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(54) Title: COMFORT GUARD APPARATUS FOR REGULATING BODY TEMPERATURE AND METHOD OF USE

(57) Abstract: A comfort guard apparatus and method of use comprises a compartmentalized chamber positioned adjacent to protective equipment such as shin guards, chest protectors, and helmets. In one embodiment, the apparatus is interchangeable and removeably positioned between the user and the protective equipment. In another embodiment, the apparatus is built into the protective equipment including clothing such as shirts and pants. The apparatus can be replaced with a freshly cool or warmed version during use. The apparatus conforms to the body of the user, keep the chamber in contact with a greater surface area, and prevent the contents of the compartments from gravitating towards edges. Adjacent compartments can be separated by a breakable membrane or contain breakable packets. The apparatus cushions the user from abrupt edges of the protective equipment. The apparatus, positioned against the body of the wearer, regulates the wearer's body temperature which contributes to enhanced athletic performance.

[Continued on next page]
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COMFORT GUARD APPARATUS FOR REGULATING BODY TEMPERATURE AND METHOD OF USE

FIELD

[0001] This disclosure relates to sporting equipment, and more particularly to a comfort guard positioned between a user and protective sport equipment, which regulates body temperature.

BACKGROUND

[0002] Stabilizing body temperature of an athlete can lead to better performance and comfort during athletic competition. For example, an athlete in warm weather wearing protective padding gear is prone to overheating. Similarly, a cold weather athlete is more likely to require heat to warm and maintain muscle strength.

[0003] U.S. Patent No. 6,789,274 to Karpati discloses a chest protector. The device utilizes a pliable gel attached to a chest protector to enhance absorption and dissipation of impact forces. The gel is that commonly used for heat or freezer pads and is configured in separate panels to keep the gel from flowing across the entire device. The gel may be frozen or refrigerated prior to use in order to cool the user.

[0004] U.S. Patent Publication No. 201 1/0307998 to Turner discloses an article of apparel including a base component and an attachment component. The base component is formed from a plurality of joined material elements. An attachment component includes a cover layer, a plurality of pad elements, and a plurality of securing elements. Each of the pad elements are joined to the cover layer. The securing elements include a second part of a fastening system. The shape of the pad elements varies. A variety of materials may be utilized for the pad elements including various polymer foam, gas or liquid.
U.S. Patent Publication No. 2005/0038368 to Richter, et al. discloses a padding layer fitted to objects such as hearing aids, eyeglasses, and bicycle helmets. The comfort layer includes a temperature sensitive gel that conforms to the shape of the user. The comfort layer can be chambered.

International Patent Publication No. WO 2012086676 to Hasegawa discloses a body temperature regulation pad that uses a melting material to prevent a change in body temperature. The pad is worn under the clothing and is capable of bending along the shape of the body. The pad has an external shape that does not deform and is provided with a plurality of tube shaped compartments.

Therefore, there is a need in the art for an insertable and interchangeable pad that controls body temperature and contours to the body of the athlete. Further, there is a need for a protective guard that applies cooling immediately after impact without removing the athlete from the sporting activity. There is also a need for an impact indicator that aids in rapid field side medical diagnosis.
SUMMARY

[0008] A compartmentalized pad and guard are provided, which are fitted between an athlete and certain protective sports equipment, which can prevent heating and cooling during an athletic event. The compartments are filled with a gel, liquid, or solid of varying composition. The pad reacts to impact forces by immediately cooling or warming the affected area of the athlete and changing color to show the intensity of the impact. The level of cooling and heating and of temperature change can be affected by the level of impact absorbed by the pad during use. The pad also conforms to the shape of the wearer and can be easily interchanged during competition.

[0010] The pad is designed to be used with protective equipment such as shin guards, thigh guards, shoulder pads, chest protectors, helmets, etc. The pad also can accommodate use in medical sports braces such as knee braces, elbow braces, and sweat bands.

[0011] The apparatus can accommodate different sizes and shapes of protective equipment. The apparatus is sectioned into individual compartments with flexible seams. The seams allow the individual compartments to conform to the shape of the body and aid in maintaining contact with a greater surface area.

[0012] In a first embodiment, the apparatus is removably fitted with Velcro® or a suitable adhesive or in pockets or other fitted clothing. In an alternate embodiment, the apparatus is permanently fitted into protective equipment.

[0013] In another alternate embodiment, the apparatus includes paired compartments separated by rupturable membranes. The compartments contain substances which demonstrate exothermic or endothermic reactions when mixed.

[0014] The apparatus forms a barrier between the athlete and the protective equipment to cushion the athlete from sharp edges. Additionally, the heating or cooling contributes to enhanced athletic performance. Further, in one embodiment, the apparatus
supplies immediate cooling to an area of the body after a forceful impact, thereby immediately aiding in recovery of the athlete.

[0015] In another alternate embodiment, the substance in the chamber acts as an inert heat capacitor and therefore can be either reusable or disposable.

[0016] In an alternate embodiment, the apparatus includes pockets of silicone pellets that are potentially heavy to provide a weighted workout in addition to the cushioning and body temperature affecting characteristics.

[0017] In an alternate embodiment, the apparatus includes temperature sensitive dye to indicate the need for replacement or to indicate severity of an impact to the athlete.
BRIEF DESCRIPTION OF DRAWINGS

[0018] In the descriptions that follow, like parts are marked throughout the specification and drawings with the same numerals, respectively. The drawing figures are not necessarily drawn to scale and certain figures may be shown in exaggerated or generalized form in the interest of clarity and conciseness.

[0019] Figure 1A is an elevation view of a preferred embodiment of this disclosure.

[0020] Figure 1B is a side view of a preferred embodiment of this disclosure.

[0021] Figure 2A is a partial elevation view of a preferred embodiment of this disclosure.

[0022] Figure 2B is a partial elevation view of a preferred embodiment of this disclosure.

[0023] Figure 2C is a partial elevation view of a preferred embodiment of this disclosure.

[0024] Figure 2D is a partial elevation view of a preferred embodiment of this disclosure.

[0025] Figure 3A is an isometric view of protective equipment of the preferred embodiment.

[0026] Figure 3B is an isometric view of a preferred embodiment of this disclosure attached to the protective equipment of Figure 3A.

[0027] Figure 4 is a partial cross-sectional view of a preferred embodiment of this disclosure.

[0028] Figure 5 is an elevation view of a preferred embodiment of this disclosure inserted within athletic pants.
[0029] Figure 6 is an elevation view of a preferred embodiment of this disclosure inserted within an athletic shirt.

[0030] Figure 7 is an isometric view of a preferred embodiment of this disclosure in conjunction with a knee brace.

[0031] Figure 8 is an isometric view of a preferred embodiment of this disclosure in conjunction with a sweat band.
DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0032] Referring to Figures 1A and IB, comfort guard 100 is a flexible, generally planar chamber manufactured of a tear and puncture resistant vinyl plastic or similar material. Comfort guard 100 is comprised of a plurality of compartments 120 containing gel. Other shapes, conforming to protective equipment such as thigh pads, helmets, shoulder pads, elbow pads, arm pads, chest protectors, and medical braces are also envisioned.

[0033] Outer edge 102 confines the gel within comfort guard 100. Horizontal seam 104 and vertical seams 106, 108, and 110 further divide comfort guard 100 into the plurality of compartments 120. Horizontal seam 104 and vertical seams 106, 108, and 110 also provide natural bending axes to allow comfort guard 100 to conform to the shape of the protective equipment. Compartments 120 are generally tubular shaped. The seams could be other than generally horizontally and vertically aligned. In alternate embodiments, compartments 120 could form concentric circles or other concentric shapes particularly suited to a certain type of equipment or body part. The seams forming compartments 120 prevent the gel from being forced away from pressure points or gravitating downward during use. The total number of compartments 120 may vary with the size of comfort guard 100 and also with the axes required to conform to the shape of any particular body part. The thickness of each compartment 120 can range from approximately 1/8 inch to an inch or more. Additionally, the thickness and shape of each compartment 120 can vary throughout the apparatus depending on desired use.

[0034] In an alternate embodiment, comfort guard 100 includes layer 112. Layer 112 is an insulating fabric. Layer 112 may also include an absorbent, wicking, and anti-bacterial material.

[0035] In one embodiment, the gel comprises a silicone based suspension including
water. The gel can be repeatedly chilled and reused. The gel also resists freezing at normal refrigeration temperatures to avoid becoming stiff. In other embodiments, the gel confined in compartments 120 is a polymer or glycerin capable of retaining heat or cold.

[0036] Referring to Figure 2A, in an alternate embodiment, the compartments are paired and separated by breakable membranes. Horizontal seams 214 and 215 and vertical seams 216, 217, 218, 219, 220, 221, 222, 223, and 224 divide comfort guard 100 into the paired compartments 120A and 120B, 120C and 120D, 120E and 120F, and 120G and 120H. Membrane 202 separates compartment 120A from compartment 120B. Membrane 204 separates compartment 120C from compartment 120D. Membrane 206 separates compartment 120E from compartment 120F. Membrane 208 separates compartment 120G from compartment 120H.

[0037] In one embodiment, compartment 120A contains a first endothermic reaction substance, such as water, and compartment 120B contains a second endothermic reaction substance, such as calcium ammonium nitrate or urea. In another embodiment, compartment 120A contains a first exothermic reaction substance, such as water, and compartment 120B contains a second exothermic reaction substance, such as supersaturated sodium acetate. In each case, membrane 202 keeps the substances contained in compartments 120A and 120B are separated until the membranes are broken allowing the substrates to mix.

[0038] A breakable membrane such as disclosed in U.S. Patent Nos. 6,379,069, 6,641,319, and 6,869,242 will suffice.

[0039] Once membrane 202 is broken, the two substances combine and produce an endothermic or exothermic reaction, thereby causing compartments 120A and 120B to become cool or warm. In one embodiment, all the compartments in the pad are either endothermic or exothermic. In another embodiment, the pairs of compartments alternately contain substances
which produce endothermic or exothermic reactions. In this embodiment, the compartments are separated by their respective membranes, thereby providing both cool and warm regions in the same apparatus. Membranes in the alternating compartments may be of differing rupture strengths to control when each reaction occurs.

[0040] Membrane 202 can be ruptured manually by squeezing either compartment 120A or 120B such that the pressure on membrane 202 causes membrane 202 to break thereby allowing the substances contained within compartments 120A and 120B to mix and start the reaction. Alternatively, membrane 202 can be ruptured automatically during use as the user receives an impact blow to the protective gear.

[0041] In one embodiment, membranes 202, 204, 206, and 208 are purposefully varied in size, ranging from a relatively small weak membrane to a relatively strong membrane. For example, the pressure or impact required to rupture membrane 204 is greater than that required to rupture membrane 202. The pressure required to rupture membrane 206 is greater than that required to rupture membrane 204. Finally, the pressure required to rupture membrane 208 is greater than that required to rupture membrane 206. The positioning of membranes 202, 204, 206, and 208 relative to each other are ordered sequentially as to the amount of pressure required to rupture each. As a result, select pairs of compartments can be activated separately while other pairs of compartments can remain inactive until needed. Furthermore, selection of which membranes are ruptured provides for local control of what portion of comfort guard 100 is cooled or heated. Furthermore, more than one membrane may be provided between any given pair of compartments. The pressures required to rupture the membranes can range from approximately 1 to 20 lbs/in².

[0042] Additionally, the duration of the useful life of the apparatus can be extended
by selectively breaking some membranes while purposefully keeping other membranes intact for later use.

[0043] The variable level of rupture pressures for the particular membranes also allows the timing of the temperature change to be triggered by the level of impact absorbed by the apparatus during use. Accordingly, the apparatus can begin applying a cooling effect immediately after receiving a small impact and continue to provide additional cooling after different larger impact. The distinct advantage provided is that the athlete would not have to be removed from a game to be treated for any injury due to the impact, because the apparatus would begin cooling the affected area immediately afterward.

[0044] In an alternate embodiment, all the membranes are the same size and require an equivalent amount of pressure to rupture.

[0045] Referring to Figure 2B, in an alternate embodiment, the positioning of the membranes between their respective compartment pairs relative to pressure required to rupture them is staggered. Compartments 120A and 120B are separated by membrane 232. Compartments 120C and 120D are separated by membrane 234. Compartments 120E and 120F are separated by membrane 236. Compartments 120G and 120H are separated by membrane 238. The pressure required to rupture membrane 232 is approximately 1 to 3 lbs/in$^2$. The pressure required to rupture membrane 234 is approximately 18 to 20 lbs/in$^2$. The pressure required to rupture membrane 236 is approximately 6 to 8 lbs/in$^2$. The pressure required to rupture membrane 238 is approximately 12 to 14 lbs/in$^2$. The advantage of this arrangement is to evenly distribute the cooling or heating effect of the apparatus when an impact occurs.

[0046] Referring to Figure 2C, in an alternate embodiment, the apparatus comprises alternating compartment pairs including endothermic reaction substances directly adjacent but
separate from exothermic reaction substances. For example, section 240 may be comprised of compartment pairs like 120A and 120B containing exothermic reaction substances. When membrane 232 is ruptured compartments 120A and 120B warm. Section 244 may be comprised of compartment pairs like 120E and 120F and also contain exothermic reaction substances. When membrane 236 is ruptured compartments 120E and 120F warm. Compartments 120C and 120D include endothermic reaction substances. Section 242 is comprised of a plurality of compartment pairs like 120C and 120D containing endothermic reaction substances. When membrane 234 is ruptured compartments 120C and 120D cool. Section 246 is comprised of a plurality of compartment pairs like 120G and 120H and also contains endothermic reaction substances. When membrane 238 is ruptured compartments 120G and 120H cool. The advantage of this arrangement is that heating can be selectively applied by the athlete during warm-up and then cooling can be applied after impact from the same apparatus without replacement or recharge.

[0047] In this configuration, the membranes of the heat production sections 240 and 244 are manually ruptured and inserted in place in the protective equipment. The warmth produced by the apparatus helps warm the muscles. During activity, if the user absorbs a particularly severe force, the membranes of the cold production sections 242 and 246 are ruptured by the severe force and the apparatus begins cooling. The athlete would not have to be removed from activity to be tended to by an athletic trainer to apply an ice pad because the apparatus would begin cooling the affected area immediately.

[0048] Referring to Figure 2D, in an alternate embodiment, the apparatus comprises a plurality of compartments including a first exothermic or a first endothermic reaction substance. Horizontal seams 233 and 235 and vertical seams 250, 252, 254, 256, 258, and 260 divide the
apparatus into compartments 262. Each compartment 262 contains a single or a plurality of packets 270. Packet 270 is hollow and contains either a second exothermic or a second endothermic reaction substance. Packet 270 is preferably comprised of a mechanically breakable rigid plastic window of a material such as polyethylene. However, any plastic with characteristics which allow ripping and tearing without shattering and splintering will suffice. Packet 270 is scored with frangible seam 272 such that when pressure is applied to compartment 262 and packet 270, packet 270 will fracture along frangible seam 272 and allow its contents to mix with the contents of compartment 262. The size, volume, and durability of each packet 270 can vary as well as the number of packets in each compartment 262.

[0049] Figure 3A shows protective equipment 300 which in this case is a shin guard. Extending from the lateral edges of protective equipment 300 are straps 302, 304, 306, and 308. Straps 302, 304, 306, and 308 are common in the art attachment straps and incorporate common attachment features such as buttons, snaps, or Velcro™. Straps 302, 304, 306, and 308 are used to attach protective equipment 300 to the body of a user. In many applications such as shin guards and thigh pads, attachment straps may not be required as tight fitting clothing such as socks and shorts may secure the protective equipment in place. Fabric 310 is attached to protective equipment 300 with stitching 311 and forms pocket 312. Fabric 310 is attached to protective equipment 300 with stitching 313 to form pocket 314. Stitching 311 and 313 could be replaced with adhesive common in the art. Pockets 312 and 314 are separated from each other and open to each other by flap 316.

[0050] Figure 3B shows comfort guard 100 attached to protective equipment 300. Comfort guard 100 is adjacent protective equipment 300 within pockets 312 and 314. Comfort guard 100 is shaped to follow the interior shape of a shin guard. In use, flap 316 is separated to
expose pockets 312 and 314. Comfort guard 100 is inserted into and rests in both pockets 312 and 314. Flap 316 is closed. In alternate embodiments, comfort guard 100 is attached to the protective equipment with adhesives, clips, Velcro®, or straps. Straps 302, 304, 306, and 308 attach protective equipment 300 with the attached comfort guard 100 to the body of a user. Alternatively, protective equipment 300 is secured to the user with socks without the use of straps.

[0051] During use, the desired effect of the apparatus stops as it reaches ambient temperature. Hence, it is desirable to replace it when exhausted. To do so, straps 302, 304, 306, and 308 are undone to remove protective equipment 300 from the body of the user or the protective equipment is removed from the user's sock. Flap 316 is opened and comfort guard 100 is removed from pockets 312 and 314. A replacement apparatus is inserted into pockets 312 and 314. Additional replacements may be stored, to be reused.

[0052] In an alternate embodiment, comfort guard 100 is permanently attached to protective equipment 300. Therefore, in this alternate embodiment, the entire combination, which would be heated or cooled in its entirety, could be replaced once the apparatus reached ambient temperature.

[0053] It is envisioned that differently shaped comfort guards can be used with protective equipment such as thigh pads, helmets, shoulder pads, elbow pads, arm pads, and chest protectors. Where the protective equipment includes thigh pads, helmets, shoulder pads, elbow pads, arm pads, and chest protectors, the protective equipment and the apparatus are secured to the user with fitted shirts or pants. It is further envisioned that a comfort guard can be fitted to protective equipment such as braces and sleeves used by athletes for support and reinforcement of knees, ankles, elbows, shoulders, and wrists.
In an alternate embodiment, the compartments 120 include silicone pellets. In one embodiment, all compartments 120 include the silicone pellets. In another embodiment, compartments 120 alternate including gel and silicone pellets. The silicone pellets are potentially heavy to provide a weighted workout in addition to the cushioning and body temperature affecting characteristics.

In an alternate embodiment, the apparatus is treated with a temperature sensitive thermochromic dye. In this embodiment, the temperature sensitive dye indicates to the user when the pad is exhausted.

In an alternate embodiment, the temperature sensitive dye indicates the severity of impact received during an athletic endeavor. The severity of the impact controls the number of membranes that rupture and so controls the temperature of the pad. The temperature of the pad controls the color of the dye. Hence, the color of the apparatus indicates the impact that was required to rupture the membranes, and, hence, the severity of the impact received by the athlete. For example, if multiple chambers are activated, the color change will be different or greater than if only a few chambers are activated. Knowing the severity of the impact is valuable information to the athletic trainer in providing treatment. Also, advantageously, the severity of an impact indicated by the color remains hidden under the protective gear. This is important to avoid competitors from identifying and targeting an injured player.

Referring to Figure 4, a partial cross-section of the apparatus with thermochromic dye is shown. Comfort guard 100 is comprised of temperature altering substance 402 confined in a tear resistant chamber having sides 404 and 405. Side 405 is treated with thermochromic dye 406. Side 405 is positioned inside protective equipment 408. Protective equipment includes a pocket for insertion of comfort guard 100 made from fabric layer 410.
Finally, pocket 411 holds the combination of protective equipment 408 and comfort guard 100 securely adjacent the user's body 412. In an alternate embodiment, the protective equipment does not include a pocket for insertion of the apparatus and therefore fabric layer 410 is not present and side 404 is directly adjacent user's body 412. In an alternate embodiment, side 405 may also be treated with a reflective metallic coating to effect a radiant barrier to increase the heating or cooling effect of the device.

[0058] Referring to Figure 5, an alternate embodiment comfort guard 500 is shown in combination with athletic pants. Comfort guard 500 is sized to be positioned adjacent a user and protective equipment such as common in the art thigh pad or hip pad. Comfort guard 500 is attached to the protective equipment in any manner previously disclosed or in a pocket built into the athletic pants. Alternatively, no pockets are used and the tight fitting nature of the pants securely positions the apparatus adjacent both the user and the protective equipment.

[0059] Referring to Figure 6, an alternate embodiment comfort guards 600 and 602 are shown in combination with an athletic shirt. Comfort guard 600 is sized to be positioned adjacent a user and protective equipment such as common in the art shoulder pads. Comfort guard 602 is sized to be positioned adjacent a user and protective equipment such as common in the art chest protector. Comfort guards 600 and 602 are attached to the protective equipment by the means previously disclosed or in a pocket built into the athletic shirt. Alternatively, no pockets are used and the tight fitting nature of the shirt positions the apparatus adjacent both the user and the protective equipment.

[0060] Referring to Figure 7, an alternate embodiment comfort guard 700 is shown in combination with a knee brace. Comfort guard 700 is sized to mimic the shape of and fit under the sleeve of a knee brace. Knee brace 702 is comprised of sleeve 720, collars 722 and 724,
straps 726 and 728, struts 730 and 732, and hinge 734. Sleeve 720 is adjacent to the user’s skin and includes cutout 721 for the knee cap of the user. Collar 722 is secured to user’s upper leg around sleeve 720 by strap 726. Collar 724 is secured to user’s lower leg around sleeve 720 by strap 728. Strut 730 extends from collar 722 and connects to hinge 734. Strut 732 extends from collar 724 and connects to hinge 734. Sleeve 720 secures comfort guard 700 under knee brace 702.

[0061] Referring to Figure 8, an alternate embodiment comfort guard 800 is shown in combination with a sweat band around a wrist. Comfort guard 800 is sized to mimic the shape of and fit under sweat band 802. Comfort guard 800 is attached to sweat band 802 in any manner previously disclosed or in a pocket built into the sweat band. Advantageously, the temperature altering effect of comfort guard 800 is positioned at the wrist to directly affect the bloodstream that passes close to the wrist. It is envisioned that comfort guard 800 could be fitted to a head band.

[0062] It will be appreciated by those skilled in the art that changes could be made to the embodiments described above without departing from the broad inventive concept. It is understood, therefore, that this invention is not limited to the particular embodiments disclosed, but it is intended to cover modifications within the spirit and scope of the present invention as defined by the appended claims.
CLAIMS:

1. A guard for protective equipment comprising:
   a generally planar chamber, adapted to follow a contour of the protective equipment;
   the chamber, further comprising a first surface and a second surface, divided into a
   plurality of compartments by a plurality of seams;
   whereby the first surface is positioned adjacent the user and the second surface is
   positioned adjacent the protective equipment; and,
   whereby the plurality of compartments contain a temperature altering substance.

2. The guard of claim 1 further comprising:
   an attachment means, attached to the protective equipment, for securing the chamber to
   the protective equipment.

3. The guard of claim 1 further comprising:
   a first compartment, of the plurality of compartments, separated from a second
   compartment, of the plurality of compartments, by a rupturable membrane.

4. The guard of claim 3 wherein the first compartment contains a first endothermic paired
   substance and the second compartment contains a second endothermic paired substance.

5. The guard of claim 3 wherein the first compartment contains a first exothermic paired
   substance and the second compartment contains a second exothermic paired substance.

6. The guard of claim 1 further comprising:
a first compartment, of the plurality of compartments, containing a first substance and a second compartment, of the plurality of compartments, containing a second substance, where the first compartment is separated from the second compartment by a first rupturable membrane;

a third compartment, of the plurality of compartments, containing a third substance and a fourth compartment, of the plurality of compartments, containing a fourth substance, where the third compartment is separated from the fourth compartment by a second rupturable membrane;

wherein the first substance and the second substance cause a first thermodynamic reaction; and,

wherein the third substance and the fourth substance cause a second thermodynamic reaction.

7. The guard of claim 6 wherein the first thermodynamic reaction creates a first temperature and the second thermodynamic reaction creates a second temperature, and wherein the first temperature and the second temperature are generally equal.

8. The guard of claim 6 wherein the first thermodynamic reaction creates a first temperature and the second thermodynamic reaction creates a second temperature, and wherein the first temperature and the second temperature are generally not equal.

9. The guard of claim 6 wherein the first thermodynamic reaction creates a first temperature and the second thermodynamic reaction creates a second temperature, and wherein the first temperature is generally above ambient temperature and the second temperature is generally below ambient temperature.

10. The guard of claim 1 further comprising:
a first compartment, of the plurality of compartments, and a second compartment, of the plurality of compartments, where the first compartment is separated from the second compartment by a first rupturable membrane;

a third compartment, of the plurality of compartments, and a fourth compartment, of the plurality of compartments, where the third compartment is separated from the fourth compartment by a second rupturable membrane; and,

wherein a first force is required to rupture the first membrane and a second force is required to rupture the second membrane.

11. The guard of claim 10 wherein the first force is equal to the second force.

12. The guard of claim 10 wherein the first force is not equal to the second force.

13. The guard of claim 1 further comprising:

a packet contained within a compartment of the plurality of compartments, wherein the packet further comprises a frangible seam;

a first temperature altering substance confined within the compartment;

a second temperature altering substance confined within the packet;

wherein a pressure applied to the packet ruptures the packet along the frangible seam; and,

wherein the first substance mixed with the second substance causes a thermodynamic reaction.

14. The guard of claim 1 wherein the second surface is treated with a layer of thermochromic dye.
15. The guard of claim 1 wherein the protective equipment is selected from the group consisting of a shin guard, a thigh pad, a helmet, a shoulder pad, an elbow pad, an arm pad, a chest protector, a knee brace, and a sweat band.

16. A method of regulating a body temperature of a user wearing protective equipment over a body part, comprising:
   - providing a chamber containing a temperature altering substance;
   - activating the temperature altering substance; and,
   - positioning the chamber between the user and the protective equipment.

17. The method of claim 16 wherein the step of activating further comprises cooling the temperature altering substance.

18. The method of claim 16 wherein the step of providing further comprises:
   - providing a first compartment and a second compartment in the chamber;
   - providing a rupturable membrane between the first compartment and the second compartment; and,
   - the step of activating further comprises rupturing the membrane.

19. The method of claim 16 wherein the step of providing further comprises providing a first membrane separating a first compartment, containing a first substance, and a second compartment, containing a second substance; and,
   - providing a second membrane separating a third compartment, containing a third substance, and a fourth compartment, containing a fourth substance; and
the step of activating further comprises rupturing the first membrane, thereby mixing the first substance and the second substance; and,
rupturing the second membrane; thereby, mixing the third substance and the fourth substance.

20. The method of claim 19 wherein the step of providing further comprises providing a first paired exothermic substance as the first substance, and a second paired exothermic substance as the second substance; and
providing a first paired endothermic substance as the third substance, and a second paired endothermic substance as the fourth substance.

21. The method of claim 16 wherein the step of providing further comprises:
providing a first membrane separating a first compartment, containing a first substance, and a second compartment, containing a second substance;
providing a first endothermic substance as the first substance; and,
providing a second endothermic substance as the second substance.

22. The method of claim 16 wherein the step of providing further comprises:
providing a first membrane separating a first compartment, containing a first substance, and a second compartment, containing a second substance;
providing a first exothermic substance as the first substance; and,
providing a second exothermic substance as the second substance.

23. The method of claim 16 where the step of providing further comprises providing a packet with a frangible seam within a first compartment; and, the step of activating further comprises
fracturing the packet along the frangible seam.

24. The method of claim 16 further comprising:

conforming the chamber to a shape of the body part.

25. A guard apparatus for regulating a body temperature of a user during use of protective equipment over a body part comprising:

a pack divided into a plurality of compartments by a plurality of seams, a first compartment, of the plurality of compartments, containing a first temperature altering substance and a second compartment, of the plurality of compartments, containing a second temperature altering substance;

the first compartment separated from the second compartment by a first membrane;

wherein the pack is positioned between the body part and the protective equipment;

wherein the pack bends at the plurality of seams to conform the pack to the body part; and,

wherein a first pressure applied to the first compartment ruptures the first membrane and the pack imparts a first temperature sensation to the user.

26. The guard apparatus of claim 24 wherein the pack further comprises a first surface and a second surface, and wherein the first surface is treated with a thermochromic dye.

27. The guard apparatus of claim 24 further comprising:

a third compartment, of the plurality of compartments, containing a third temperature altering substance and a fourth compartment, of the plurality of compartments, containing a fourth temperature altering substance;
the third compartment separated from the fourth compartment by a second membrane;

wherein a second pressure applied to the third compartment ruptures the second membrane and the pack imparts a second temperature sensation to the user; and,

wherein the second pressure is greater than the first pressure.
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - A63B 71/08 (2014.01)
USPC - 2/458

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC(8) - A63B 71/08 (2014.01)
USPC - 2/410, 455, 458, 459, 463, 464, 465, 466, 468; 126/263.01, 263.05; 128/857; 241/300; 607/114

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

CPC - A63B 71/08 (2014.02)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

PatBase, Google Scholar

C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
<thead>
<tr>
<th>Category*</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>US 5,539,934 A (PONDER) 30 July 1996 (30.07.1996) entire document</td>
<td>1, 2, 15-17, 21, 24</td>
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<tr>
<td>Y</td>
<td>US 4,573,447 A (THRASH et al) 04 March 1986 (04.03.1986) entire document</td>
<td>5, 9, 20, 22</td>
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Further documents are listed in the continuation of Box C.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

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