An item of protective gear, comprising: a first shield element and a separate base portion of the item, each adapted to overlie the same or different area of anatomy of an intended user; and a pivot system movably intercoupling the shield element and the base portion so that relative to the base portion, the shield element is capable of rotating laterally around a fixed pivot axis for a predetermined degree. While not limited to use over any particular anatomical areas, the assembly of the shield element and base portion is particularly suited for use as a shoulder pad assembly for protecting at least a portion of an intended user’s shoulder-joint area.
The Shoulder Joint

Acromioclavicular (AC) joint

Clavicle

Bursa

Humerus

Biceps muscle

Scapula

Rotator Cuff Tendons:
- Supraspinatus
- Subscapularis
- Teres minor
- Infraspinatus (behind, not shown)

FIG. 2A THE SHOULDER

Capsule of shoulder-joint (distended). Anterior aspect.

FIG. 2B.
ASSEMBLY FOR A MOovable PROTECTIVE SHIELD

RELATED APPLICATIONS

[0001] This application claims the benefit of and priority to U.S. Provisional Application Ser. No. 61/944,331, filed Feb. 25, 2014, the contents of which are hereby incorporated by reference as if recited in full herein for all purposes.

BACKGROUND

[0002] The inventive subject matter described herein generally relates to gear that protects a human body from impact forces. It is particularly suitable for use in action sports, such as motor sports, including street and off-road motorcycling (including motocross), snowmobiling, and human powered or gravity sports, such as BMX bicycling, downhill mountain biking, etc. It may also be suitable for other sports and activities such as football, lacrosse, hockey, baseball, rock climbing, whitewater kayaking, mountain climbing, and other sports or activities where there is a need to protect predetermined portions of anatomy from impacts.

[0003] Protective gear is commonly used in sports where a participant risks injury from accidental collisions with the ground, obstacles, or other participants. Additionally, protective gear can be worn to guard against occupational injuries, such as hazards faced by workers in the forestry, construction, mining, and manufacturing industries.

[0004] In certain respects, the inventive subject matter is directed to shoulder pad assemblies. The inventive subject matter is particularly directed to shoulder pad assemblies that are integrated into chest protectors or roost deflectors used in motocross and other moto-sports or other motion sports. Accordingly, while not limited to such applications, the discussion of the inventive subject matter herein will use a roost deflector to illustrate the inventive subject matter.

[0005] Protective gear is a critical component for amateur and professional motorcycle enthusiasts, and manufacturers often tailor such equipment for specific uses. Off-road motorcycle riding and racing uniquely challenge protective riding gear. Not only must the equipment protect riders in the case of falls and crashes, but it must accommodate the athletic movements of a rider while maneuvering in challenging and treacherous riding terrain features, such as dirt, rock, sand, water, mud, snow, trees, stumps, boulders, brush, etc.

[0006] In the prior art, chest protectors and roost deflectors consist of shield structures having a shell-like form of thin walls and relatively broad surface areas. The shields may be formed to follow the contours on an anatomical area of intended use. The shield structures are typically made of a hard molded plastic or composite material formed of, for example, molded polycarbonate, polyethylene, carbon fiber, or fiberglass. The hard shell material may include an inner liner of a cushioning or comfort foam material. Because these materials are relatively hard so that they are able to attenuate impact forces, they also tend to be relatively inflexible and block or impede movement of a user’s joints and body parts. Consequently, to accommodate such movement, a roost deflector may have a shoulder pad assembly of multiple components of hard material joined together using mechanical hinges, straps, leather or textile joints, which are typically joined to components using fasteners or adhesives. FIG. 1 shows example of prior art roost deflectors or chest protectors 1A-1C, each with a shoulder pad assembly 2A-2C that includes an upper shoulder pad shield 3 that covers a clavicle area of the shoulder, and in two cases, a lower shield 4A or 4C that downwardly extends from the upper shoulder shield and which adjustably covers the upper humerus of a user. In all the examples, the upper shield is hingeably coupled to the main body of the chest protector with fasteners 5, 6 on front and back corner areas of the shield so that the shield can hinge upwardly and downwardly relative to the body of the protector 10 and the user’s shoulder. Because the shield 3 attaches to the body of the chest protector at opposite corners 5, 6 and to a lateral rotation of the shield 3 relative to the body of the chest protector 10 or user’s shoulder is possible. While the up and down movement of the shield may accommodate up and down motions of the user’s anatomy, the range of movement is very restricted. Running counter to this limitation is the fact that the shoulder joints have among the highest range of movement in the human body, allowing for lateral rotation of the associated bones, as well as up and down movement. In action sports, there is a great need for participants to have a full range of motion. Unfortunately, prior art devices may restrict the range of motion, impeding participants’ from the full range of motion needed for performance or safety. Alternatively, if the prior art does not restrict range of movement, the shields may not follow the user’s anatomy, causing the areas that need to be protected to become exposed and vulnerable to injury.

[0007] Accordingly, there is a significant need for improved protective gear where shield elements or portions do not impede a user’s range of movement and afford protection through a range of user movements.

[0008] Referring to FIGS. 2A, 2B, the human shoulder is made up of three bones: the clavicle (collarbone), the scapula (shoulder blade), and the humerus (upper arm bone) as well as associated muscles, ligaments and tendons. The articulations between the bones of the shoulder make up the shoulder joints. “Shoulder joint” typically refers to the glenohumeral joint, which is the major joint of the “shoulder,” but can more broadly include the acromioclavicular joint. In human anatomy, the shoulder joint comprises the part of the body where the humerus attaches to the scapula, the head sitting in the glenoid fossa. The shoulder is the group of structures in the region of the joint. The shoulder must be mobile enough for the wide range actions of the arms and hands, but also stable enough to allow for actions such as lifting, pushing and pulling. The compromise between mobility and stability results in a large number of shoulder problems not faced by other joints such as the hip.

[0009] In view of the foregoing, there is a substantial need for improved items of protective gear that are: (1) strong but which allow desired movement through a range of movements; (2) conformable to the anatomy; (3) lightweight; (4) cooler; (5) more comfortable to use; (6) made of unitary components or sections; and/or (6) aesthetically designable.

SUMMARY

[0010] The inventive subject matter overcomes the disadvantages and problems in the prior art by providing items of protective gear that better conform to anatomical movements of the intended user and which may address any one or more of the other foregoing needs.

[0011] The following is a short description of some of the various inventive lines under the inventive subject matter. The appended claims, as originally filed in this document, or as subsequently amended, are hereby incorporated into this
Summary section as if written directly in. The following is not intended to be an exhaustive list of embodiments and features of the inventive subject matter. Persons skilled in the art are capable of appreciating other embodiments and features from the following detailed description in conjunction with the drawings.

The inventive subject matter is generally directed to an item of protective gear, comprising: a first shield element and a separate base portion of the item, each adapted to overlie the same or different area of anatomy of an intended user; and a pivot system movably intercoupling the shield element and the base portion so that relative to the base portion, the shield element is capable of rotating laterally around a fixed pivot axis. The pivot system may be configured to provide for a range of degrees of rotation and multiple degrees of freedom.

While not limited to use over any particular anatomical areas, the assembly of the shield element and base portion is particularly suited for use as a shoulder pad assembly for protecting at least a portion of an intended user’s shoulder-joint area.

As used herein, terms such as “protective”, “shield”, or “shell” are not intended to mean that the wearer is completely protected from all potential injuries. Instead, such terms mean that the gear provides some measure of deflection or attenuation against outside forces imparted upon the wearer during use. For example, the protective gear can be used in motocross racing, which involves numerous risks of injury from hazards such as collisions with other racers, collisions with retaining walls and other obstacles on the track, dirt and rocks kicked up by motorcycle tires, and riders falling or spilling from their motorcycles. The items of protective gear described or contemplated herein do not necessarily eliminate all risk of injury to a rider wearing the gear. Instead, the gear may deflect or attenuate at least part of the injurious force that a rider would otherwise suffer had the rider not been wearing the protective gear.

BRIEF DESCRIPTION OF THE DRAWINGS

The appended Figures show embodiments according to the inventive subject matter, unless noted as showing prior art.

FIG. 1 shows examples of chest protectors (roost deflectors) according to the prior art.

FIGS. 2A-2B show anatomical features of the human shoulder joint.

FIGS. 3A-3B-1 show a representative item of protective gear in the nature of a shoulder pad assembly, with FIG. 3 showing a bottom view with elements in a first position, FIG. 3A-1 showing the elements in a second position, FIG. 3B showing the assembly on a left shoulder of a wearer with the elements in a first position, and FIG. 3B-1 showing the assembly on the wearer with the elements in a second position that follows the shoulder movement of the wearer.

FIG. 4 shows a bottom view of details of a pivot system for the assembly shown in FIG. 3, the pivot system intercoupling a first element (left) and a second element (right).

FIG. 5 shows a bottom view of isolated, fragmentary details of the first element and part of the pivot system from the assembly shown in FIG. 4.

FIG. 6 shows a top, side perspective view of isolated details of the second element and a part of the pivot system from the assembly shown in FIG. 4.

FIG. 7 shows a side view of the element and part from FIG. 6.

FIG. 8 shows a top view of the element and part from FIG. 6.

FIG. 9 shows the element and part from FIG. 6 prior to placement of the part into a padding layer associated with a chest protector (partial view).

FIG. 10 shows the element from FIG. 6 with the associated part placed into the padding layer.

FIG. 11 shows a rear view of the element and part from FIG. 9 prior to insertion of a fastener receiver into a padding layer associated with a chest protector (roost deflector), the chest protector being a partial view of a rear shoulder and upper back area.

FIG. 12 shows the part and element of FIG. 11 after placement of the fastener receiver into the padding layer.

FIG. 13 shows a side view of the assembly of part/element and padding layer, with the element on top of the padding layer and the part extending through the bottom side of the padding layer.

FIG. 14 shows a bottom view of the assembly of FIG. 13.

FIG. 15 shows a second receiver on the element in the assembly of FIG. 13 and a second fastener prior to placement of the fastener in the second receiver.

FIG. 16 shows the assembly of FIG. 15 after placement of the second fastener in the second receiver.

FIG. 17 shows a top view of the assembly of FIG. 11 from a different angle.

FIG. 18 shows a bottom view of the assembly of FIG. 16 with all fasteners extending through the padding layer into their receivers on the opposite side of the padding layer.

FIG. 19 shows a top, side perspective view of the assembly of FIG. 18.

FIG. 20 shows a bottom view of an assembly of the first element to the assembly of FIG. 19, via a pivot system.

FIG. 21 shows the assembly of FIG. 20 from a different angle.

FIG. 22 shows a top, side perspective view of the assembly of FIG. 20.

DETAILED DESCRIPTION

Representative embodiments according to the inventive subject matter are shown in FIGS. 3A-22, wherein the same or generally similar features share common reference numerals.

The inventive subject matter is generally directed to an item of protective gear 10 that allows for controlled movement of selected assembled elements in conformance with a user’s anatomy. In the representative embodiment shown in the Figures, the item of protective gear is a shoulder pad assembly 12, which may be incorporated in a chest protector 1 or other item for protection of the upper body. The shoulder pad assembly 12 is configured to conform generally to shoulder and upper arm anatomy and movements. Such movements may include lateral rotational movement, as well as up and down movement.

In certain embodiments, as shown in FIGS. 3-22, movement may be achieved using a pivot system 14 that intercouplings at least a first shield element 16 of the assembly and a second element or portion 18 of the item of protective gear 10. The pivot system is configured to allow for a range of lateral movement of the intercoupled elements or portions
relative to one another. The relative movement is indicated by the curving arrows in some of the Figures, including FIGS. 3A to 3B-1. The pivot system 14 components may be formed separately from, or unitary with, other elements or portions within an item of protective gear and can be arranged on surfaces or recessed into the surfaces or bodies of the elements or portions of the protective gear with which they are associated.

The pivot system 14 may be based on a system of a post 20 that rotatably engages a receiver 22. The post 20 has a longitudinal axis disposed in a shaft portion that projects perpendicularly or otherwise outwardly from the surface of a shield element in the assembly. The post may also include a threaded recess for receiving a screw (not shown) so that the post is retained in place. The shaft portion 20A defines an axis of lateral rotation for the shield element relative to another portion of the shoulder pad assembly. (In the Figures, the axis is labeled as “Axis” and indicated by dashed lines.) A receiver 22 disposed on or in a second portion 18 of the assembly may define a range of rotational travel for the shield element around the axis of rotation. The range of movement may be set to conform to a range of movement of a user during intended activities of use for the assembly.

As used herein, “base” portion or element 18 refers to a portion or element in an item of protective gear that serves as an anchoring portion for intercoupling with the movable shield element 16 via the pivot system 14. The base portion 18 may also be a shield element that is or is not movable. In FIGS. 3A-22, the shield element 16 is coupled via the pivot system 14 to another portion of the shoulder pad assembly 12, the base portion 18, which also may be and serve as a shield element or portion.

The shield material may be the same for both the base and the movable shield portion 16. The base portion 18 is shown sitting over and coupled to a pliable layer 24 of padding material that faces a user’s body. The padding layer may serve as a comfort layer and/or additional protective material. The padding layer may be attached to the base portion 18 or another portion using any known or discovered means. The layer may be bonded using adhesives, fusion bonding, or mechanical fasteners. In the example shown, the padding layer 24 is attached using one or more pairs of a pin fastener 25 and a receiver 27 that intercouple the base portion and the padding layer.

The padding layer may be made of foamed or cellular materials, such as polyurethane (PU), ethylvinyl acetate (EVA). Gel materials, such as silicone based gel materials may also serve as the padding layer, as well as leathers and woven and non-woven textile synthetic or natural materials, such as mats made of wool or cotton fibers. Any such materials may also serve as lining or padding between other elements or portions of the protective gear. As a non-limiting example of a suitable construction for protective for motocross, the type C dirometer on the EVA or other padding material may be equal to 40±/−20 or thereof. And the diometer on the shield material may be equal to 90±/−10 or thereof.

As seen in the Figures, a receiver 22, which may have a keyhole form, is disposed in a base portion 18 or first shoulder pad shield or protective element 16. The receiver consists of an overall opening 22 having a central open portion 22A and opposing laterally extending open portions 22B, 22C. All or some of the overall opening may be in the nature of a through opening or a blind hole. The Figures show the receiver disposed in a tab or flange structure 21, extending from the base portion 18. The tab or flange may be molded into an element or portion of the protective gear, or it may be a separately attached structure, such as structure of a metal, that is fastened to another element or portion of the protective gear. However, the receiver can also be disposed on the body of the protective element. The extending tab or flange 21 may be used to allow for a greater spacing of the movable protective shield element from a base portion so there’s more stand-off room for relative rotation.

The post element 20 is configured and received in the receiver in such a way that it has a predetermined degree of rotation within the receiver, with limits determined by the boundaries of the receiver’s open space. In this example, the lateral open portions 22B, 22C of the receiver define a range of rotation for the post. This is based on the elongate shaft portion 20A of the post being rotatably disposed in the central open portion 22A of the receiver 22, which has closely adjacent circular or curved sidewalls to facilitate rotation of the post. The post 20 will normally have a sufficiently rigid and durable structural form so that it holds its form through stress and repeated cycles of use and maintains an axis of rotation for the coupled shield 16 or other protective element, to allow the element to laterally rotate relative to an underlying or overlying surface. In this regard, the post may be made of suitable metals or plastics, for example.

Referring again to the Figures, the post element 20 includes opposing lateral extensions 203, 20C on its shaft portion 20A. The extensions are arranged to fit within the corresponding, opposing lateral open portions 223, 22C of the receiver 22. The sidewalks defining the opposing, lateral open portions align sufficiently with the generally complementary structure of the lateral extensions so as to serve as stops to limit the range of rotation of the post 20 around its central, longitudinal axis. This results in the shield or protective element 16 being capable of a predetermined degree of relative to the base portion 18 in generally parallel planes, as indicated by the curved arrows in the Figures. The predetermined range of motion for the pivot axis may be from zero to a value that is less than 360°, 315°, 270°, 225°, 180°, 150°, 90°, 60°, 45°, 30°, 15°, 10°, or 5°, or thereabout any such value.

While the receiver 22 shown in the Figures has opposing lateral extensions, such as 22B and/or 22C, that define a range of movement for complementary lateral post component, the receiver is not limited to that specific configuration. Similar results could be achieved by a receiver with a single lateral extension, e.g., just extension 22B or 22C, or more than two lateral extensions, and a post with one or more complementary lateral extensions, such as 203 or 20C. For example, the receiver could be configured in a tri-spoke, star, hex or other pattern, to provide a plurality of lateral extensions. The range of movement is defined by the relative space between the receiver’s open lateral extensions and the complementary lateral extensions on the post.

In addition to movement in generally parallel planes, the protective elements or portions may also have additional degrees of freedom. For example, they may move perpendicularly in and out of the parallel planes. The receiver and post assembly may be provided with some freeplay to allow for a protective element to hinge or lift off the receiver/post assembly. Alternatively, the post could be a semi-rigid, elastic structure that resiliently stretches under force. Simi-
larly, it can be a mechanical spring structure that has sufficient rigidity to define a general axis of lateral rotation for a coupled element.

**0050** The shoulder pad assembly **12** may be incorporated on a chest protector, such as one of those in FIG. 1 or as otherwise contemplated herein.

**0051** Although the Figures show a base portion **18** with the receiver **22** and a shield element **16** with the post **20**, those engagable parts may be interchanged in any assembly of protective elements or portions. It is generally immaterial which part holds which engagable element so long as the parts are rotationally engagable. The parts may also be arranged and coupled not only in side-by-side relationships but also in fully or partially coextensive overlying relationships. Any such arrangement of overlying and/or side-by-side parts or portions in an item of protective gear may be referred to as an “adjacent” arrangement. Items may be in adjacent arrangement even if there may be intervening parts between the items. For example, a movable shield element may be separated from a base portion by a layer **24** for comfort, aesthetics, and/or force attenuation.

**0052** In other possible embodiments, a shield element and another portion of protective gear may be coupled using a pivot system based on a ball-and-socket type arrangement. The post extends outwardly from a surface on a spherical ball or cylinder or other such circularly shaped object that is circular or partially circular in at least one plane of cross section. The receiver is a complementarily shaped socket that is a bearing surface to closely, rotatably receive the round object on the post.

**0053** The circular object does not need to be fully circular. For example, a hemisphere with a post extending off the middle of the flat side could also function as a rotatable object in an appropriately sized and shaped receiver. The circular object may be rotatably retained in the receiver by making the opening of the receiver smaller than the diameter of the circle defining the circular object. A range of motion of the shaft may be controlled by making the opening size between the size of that diameter and dimension of the shaft portion extending from the opening. A true ball-and-socket arrangement can allow for a wide range of lateral and up and down motion. A cylindrical circular object can allow for controlled motion in the lateral or open down direction, depending on the orientation of the cylinder as it is coupled between (1) a shield or other protective element and (2) another portion of the protective gear. However, any degree of freedom could be provided by making the cavity for the receiver longer than the cylindrical object so that object has freeplay in directions along its longitudinal axis. As with other embodiments, the range of movement for a cylindrical object may be controlled by varying the size and/or shape of the opening through which a shaft portion coupled to the cylindrical or other circular object extends.

**0054** While the foregoing discussion has been largely in terms of a shoulder pad assembly, the inventive subject matter contemplates other assemblies of protective elements that have multiple degrees of freedom based on the inventive receiver and post assemblies described herein. Other protective assemblies may include, wrist, knee, ankle, neck, and hip protective gear systems based on two or more protective elements or portions that are coupled and have multiple degrees of freedom using the inventive pivot system.

**0055** The protective shield element and base portion may include surfaces **26, 28** that are apart from the pivot system and which can abuttingly engage each other to limit the range of pivot for a movable element. For example, the pivot system may be provided with no limits on rotation and instead the separate abutting surfaces define range of motion and limits. Alternatively, the separate, abutting surface system could provide limits in case limits built into the pivot system become inoperative.

**0056** A representative roost deflecter **1** into, which the inventive subject matter may be embodied is disclosed in U.S. Pat. No. 7,987,526, which is co-owned by the present applicant and hereby incorporated by reference in its entirety for all purposes.

**0057** The roost deflector **1** typically includes a rear section **120** for covering some portion of the back of a wearer, a front portion **140** for covering some portion of the front chest or other frontal area of the wearer, and shoulder pad sections for covering some portion of the shoulders. The sections are interconnected to form a single unit of protective equipment, such as items **1A, 1B or 1C** in FIG. 1. The roost deflector’s sections include sections of shell materials that are relatively hard for attenuating impact forces, and are not necessarily comfortable against body parts because of their inability to conform with the movement of the body or because of hard edges. Accordingly, a roost deflector also typically may include soft cushioning materials **24** associated with body-facing surfaces of the shells and edges of the shells. Such materials may be referred to as "biofoam". They may include a liner layer, such as Lyca®M. These softer materials may also serve to attenuate forces and/or to provide a comfort layer between the relatively hard shell materials and the wearer’s body.

**0058** The roost deflector may also include straps or other interconnects for joining components around the body of a wearer.

**0059** The roost deflector may also include a portion for covering anatomy above the shoulders, such as the neck, or anatomy below the waistline, such as the groin, tailbone, or buttocks.

**0060** In some embodiments, the roost deflector shell sections comprise two or more molded materials that are molded together along a junction line that allows for movement. As used herein, unless otherwise indicated, “portion” or “section” generally means any designated area of an item of protective gear, for example, it can be an area spanning components of a roost deflector, an individual component, or a subsection within another designated section or component.

**0061** The contemplated shell materials for shell or shield protective elements generally are polymers or polymer-based composite materials, such as carbon fiber or fiberglass, using polymer resins. Particularly suitable polymer materials may be plastics and elastomers, particularly thermoplastics and thermoplastic elastomers, as well as blends or alloys of such materials.

**0062** A first material used in the inventive protective gear comprises a relatively hard and inflexible material intended as a shell or shield for attenuating impacts in an intended application, such as motocross. Such materials are often characterized as having a higher Shore A durometer or higher flexural modulus. Typical materials have a Shore A Durometer of from about 60 to about 90. Some suitable plastic or other polymer shell materials are, for example, polycarbonate resin thermoplastic, such as LEXAN® polycarbonate; polyprene; acrylonitrile butadiene styrene (ABS); PC/ABS Alloys; Styrene, Nylon, HIPS+Nylon 6 and 66, polyethylene;
copolyster; propionate; and acetal. In addition to polymer-based materials, the shell could also include or be based on, in whole or part, metals. Exemplary metals include aluminum, stainless steel, and titanium. Alloys of metals may also be used. The metals may be provided, for example, as stamped, molded, or thin-walled forms.

[0063] In some embodiments, a second material optionally may be used in combination with a first material shell or shield material to join adjacent sections of such materially along a flexural line or joint consisting of a relatively soft material having a low modulus, such as a thermoplastic elastomer (TPE). The flexural material allows for flexibility and relative movement of the section of the first shell or shield section to another section intercoupled by the flexural material. The flexural material may be molded, welded, bonded, or otherwise connected to an intercoupled section.

[0064] The flexural materials may be characterized as having relative to another section of material, a lower Shore A Durometer or lower flexural modulus. Typically, such materials have a Shore A Durometer of from about 30 to about 90. Typically, the first shell material will have a Shore A Durometer that is at least about 10 to about 40 Shore A Durometer points higher than that of the second, flexural material. One suitable flexural material for use with a shell material, for example, LEXAN® polycarbonate, is a TPU (thermoplastic polyurethane elastomer) or a TPU alloy. These TPE materials are available from GLS Corporation, McHenry, II, USA, and other commercial sources. GLS Corporation sells a variety of TPE materials under the VERSALON and VERSAFLEX families for bonding to plastics such as PC, ABS, PC/ABS, and copolyester.

[0065] It is noted that the shell and flexural materials are classes of materials, one being relatively harder and more suited for the primary force attenuation function of a protector, and the other being more suitable for providing a joint or zone of flexibility or softness. Accordingly, the shell material may be of a homogeneous or heterogeneous nature. For example, the shell may be composed of adjacent sections of different materials, or it may be composed of lamination of different materials or composite materials, with the overall structure being a shell material. The flexural sections may be similarly composed of heterogeneous flexural materials. Further, any section of material may be a composite material, such as a carbon fiber or fiberglass material. Accordingly, the term “material”, unless context indicates otherwise, is used in a broad sense, not limited to homogeneous materials.

[0066] The specific materials mentioned above are good examples of low modulus materials and rigid materials that provide a good balance of the desired material properties for a roost deflector. The materials are representative of a much larger array of options with respect to materials. Other thermoplastics choices and combinations of rigid and low modulus materials are also capable of providing similar structure. They should be selected to provide the desired combinations of processability, modulus, strength, rigidity, and compatibility. Preferably, in one possibly process according to the inventive subject matter, the shell and flexural materials can be over-molded or injection molded in the same injection molding machine, such as in a two shot molding process or an overmolding process. Non-thermoplastics, such as composites, or even metals, could also be used as a shell material in connection with overmolding or other known processes for molding or bonding to dissimilar materials.

[0067] An example of another application of the inventive subject matter is shin and knee guard protector, with movable shield sections, as disclosed for example in U.S. Pat. No. 7,522,679, which is co-owned by the present applicant and hereby incorporated by reference in its entirety for all purposes.

[0068] Persons skilled in the art will recognize that many modifications and variations are possible in the details, materials, and arrangements of the parts and actions which have been described and illustrated in order to explain the nature of the inventive subject matter, and that such modifications and variations do not depart from the spirit and scope of the teachings and claims contained therein.

[0069] All patent and non-patent literature cited herein is hereby incorporated by references in its entirety for all purposes.

[0070] As used herein, “and/or” means “and” or “or”, as well as “and” and “or.” Moreover, any and all patent and non-patent literature cited herein is hereby incorporated by references in its entirety for all purposes.

[0071] The principles described above in connection with any particular example can be combined with the principles described in connection with any one or more of the other examples. Accordingly, this detailed description shall not be construed in a limiting sense, and following a review of this disclosure, those of ordinary skill in the art will appreciate the wide variety of systems that can be devised using the various concepts described herein. Moreover, those of ordinary skill in the art will appreciate that the exemplary embodiments disclosed herein can be adapted to various configurations without departing from the disclosed principles.

[0072] The previous description of embodiments is provided to enable any person skilled in the art to make or use the disclosed innovations. Various modifications to those embodiments will be readily apparent to those skilled in the art from the teachings herein, and the generic principles defined herein may be applied to other embodiments without departing from the spirit or scope of this disclosure. Thus, the claimed inventions are not intended to be limited to the embodiments shown herein, but are to be accorded the full scope consistent with the language of the claims. In the claims reference to an element in the singular, such as by use of the article “a” or “an” is not intended to mean “one and only one” unless specifically so stated, but rather “one or more”.

[0073] All structural and functional equivalents to the elements of the various embodiments described throughout the disclosure that are known or later come to be known to those of ordinary skill in the art are intended to be encompassed by the features described and claimed herein. Moreover, nothing disclosed herein is intended to be dedicated to the public regardless of whether such disclosure is explicitly recited in the claims. No claim element is to be construed as “a means plus function” claim under US patent law, unless the element is expressly recited using the phrase “means for” or “step for”.

[0074] The inventor reserves all rights to the subject matter disclosed herein, including the right to claim all that comes within the scope and spirit of the following claims:

1. An item of protective gear, comprising:
   a first shield element and a separate base portion of the item, each adapted to overlie the a same or different area of anatomy of an intended user; and
a pivot system movably intercoupling the shield element and the base portion so that relative to the base portion, the shield element is capable of rotating laterally around a fixed pivot axis.

2. The item of claim 1 wherein the shield element is adjacent the base portion.

3. The item of claim 1 wherein the shield element and base portion are arranged adjacent to each other in a fully or partially overlying and/or side-by-side relationship.

4. The item of claim 1 wherein the pivot system comprises a post and a receiver that are rotatably engageable with one another, the post being disposed on or coupled to one of the first shield and the base portion, and the receiver being disposed on or in the other of the first shield and the base portion, and wherein the post’s longitudinal axis defines the pivot axis.

5. The item of 1 claim wherein the base portion comprises a second shield element.

6. The item of claim 1 wherein the item comprises a shoulder pad assembly for protecting at least a portion of a user’s shoulder joint area.

7. The item of claim 6 wherein in the shoulder pad assembly the base portion base is configured to overlie at least a portion of an intended user’s clavicle area and the shield element extends away from the base shield and is configured to overlie the joint of the clavicle and humerus of the intended user.

8. The item of claim 7 wherein the shield is configured to extend from the base portion and to at least cover a portion of an intended user’s upper humerus.

9. An item of protective gear, comprising:
a first shield element and a separate base portion of the item, each adapted to overlie the a same or different area of anatomy of an intended user; and
a pivot system movably intercoupling the shield element and the base portion so that relative to the base portion, the shield element is capable of rotating laterally around a fixed pivot axis, and wherein the pivot system allows multiple degrees of freedom, including the lateral rotation and an up and down movement of the shield element relative to the base portion.

10. An item of protective gear, comprising:
a first shield element and a separate base portion of the item, each adapted to overlie the a same or different area of anatomy of an intended user; and a pivot system movably intercoupling the shield element and the base portion so that relative to the base portion, the shield element is capable of rotating laterally around a fixed pivot axis, the pivot system allowing for the first shield element to conform to an intended user’s shoulder and upper arm movements;
wherein the item comprises a shoulder pad assembly for protecting at least a portion of a user’s shoulder joint area;

wherein in the shoulder pad assembly the base portion base is configured to overlie at least a portion of an intended user’s clavicle area and the shield element extends away from the base shield and is configured to overlie the joint of the clavicle and humerus of the intended user; and

11. The item of claim 10 wherein the pivot system comprises a post and a receiver that rotatably engage one another, the post being disposed on or coupled to one of the base portion and the shield element, and the receiver being disposed on or in the other of the base portion and side element, and wherein the post’s longitudinal axis defines the pivot axis.

12. The item of claim 1 wherein the pivot system is configured to allow for lateral rotation around the pivot axis of at least 45°.

13. The item of claim 1 wherein the pivot system comprises a post and a receiver that have generally complementary shapes that together and in combination with predetermined amount of free play define a predetermined range of motion for the pivot axis that is less than 270° or thereabout such value.

14. The item of claim 1 wherein the pivot system comprises a post comprising a ball-type element and a receiver comprising a complementary socket element, the ball-type element is disposed on or in one of the shield element and the base portion and the socket is disposed on or in the other of the shield element and the base portion.

15. The item of claim 1 wherein the shield element or elements comprise a molded plastic.

16. The item of claim 15 wherein the shield comprises a material having a durometer of at least 75.

17. The item of claim 1 wherein the shield includes a first abutment surface, and the base portion includes a second abutment surface, and the shield portion and base portion are arranged so that on relative lateral movement the abutment surfaces are engageable to limit the relative range of lateral rotation of the shield element and the base portion.

18. The item of claim 15 wherein the shield element and/or base portion further include an associated layer of a padding that is adjacent and coextensive with a portion of the shield element and/or base portion.

19. The item of claim 19 wherein the padding has a durometer of 60 or less.

20. The item of claim 1 further comprising a chest shield, coupled to the item, the overall item comprising a chest protector (roost deflector).

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