further comprises a bib depending from the collar, the bib being detachably attached to and overlapped by the upper body protector, and wherein said neck protector further comprises at least one neck shield member attached to the collar and to the bib over at least a portion of the wearer's throat, and underlying at least a portion of the chest protector shield system, wherein the neck shield member is adapted to break initial impact and distribute impact forces between the collar, the bib, and the chest protector shield system, to provide uninterrupted protection of at least a portion of the wearer's throat, larynx, sternum, and chest.

**28**. A combined neck and upper body protector comprising:

an upper body protector comprising:

a body portion having a front and a back;

a chest protector shield system attached to the front of the body portion, the chest protector shield system comprising:

at least two shield sections sized, shaped and positioned to cover at least a portion of the wearer's sternum when the upper body protector is worn by the wearer;

each of the at least two shield sections having a top end and a bottom end, the top end of each shield section being attached to the body portion;

the bottom end of at least one shield section overlapping a top end of an adjacent shield section, the bottom end of the at least one shield section being free;

whereby the chest protector shield system is adapted to protect at least a portion of the wearer's sternum, while permitting flex and freedom of movement, as well as venting in the region of overlap; and

a neck protector detachably attached to said upper body protector, said neck protector comprising:

a collar sized and shaped to provide a continuous closure around a neck of the wearer, when in a closed configuration;

said collar having a first pair of opposed ends;

said collar having a first tongue at one of the ends and a first groove at the other of the ends, wherein said first tongue is adapted to fit into said first groove to form a first tongue and groove interlock; and

a closure for maintaining the first tongue and groove interlock and keeping the collar in said closed configuration.

**29**. A combined neck and upper body protector according to claim **28** further comprising:

a spine protector shield system attached to the back of the body portion, the spine protector shield system comprising:

at least two shield sections sized, shaped and positioned to cover the wearer's spine when the upper body protector is worn by the wearer;

each of the at least two shield sections having a top end and a bottom end, the top end of each shield section being attached to the body portion;

the bottom end of at least one shield section overlapping a top end of an adjacent shield section, the bottom end of the at least one shield section being free;

whereby the spine protector shield system is adapted to protect at least a portion of the length of the wearer's spine while permitting flex and freedom of movement, as well as venting in the region of overlap.

**30**. The combined neck and upper body protector according to claim **29**, wherein the neck protector further comprises a bib depending from the collar, said bib being detachably attached to and overlapped by said upper body protector, and wherein said neck protector further comprises at least one neck shield member attached to the collar and to the bib over at least a portion of the wearer's spine, and underlying at least a portion of the spine protector shield system, wherein the neck shield member is adapted to break initial impact and distribute impact forces between the collar, the bib, and the spine protector shield system, to provide uninterrupted protection of at least a portion of the wearer's spine.

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