



(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
16.10.2013 Bulletin 2013/42

(51) Int Cl.:
A41D 13/01 (2006.01)

(21) Application number: **06785040.4**

(86) International application number:
PCT/US2006/023621

(22) Date of filing: **16.06.2006**

(87) International publication number:
WO 2007/001923 (04.01.2007 Gazette 2007/01)

(54) **Method of managing a visual stimulus of an article of team sports apparel**

Verfahren zum Bestimmen eines visuellen Reizes eines Bekleidungsstückes für Mannschaftsportarten

Procédé de déterminer un stimulus visuel d'un vêtement d'une équipe de sport

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC NL PL PT RO SE SI SK TR

(30) Priority: **20.06.2005 US 157473**

(43) Date of publication of application:
21.05.2008 Bulletin 2008/21

(73) Proprietor: **Nike International Ltd.**
Beaverton, OR 97005-6453 (US)

(72) Inventors:
• **MACDONALD, Richard**
Beaverton, OR 97005 (US)
• **HARBER, Edward, Louis**
Beaverton, OR 97005 (US)
• **GRACE, Tina, Marie**
London W1F 7BY (GB)
• **MORTON, Victoria**
High Legh, Cheshire WA16 0QT (GB)

(74) Representative: **Beattie, Alex Thomas Stewart et al**
Forresters
Skygarden
Erika-Mann-Strasse 11
80636 München (DE)

(56) References cited:
EP-A- 1 597 980 US-A- 4 517 685
US-A- 6 128 783 US-A1- 2005 037 844

- **22 February 2004 (2004-02-22), , XP002408860**
Retrieved from the Internet: URL: http://web.archive.org/web/20040508040241/www.world-of-football.de/adidas_marke_s36.php Web Archive of February 22, 2004 (retrieved on www.archive.org) showing sport clothing
- **ANONYMOUS: 'MSV Duisburg football shirt - Home football shirt 1998 - 1999', [Online] 1998, Internet Article Retrieved from the Internet: <URL: <http://www.oldfootballshirts.com/en/teams/m/msv-duisburg/old-msv-duisburg-football-shirt-s5415.html>> [retrieved on 2012-01-24]**
- **ANONYMOUS: 'Parramatta Eels Rugby Shirt - Home Rugby Shirt 1995', [Online] 1995, Internet Article Retrieved from the Internet: <URL: <http://www.oldrugbyshirts.com/en/teams/p/parramatta-eels/old-parramatta-eels-rugby-shirt-s1719.html>> [retrieved on 2012-01-24]**
- **ANONYMOUS: 'Red Bull Salzburg football shirt - Home football shirt 2001 - 2002', [Online] 2001, Internet Article Retrieved from the Internet: <URL: <http://www.oldfootballshirts.com/en/teams/r/red-bull-salzburg/old-red-bull-salzburg-football-shirt-s17633.html>> [retrieved on 2012-01-24]**
- **ANONYMOUS: 'Dynamo Dresden football shirt - Home football shirt 1998 - 1999', [Online] 1998, Internet Article Retrieved from the Internet: <URL: <http://www.oldfootballshirts.com/en/teams/d/dynamo-dresden/old-dynamo-dresden-football-shirt-s22205.html>> [retrieved on 2012-01-24]**

Note: Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent, in accordance with the Implementing Regulations. Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

- **ANONYMOUS:** '1995-96 Liberia Away Shirt Weah #9 *BNIB* L', [Online] 1995, Internet Article Retrieved from the Internet: <URL:<http://www.classicfootballshirts.co.uk/international-teams/african/other-african/1995-96-liberia-away-shirt-weah-9-bnib-l.html>> [retrieved on 2012-01-24]

Description**TECHNICAL FIELD**

5 **[0001]** The disclosure pertains to methods of managing visual characteristics of team athletic apparel based on activity-specific situations.

BACKGROUND

10 **[0002]** Visual stimuli produced by apparel and other articles associated with specific activities are generally configured to provide overall visibility, to distinguish one team or group from another (often based on traditional team or group colors), or to provide a pleasing appearance. Frequently the appearance of apparel and other articles is largely dictated by such considerations in combination with considerations of comfort, fit, and safety. For example, sports uniform colors are frequently selected based on traditional team colors such as school or club colors, and have visual characteristics
15 that are customized to provide an appearance that is stylish and up to date. Otherwise, uniform selection is based primarily on player comfort and safety. Many team uniforms are provided in both "home" and "away" versions so that opposing teams having the same team or club colors can be distinguished. While such traditional uniforms permit identification of home and away teams, and display team colors, the appearance of traditional uniforms provides little if any performance advantage. Visual stimuli provided by such uniforms are largely unrelated to participant performance.
20 As such, traditional apparel can provide comfort and safety, but little else. Accordingly, methods of selecting and managing activity-specific visual stimuli, and apparel and other items and apparatus associated with an activity configured based on such methods are needed.

25 **[0003]** US6128783 discloses a reversible sweater having a pair of contiguous configurations, one composed of a knit fabric and the other composed from micro-fibre fabric. A wearer may select which side of the reversible sweater to wear outside and/or inside. If the knit side is worn outside, the sweater has a conventional appearance, but provides warmth which is the function of the knitted configuration, and wind resistance, water resistance and vapour permeability, all of which are functions of the micro-fibre configuration. If the micro-fibre configuration is worn outside, the sweater has a florescent and reflective appearance, but provides warmth which is a function of the knit configuration, and wind resistance, water resistance and vapour permeability, all of which are functions of the micro-fibre configuration.
30

SUMMARY

35 **[0004]** According to the invention is provided a method of managing visual stimulus the method, comprising: identifying an activity-specific visual zone of an article of team sports apparel, wherein the activity-specific visual zone is associated with a selected team sport and based upon common angles of view experienced by players of the selected sport ; and assigning a visual characteristic to a surface of the article of team sports apparel associated with the activity-specific visual zone.

[0005] Advantageously, the visual characteristic comprises functional ornamentation based on luminance contrast.

[0006] Alternatively, the visual characteristic comprises functional ornamentation based on colour contrast.

40 **[0007]** Preferably, the visual characteristic comprises functional ornamentation including an almost periodic pattern.

[0008] Conveniently, the almost periodic pattern is an interrupted periodic pattern.

[0009] Advantageously, the almost periodic pattern is a spatially chirped pattern.

[0010] Preferably, the visual characteristic comprises functional ornamentation defined by a plurality of pattern segments secured to the article.

45 **[0011]** Conveniently, the visual characteristic comprises dynamic ornamentation defined by a plurality of tiles.

[0012] Advantageously, the tiles are specularly reflective.

[0013] Preferably, the plurality of tiles is situated on a relatively dark background.

[0014] Conveniently, the tiles are iridescent.

50 **[0015]** Advantageously, the activity-specific visual zone is selected based on a frequency with which the zone is encountered during the selected team sport.

[0016] Alternatively, the activity-specific visual zone is selected based on an estimated importance of the zone during the selected team sport.

[0017] These and other features and advantages are set forth below with reference to the accompanying drawings.

55 **BRIEF DESCRIPTION OF THE DRAWINGS**

[0018]

FIG. 1 is a block diagram of a representative method of managing visual stimuli.

FIG. 2 is diagram illustrating a distribution of measured viewing angles of passes directed to teammates in a soccer match.

FIG. 3 is a diagram illustrating a representative division of a player's body into body segment zones associated with typical distances from which the zone is viewed and relative body segment speed within the body segment zones.

FIGS. 4A-4C illustrate body zones associated with visual stimuli for soccer.

FIGS. 5A-5B illustrate representative almost periodic patterns.

FIGS. 6A-6G illustrate uniforms that are provided with representative visual stimulus patterns (functional ornamentation) in activity-specific zones.

DETAILED DESCRIPTION

[0019] Although the operations and function of some of the disclosed methods and apparatus are described in a particular, sequential order for convenient presentation, it should be understood that this manner of description encompasses rearrangement, unless a particular ordering is required by specific language set forth below. For example, operations described sequentially may in some cases be rearranged or performed concurrently. Moreover, for the sake of simplicity, the attached figures may not show the various ways in which the disclosed methods and apparatus can be used in conjunction with other methods and apparatus. Additionally, the description sometimes uses terms like "determine" and "evaluate" to describe the disclosed methods. These terms are high-level abstractions of the actual operations that are performed. The actual operations that correspond to these terms will vary depending on the particular implementation and are readily discernible by one of ordinary skill in the art.

[0020] For purposes of this disclosure, the word "including" has the same broad meaning as the word "comprising." In addition, words such as "a" and "an," unless otherwise indicated to the contrary, include the plural as well as the singular. Thus, for example, the requirement of "a feature" is satisfied where one or more of these features are present.

[0021] Some specific examples of visual stimulus management methods and applications thereof are described with respect to a particular activity - soccer. This activity is selected as an example because of its worldwide appeal and familiarity. The methods and applications described herein are applicable to other team sports such as basketball, baseball, soccer, lacrosse, hockey, rugby, and football. The described methods and applications are also applicable to activities other than sports, including other commercial and recreational activities. Examples of uniforms and other articles of clothing are described, but other items can be configured in a similar manner.

[0022] Assignment of a specific visual stimulus to a particular participant zone can be associated with improved perception, and thus improved decision making by a participant's teammate. For example, a visual stimulus can be selected to increase the accuracy of passes between teammates. In some typical examples, visual stimuli configured for peripheral vision are preferred. Various kinds of visual stimuli can be used. For central vision or peripheral vision, luminance contrast and object detail can be used to provide an appropriate visual stimulus. For central vision perception, color characteristics (such as hue or saturation) can be used. A just noticeable color difference is typically associated with dominant wavelength differences of between about 2 nm to 4 nm, but depends on spectral region. Differences in luminance can also be used, with differences of 1-1.5% typically observable for either central or peripheral vision. For central vision, details as small as about 1 arcmin are legible, while details as small as about 0.5 arcsec can be detected. For peripheral vision, details as small as about 10 arcmin are legible, while details as small as about 0.5 arcsec can be detected. Angular spacings of about 0.6 arcmin or greater permit objects to be perceived as separate objects in either central or peripheral vision. Misalignments of objects can be detected that are as small as about 3-5 arcsec ("hyperacuity"). Peripheral vision can detect flicker at rates as high as about 80 Hz-100 Hz, while central vision can detect flicker at rates less than about 20 Hz. In an example, visual stimuli for central vision, ranked in order from most to least sensitive, are lateral motion, luminance contrast, color contrast, and flicker. For peripheral vision, a similar ranking is lateral motion, flicker, luminance contrast, and color contrast. Visual factors are generally interdependent, and can depend on observer adaptation or recent exposure of the observer to a bright object. Visual stimuli can also be affected by environmental conditions such as stadium lighting, hazy or foggy weather, or direct sunlight. Backgrounds such as grass, stadium seating, spectator apparel can also be significant.

[0023] An example visual stimulus management method is illustrated in FIG. 1. For a selected activity, a set of activities, or a selected situation in one or more activities, a distribution of common angles of view are identified in a step 100. For example, common angles of view experienced by a passer and a pass receiver in a soccer match can be identified. Such a distribution provides a quantitative assessment of what portions of teammates are visible to each other while passing. The identification of viewing angles can be based on one or more matches or practices using a diverse player group, or using a player group of a particular skill level and experience. For example, common angles of view can be different for relatively inexperienced youth league players and premier league professionals. Particular situations other than routine passing can be selected for common view angle identification, and common view angles can differ for different locations on a soccer pitch as well as for different player positions. Typically, common angles of view are activity

specific, and observations of an activity are used to establish activity-specific common view angles.

[0024] In an example, numbers of "through balls" in an attacking third of a soccer pitch were observed and tabulated for premiership football matches. (Through balls are defined as passes that penetrate the defense and allow attacking forwards a scoring opportunity.) In such a tabulation, through balls were noted as a function of pass angle (i.e., angle with respect to the passer's line of sight at the time of the pass), pass distance (distance from passer to intended receiver), and receiver body position. For convenient analysis, pass angles were noted as in a range of 0-20 degrees, 20-40 degrees, or greater than 40 degrees. Pass distances were recorded in ranges of 0-5 m, 5-10 m, 10-15 m, and 15-20 m. Receiver body position was recorded as front (facing the passer), side, or back. In the observed matches, as pass distance increased, passers tended to play more through balls to receivers in wide positions (i.e., at larger angles from the passer's line of sight). The greatest number of through balls was played when the receiver was positioned side-on to the passer. The lowest number of through balls was played to the backs of receiving players. For smaller pass distances, fewer through balls were played at wider pass angles.

[0025] A depiction of common view angles is shown in FIG. 2, based on observations of about twenty premier league soccer matches. Approximately 56% of all forward passes were made while viewing a front 202 of a pass receiver. About 16% and 18% were made while viewing a right front side 204 and a left front side 206, respectively. About 1% were made viewing a player back 212, and 5% and 4%, respectively, were made viewing a right back side 208 and a left back side 210, respectively. To assist in the most commonly encountered passing situations, visual treatments can be applied to fronts and/or sides of player uniforms. For example, if passing to player sides is to be improved, corresponding front and/or side regions of player uniforms can be visually enhanced.

[0026] While common views can be recorded based on activity observation, and visual stimuli associated with these views can be provided by, for example, coloring or otherwise treating player uniform portions, additional considerations can improve the effectiveness of treating player uniform portions in this way. With reference to FIG. 3, for a particular activity (soccer), body zones 302, 304, 306 can be associated with corresponding motion speeds and viewing distances. For example, the body zone 302 is commonly viewed from a considerable distance, and typical player movements associated with this body zone are relatively slow. Such a characterization of this body zone can differ greatly in different activities. Because most use of the arms is forbidden in soccer, arm movements tend to be slow and provide only generally indicators of player activity. The body zone 304 is associated with intermediate viewing distances, and fast, large scale player movements. For example, a player dribbling at midfield can be moving rapidly to cover a large distance to approach an opponent's goal. The body zone 306 can be associated with fast movements viewed at near distances. In soccer, this body zone is particularly important as passing is based on player movements in this zone. Sports or other activities in which hand/arm motions are significant can be associated with different zone divisions and different zone characterizations. Adjacent body portions of a player can be associated with different zones. For example, portions of a player's arms can be assigned to different zones based on anticipated types of motion.

[0027] Based on body segment zones and characterizations, activity-significant portions of selected body zones can be treated to provide visual characteristics such as zone-specific enhanced visibility. Referring again to FIG. 1, in a step 104, body zones and player functions are correlated. In a step 106, surfaces are selected for visual management based on, for example, as noted above, a frequency with which the surfaces are encountered, an estimated importance of the surface during the activity, or likely benefit to be obtained by managing visual stimuli on such surfaces. In a step 108, visual stimuli provided by the selected surfaces are managed to enhance or otherwise configure visual stimuli produced by the surface. In some cases, additional testing is performed in a step 110 to confirm performance enhancement.

[0028] Visual stimuli provided by surfaces of team uniforms can be managed using texture, color, gray level, patterning, surface reflectivity, fluorescence, iridescence, or other visually observable surface properties. To preserve traditional uniform appearance, one or more color parameters such as hue, saturation, and value associated with a selected surface portion can be configured to provide, for example, a selected contrast, while remaining color parameters are selected so that the uniform retains a traditional appearance. For example, a relatively dark surface portion can be configured to contrast with a relatively light surface portion while other color parameters are selected in accordance with traditional team colors, logos, and designs. For visual stimuli targeting peripheral vision, gray values can be used that can provide an intended stimulus in a selected zone while not detracting from a traditional team colors or team appearance.

[0029] In a representative example, visual stimuli are provided to selected zones by one or more individual tiles of a heat transferable material arranged in a mosaic layout. Highly reflective tiles (such as tiles having a chrome appearance) typically having areas greater than about 1 cm² can be applied, while tinted chrome, pearl, or crystal colored tiles typically having areas of about 2.5-3.0 cm² can be applied. Such tiles can be split into segments as needed to facilitate garment movement or to catch and/or reflect light. Tiles are typically separated by less than about 0.5 cm, and can have various shapes such as square, rectangular, circular, elliptical, polygonal, or other regular or irregular shapes. Tile edges can be linear, curved, dentate, smooth, rough, or other configurations. Such tiles are typically applied to a background portion of a garment in a selected zone of the garment, and can be configured (with the background portion) to provide a selected luminance contrast rather than a color contrast. Background luminance and texture are preferably "opposite" that of the tiles. Some representative combinations of tiles and backgrounds are summarized in the following table.

Tiles	Background (color and/or texture)
Silver pearl or chrome	Dark (black), matt texture
Silver pearl or chrome	White
Light tint	Dark

[0030] Tiles can be applied in regular or periodic patterns, irregular, almost-periodic, or chirped patterns can provide a superior visual stimulus. Irregular patterns can be based on an approximately random arrangement of tiles of randomly varying areas. Almost-periodic patterns can have a spatially varying placement frequency. One example can be referred to as a "chirped" pattern in which pattern pieces are regularly situated but become progressively smaller and/or closer together in at least some regions of the pattern. Other almost periodic patterns include "interrupted" patterns in which at least some pattern portions required in a periodic placement are omitted or are configured differently than other pattern portions.

[0031] Visual stimuli can be selected based on either central vision, peripheral vision, or both, but in at least some typical examples, selection based on peripheral vision is preferred. For example, visual stimuli can be based on relative differences in apparent darkness, such as a pattern of light areas on a dark background or dark area on a light background to provide luminance contrast. For application to soccer, a high proportion of passes are played to receivers that are at angles of about 20-40° to the passer, and only the receiver's side or front faces the passer. Therefore, visual markers associated with visual stimuli can be assigned to jersey chests, sleeves, and front sides as well as sides of shorts and socks. Alternatively, visual markers can be assigned to one or more of a jersey side, sides of shorts, or sides of socks. Such markers can be applied and selected to aid a passer in rapid location of an intended pass recipient. Visual markers can be defined in one or more zones of, for example, a jersey, shorts, or both. Such markers can be defined by additional materials attached to a garment, textured, colored, or patterned portions of a garment, or combinations of such markings. Marker size can be selected based on anticipated or intended viewing distances so that the marker can be noted during the activity. Some representative marker sizes for various distances are summarized in the table below.

separation (m)	zone area (cm ²)
5	2.5
10	3.75
15	5.6
20	7.5

[0032] Visual stimulus zone area as a function of passer-receiver separation.

[0033] A representative arrangement of zones configured to provide visual stimuli for soccer uniforms is illustrated in FIGS. 4A-4C that show rear, side, and front views of a soccer player. In the rear view of FIG. 4A, zones in which visual stimuli are defined not apparent, as effective passes are rarely directed toward a player's back. In FIG. 4B, visual stimuli are defined in zones 401, 403, 405, 407 that can be situated on sides of a uniform jersey, shorts, and socks, respectively. FIG. 4C shows the zones 401, 403, 405, 407 continuing onto front portions of the uniform. In some examples, visual stimuli are defined in one, two, three, or all of these zones. Superior results are generally obtained with zones defined at least on sides of a jersey, shorts and socks. Defining zones on jersey sleeves and fronts can provide additional performance improvement, but such zones can be omitted.

[0034] Zone areas listed in the above table generally provide a response accuracy of about 20% when applied to jersey (sides, sleeves, chest), shorts, and socks, and can produce typical player response times that are at least as much as 50 ms faster than response times in the absence of such visual stimuli. When applied only to jersey sides, shorts, and socks, response accuracy is typically about 13-15% but with inconsistent changes in player response time.

[0035] While visual stimulus management is particularly well suited for team uniforms, other activities and apparatus that can benefit from visual stimulus management include uniforms for police officers, fire fighters, and military personnel. Portions of apparel for such officers can be selected, and particular visual characteristics assigned to the selected portions in order to, for example, enhance officer visibility in typical emergency situations while maintaining a uniform, professional appearance. Appearance of military uniforms can also be managed to enhance visibility to facilitate unit communication. Some surfaces of apparel portions can be dedicated to visual enhancement while other portions are provided with, for example, conventional camouflage. For example, soldier locations and movements should be communicated to allies, while concealed from enemies.

[0036] One or more components of a team uniform such as, for example, jerseys, shorts, pants, helmets, shoes, shin guards, gloves, skirts, or sock can be provided with visually managed surfaces. Alternatively, patterns or other visual stimuli can be applied directly to a player's body. Apparatus associated with sports and other activities can also include visually managed surfaces. In some examples, sporting equipment such as hockey or lacrosse sticks can include visually managed surfaces. Visual management methods can permit enhanced visibility objects to be otherwise configured for aesthetic or other reasons. Visibility of selected object portions can be enhanced for communication with teammates but other selected portions treated conventionally.

[0037] Activity- specific surfaces can be visually managed based on luminance contrast provided with black and white (or with colors having a relatively high luminance contrast such as blue and yellow) . However, superior results can be obtained using variable visual treatments that provide visual appearances that vary in response to player movement, motion of a portion of the visual treatment, or changes in position or angle from which the visual treatment is viewed. Examples of such visual treatments include deformable reflective surfaces, iridescent materials and surfaces, fringes, tassels, quasi- periodic patterns, patterns based on relative displacements between periodic or regular patterns (e.g., Moire patterns), sets of irregularly spaced or variably energized light emitters, lenticular surfaces, or the like. Such visual treatments can be associated with apparent movement. For example, iridescent surfaces can have spectral reflectivities that vary as a function of viewing angle, and enhance motion perception. Using such patterns on an athletic jersey permits slight changes in jersey shape or position to produce substantial visual stimuli in comparison with, for example, surfaces that are dyed or ornamented with a set of dyed segments. For convenience, such visual treatments are referred to herein as dynamic functional ornamentation.

[0038] Representative quasi-periodic patterns suitable for application to activity specific zones are illustrated in FIGS. 5A-5B. Referring to FIG. 5A, a quasi-periodic pattern 502 includes a series of rectangular regions 504 associated with a relatively high luminance value and a series of rectangular regions 506 associated with a relatively low luminance value. The low luminance value regions 506 are situated to approximately correspond to locations at which additional high luminance value regions would appear if the pattern 502 were strictly periodic. The regions 506 thus correspond to "missing" high luminance regions. Such missing portions of a periodic pattern can produce a marked visual stimulus. FIG. 5B illustrates an alternative arrangement of high luminance regions and low luminance regions. For convenience, the visual treatments of FIGS. 5A-5B can be referred to as interrupted period patterns.

[0039] The patterns of FIGS. 5A-5B are illustrative examples. Typically, low luminance regions can be substituted at random locations in an otherwise periodic arrangement of high luminance regions, but can also be associated with a different period (repetition frequency) than the high luminance regions. High or low luminance regions can have other shapes such as elliptical, circular, square, polygonal, or other regular or irregular shapes with a curved perimeter, a perimeter defined by straight lines, or a combination thereof. High and low luminance values can be defined with gray scale values (such as black and white), colors (such as blue and yellow), reflectivity, spectral reflectivity, texture, other visual parameters, or combinations thereof. For example, some regions of a quasi-periodic pattern can be defined in black and white while other regions are defined in one or more sets of contrasting colors. Color and gray scale regions can be configured to blend each other, and such blending can be periodic. The examples of FIGS. 5A-5B use rectangular regions of similar shape and size, but in other examples, shape and size of individual regions can vary regularly or irregularly. Rectangular regions can have longer dimensions oriented along different axis in different portions, or curved regions such as elliptical regions can have different orientations of major axes, and ellipticity can vary periodically or otherwise. Quasi-periodic patterns can also be defined with a spatially varying period, so that pattern element spacing varies. A combination of two frequencies can be used to provide a visual "beat frequency."

[0040] Representative arrangements of activity specific visual zones and visual stimuli patterns provide in the zones are illustrated in FIGS. 6A-6G. Referring to FIG. 6A, a football uniform includes a jersey 600 and pants 602 that include activity specific visual zones 601, 603, respectively. The zones 601, 603 include a series of pattern elements such as representative pattern elements 604, 605 situated along an axis that generally extends along a side of the uniform. Visual zones can be provided on a left side, a right side, or both sides of the uniform. In the zones 601, 603, pattern element area decreases from a waist region 606 towards player shoulders and player feet. In addition, pattern element shape varies from generally oblong in a horizontal direction as worn at the waist region 606, to generally oblong in a vertical direction in other portions of the zones 601, 603. A pattern element such as the pattern element 604 can be defined as a single patch applied to the jersey 600, or can be defined with a series of pattern segments or cells. As shown in FIG. 6A, the zones 601, 603 are defined on a player side, but zone size and location generally depends on specific game tasks undertaken by a particular player based on visual communication with one or more teammates.

[0041] FIG. 6B is another representative example of a football uniform that includes activity-specific visual zones 610, 612 situated on a jersey and pants. Visual stimuli patterns 611, 613 are defined with a plurality of pattern elements such as representative pattern elements 611, 612 that are distributed throughout the zones 610, 612. As shown in FIG. 6B, shapes, shapes, colors, and gray levels of the pattern elements can vary. In some examples, the pattern elements are defined using reflective materials having a reflectivity that varies as a function of angle so that movement of a pattern element can cause the pattern element to appear darker or lighter.

[0042] FIGS. 6C-6E illustrate placement of additional visual stimuli in activity specific visual zones situated on a rugby jersey and shorts. Various stimulus patterns are applied in the zones. FIG. 6C shows patterns that include a periodic arrangement of lines that extend along a first direction and bend to extend along a second direction, similar to those of FIGS. 5A-5B. Alternative periodic patterns are shown in FIGS. 6C-6D, with the activity specific visual zones extending to the jersey sleeve.

[0043] FIG. 6E illustrate rugby shorts and jersey that are provided with visual stimulus zones in which pattern segments are periodically applied, but selected pattern segments have different luminance values. Typically, arrangements of the selected pattern portions is not strictly periodic, but can be random, periodically interrupted, or with varying frequency (chirped). For example, pattern segments 620, 622 can be relatively light in appearance, while pattern segments 624, 626 can be relatively dark in appearance. As shown in FIG. 6E, the arrangement of light and dark segments is not strictly periodic, and an arrangement of light and dark segments can be randomly selected.

[0044] A representative soccer jersey 650 is illustrated in FIG. 6F. Activity specific visual zones 652, 654 are defined on portion of the jersey shoulders and sides. The visual zone 652, 654, also extend to a jersey front. Pattern elements of varying size, shape, and orientation are provided in rows of varying spacings. For example, in a region 656, pattern elements are at least partially situated rows having varying spacings and orientations, and are of varying size. In a region 658, pattern elements are more randomly placed and sized. Such pattern elements can be applied to the jersey, or woven or otherwise incorporated in the jersey.

[0045] Another representative soccer uniform is illustrated in FIG. 6G, and include zones 672, 674 that are provided with visual stimulus patterns. As shown in FIG. 6G, patterns are applied to both left and right sides of jersey and shorts, but in other example, such patterns can be applied to only one side, and different sides can be selected for the jersey and shorts.

[0046] The above examples are representative only, and it will be apparent that these examples can be modified in arrangement and detail without departing from the teaching of the disclosure. Applications of such methods and apparatus to particular team sports are described only for convenience, and such methods and apparatus can be applied to other activities. In general, activity-specific zones of apparel or other items can be selected, and visual characteristics of the zones configured to provide an intended visual stimulus based on a functional ornamentation. Such ornamentation can be based on luminance contrast, color contrast, or other visual effect or combination of visual effects. In some examples, dynamic functional ornamentation can be applied in which ornamentation appearance is based on ornamentation motion, ornamentation distortion, viewing angle, random or distorted periodic placement of ornamentation segments or other ornamentation components. For convenience, ornamentation associated with interrupted periodic patterns, chirped periodic patterns, or other deviations from periodicity (such as distorted periodic placement) can be used, and such ornamentation can be referred to as "almost periodic" for convenience. Accordingly, the disclosed examples are not to be interpreted as limiting, and we claim all that is encompassed by the appended claims.

Claims

1. A method of managing visual stimulus, the method, comprising:

identifying an activity-specific visual zone (302, 304, 306, 401, 403, 405, 407, 601, 603, 610, 612, 652, 654) of an article of team sports apparel (600, 602, 650), wherein the activity-specific visual zone (302, 304, 306, 401, 403, 405, 407, 601, 603, 610, 612, 652, 654, 672, 674) is associated with a selected team sport and based upon common angles of view experienced by players of the selected sport; and assigning a visual characteristic to a surface of the article of team sports apparel (600, 602, 650) associated with the activity-specific visual zone (302, 304, 306, 401, 403, 405, 407, 601, 603, 610, 612, 652, 654, 672, 674).

2. A method according to claim 1, wherein the visual characteristic comprises functional ornamentation based on luminance contrast.

3. A method according to claim 1, wherein the visual characteristic comprises functional ornamentation based on colour contrast.

4. A method according to claim 1, wherein the visual characteristic comprises functional ornamentation including an almost periodic pattern (502).

5. A method according to claim 4, wherein the almost periodic pattern is an interrupted periodic pattern.

6. A method according to claim 4, wherein the almost periodic pattern is a spatially chirped pattern.

7. A method according to claim 1, wherein the visual characteristic comprises functional ornamentation defined by a plurality of pattern segments (604, 605) secured to the article (600).
- 5 8. A method according to claim 1, wherein the visual characteristic comprises dynamic ornamentation defined by a plurality of tiles.
9. A method according to claim 8, wherein the tiles are specularly reflective.
- 10 10. A method according to claim 9, wherein the plurality of tiles is situated on a background which is darker than the plurality of tiles.
11. A method according to claim 8, wherein the tiles are iridescent.
- 15 12. A method according to any preceding claim, wherein the activity-specific visual zone (302, 304, 306, 401, 403, 405, 407, 601, 603, 610, 612, 652, 654, 672, 674) is selected based on a frequency with which the zone (302, 304, 306, 401, 403, 405, 407, 601, 603, 610, 612, 652, 654, 672, 674) is encountered during the selected team sport.
- 20 13. A method according to one of claims 1 to 11, wherein the activity-specific visual zone (302, 304, 306, 401, 403, 405, 407, 601, 603, 610, 612, 652, 654, 672, 674) is selected based on an estimated importance of the zone (302, 304, 306, 401, 403, 405, 407, 601, 603, 610, 612, 652, 654, 672, 674) during the selected team sport.

Patentansprüche

- 25 1. Verfahren zum Bestimmen eines visuellen Reizes, umfassend:

Identifizieren einer aktivitätsspezifischen visuellen Zone (302, 304, 306, 401, 403, 405, 407, 601, 603, 610, 612, 652, 654) eines Bekleidungsstückes für Mannschaftssportarten (600, 602, 650), wobei die aktivitätsspezifische visuelle Zone (302, 304, 306, 401, 403, 405, 407, 601, 603, 610, 612, 652, 654, 672, 674) einer ausgewählten Mannschaftssportart zugeordnet und auf gemeinsamen Sichtwinkeln basiert ist, die von Spielern der ausgewählten Sportart erfahren werden; und
 Zuweisen einer visuellen Eigenschaft zu einer Oberfläche des Bekleidungsstücks für Mannschaftssportarten (600, 602, 650), die der aktivitätsspezifischen visuellen Zone (302, 304, 306, 401, 403, 405, 407, 601, 603, 610, 612, 652, 654, 672, 674) zugeordnet ist.

- 35 2. Verfahren nach Anspruch 1, wobei die visuelle Eigenschaft einen funktionellen Dekorationszweck auf der Basis des Luminanzkontrasts umfasst.
- 40 3. Verfahren nach Anspruch 1, wobei die visuelle Eigenschaft einen funktionellen Dekorationszweck auf der Basis des Farbkontrasts umfasst.
4. Verfahren nach Anspruch 1, wobei die visuelle Eigenschaft einen funktionellen Dekorationszweck einschließlich eines fast periodischen Musters (502) umfasst.
- 45 5. Verfahren nach Anspruch 4, wobei das fast periodische Muster ein unterbrochenes periodisches Muster ist.
6. Verfahren nach Anspruch 4, wobei das fast periodische Muster ein räumlich gezirptes (chirped) Muster ist.
- 50 7. Verfahren nach Anspruch 1, wobei die visuelle Eigenschaft einen funktionellen Dekorationszweck umfasst, der durch mehrere Mustersegmente (604, 605), die am Bekleidungsstück (600) befestigt sind, definiert ist.
8. Verfahren nach Anspruch 1, wobei die visuelle Eigenschaft einen dynamischen Dekorationszweck umfasst, der durch mehrere Fliesen definiert ist.
- 55 9. Verfahren nach Anspruch 8, wobei die Fliesen spiegelähnlich reflektierend sind.
10. Verfahren nach Anspruch 9, wobei sich die mehreren Fliesen auf einem Hintergrund befinden, der dunkler als die mehreren Fliesen ist.

11. Verfahren nach Anspruch 8, wobei die Fliesen irisierend sind.

12. Verfahren nach irgendeinem vorhergehenden Anspruch, wobei die aktivitätsspezifische visuelle Zone (302, 304, 306, 401, 403, 405, 407, 601, 603, 610, 612, 652, 654, 672, 674) auf der Basis einer Frequenz ausgewählt ist, der die Zone (302, 304, 306, 401, 403, 405, 407, 601, 603, 610, 612, 652, 654, 672, 674) während der ausgewählten Mannschaftssportart begegnet.

13. Verfahren nach einem der Ansprüche 1 bis 11, wobei die aktivitätsspezifische visuelle Zone (302, 304, 306, 401, 403, 405, 407, 601, 603, 610, 612, 652, 654, 672, 674) auf der Basis einer geschätzten Bedeutung der Zone (302, 304, 306, 401, 403, 405, 407, 601, 603, 610, 612, 652, 654, 672, 674) während der ausgewählten Mannschaftssportart ausgewählt ist.

Revendications

1. Procédé de gestion d'un stimulus visuel, le procédé comprenant les étapes consistant à :

identifier une zone visuelle propre à l'activité (302, 304, 306, 401, 403, 405, 407, 601, 603, 610, 612, 652, 654) d'un vêtement de sport d'équipe (600, 602, 650), où la zone visuelle propre à l'activité (302, 304, 306, 401, 403, 405, 407, 601, 603, 610, 612, 652, 654, 672, 674) est associée à un sport d'équipe sélectionné et basée sur des angles de vue fréquemment ressentis par les joueurs du sport sélectionné ;
et affecter une caractéristique visuelle à une surface du vêtement de sport d'équipe (600, 602, 650) associée à la zone visuelle propre à l'activité (302, 304, 306, 401, 403, 405, 407, 601, 603, 610, 612, 652, 654, 672, 674).

2. Procédé conforme à la revendication 1, où la caractéristique visuelle comprend une ornementation fonctionnelle basée sur un contraste de luminance.

3. Procédé conforme à la revendication 1, où la caractéristique visuelle comprend une ornementation fonctionnelle basée sur un contraste de couleur.

4. Procédé conforme à la revendication 1, où la caractéristique visuelle comprend une ornementation fonctionnelle comportant un motif quasi-périodique (502).

5. Procédé conforme à la revendication 4, où le motif quasi-périodique est un motif périodique interrompu.

6. Procédé conforme à la revendication 4, où le motif quasi-périodique est un motif à fréquence modulée spatialement.

7. Procédé conforme à la revendication 1, où la caractéristique visuelle comprend une ornementation fonctionnelle définie par une pluralité de segments de motif (604, 605) fixés au vêtement (600).

8. Procédé conforme à la revendication 1, où la caractéristique visuelle comprend une ornementation fonctionnelle définie par une pluralité de carreaux.

9. Procédé conforme à la revendication 8, où les carreaux sont à réflexion spéculaire.

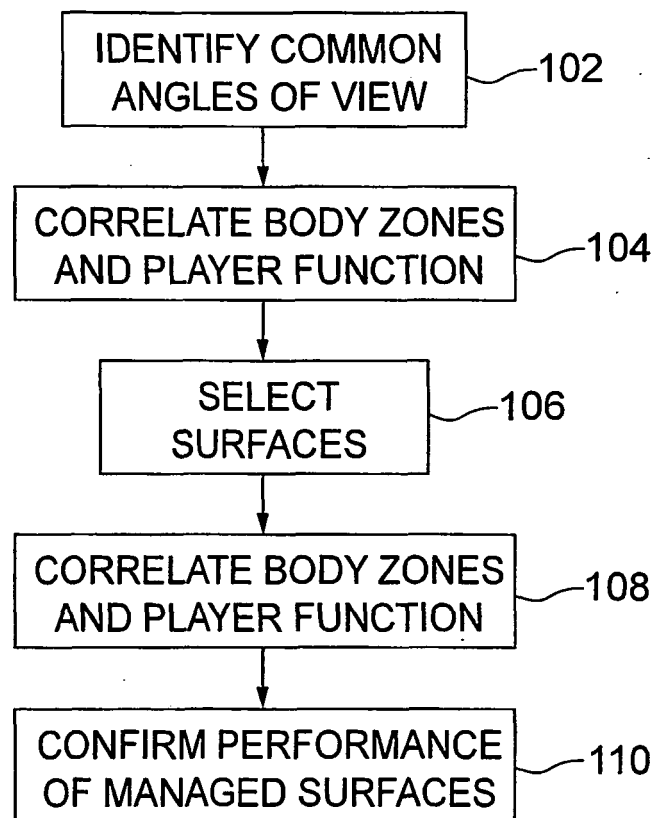
10. Procédé conforme à la revendication 9, où la pluralité de carreaux est située sur un fond qui est plus sombre que la pluralité de carreaux.

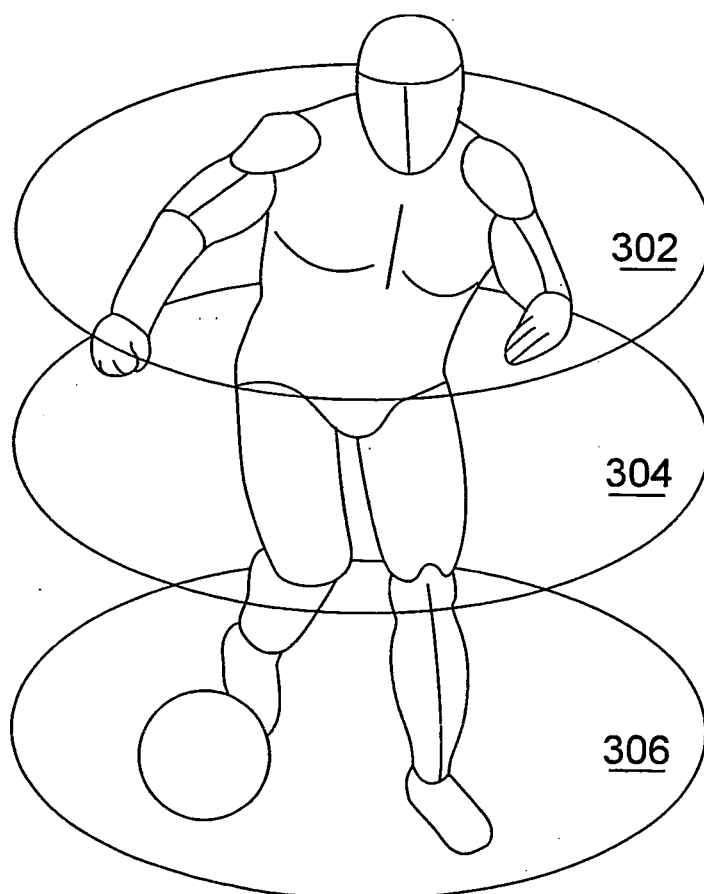
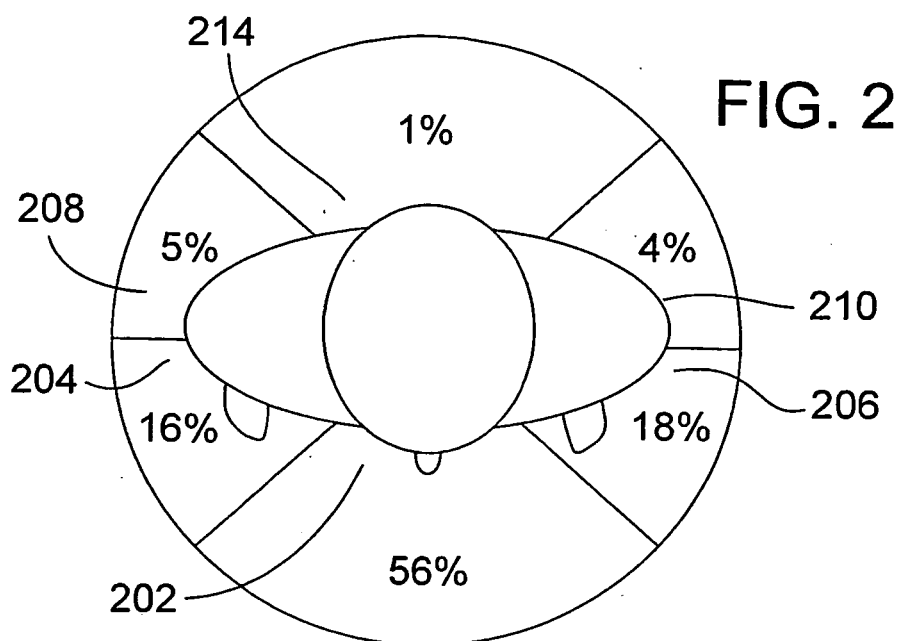
11. Procédé conforme à la revendication 8, où les carreaux sont iridescents.

12. Procédé conforme à une quelconque des revendications précédentes, où la zone visuelle propre à l'activité (302, 304, 306, 401, 403, 405, 407, 601, 603, 610, 612, 652, 654, 672, 674) est sélectionnée sur la base d'une fréquence avec laquelle la zone (302, 304, 306, 401, 403, 405, 407, 601, 603, 610, 612, 652, 654, 672, 674) se rencontre au cours du sport d'équipe sélectionné.

13. Procédé conforme à une des revendications 1 à 11, où la zone visuelle propre à l'activité (302, 304, 306, 401, 403, 405, 407, 601, 603, 610, 612, 652, 654, 672, 674) est sélectionnée sur la base d'une estimation de l'importance de la zone (302, 304, 306, 401, 403, 405, 407, 601, 603, 610, 612, 652, 654, 672, 674) au cours du sport d'équipe sélectionné.

FIG. 1





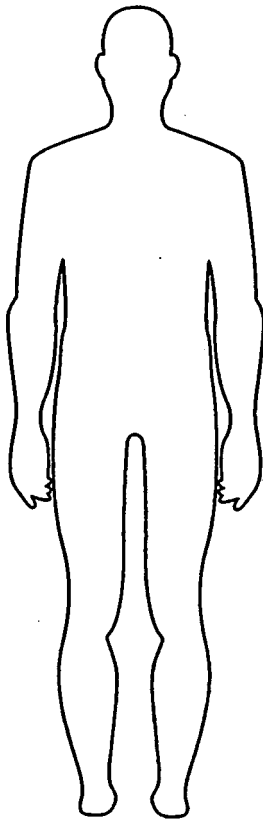


FIG. 4A

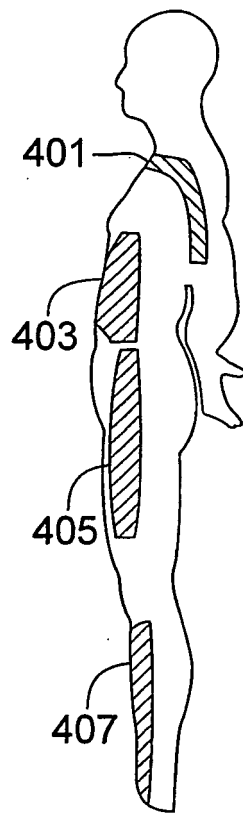


FIG. 4B

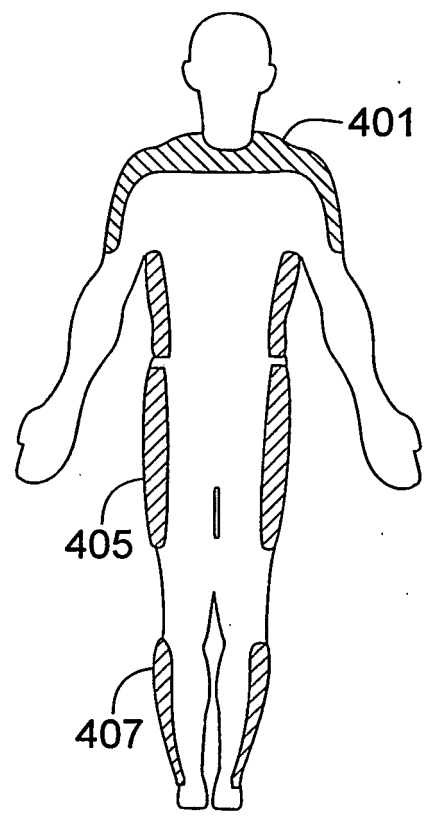


FIG. 4C

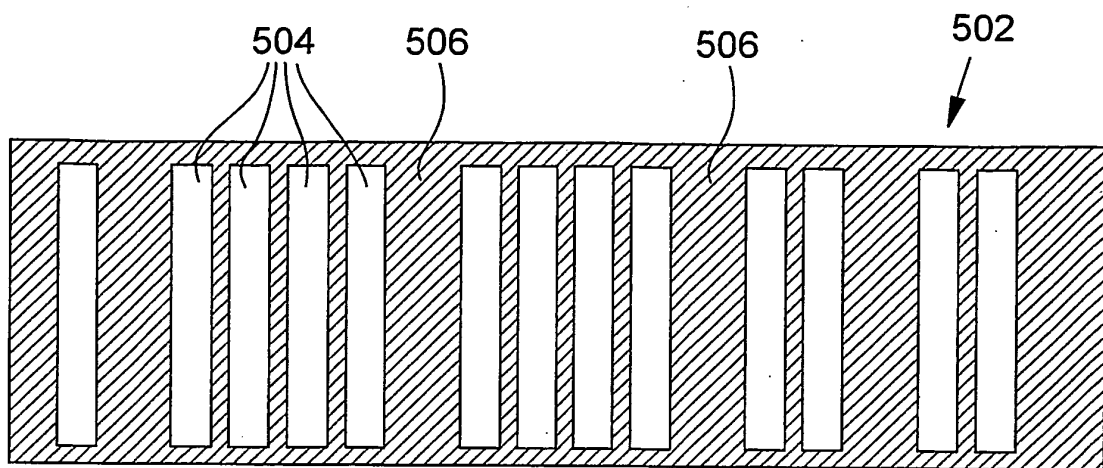


FIG. 5A

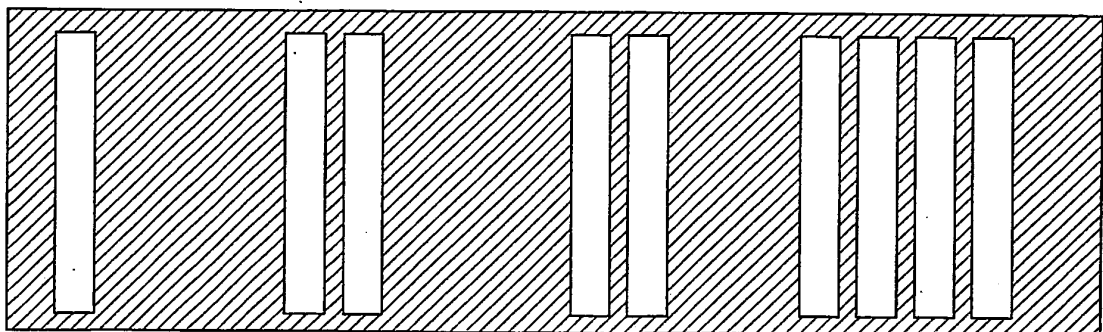


FIG. 5B

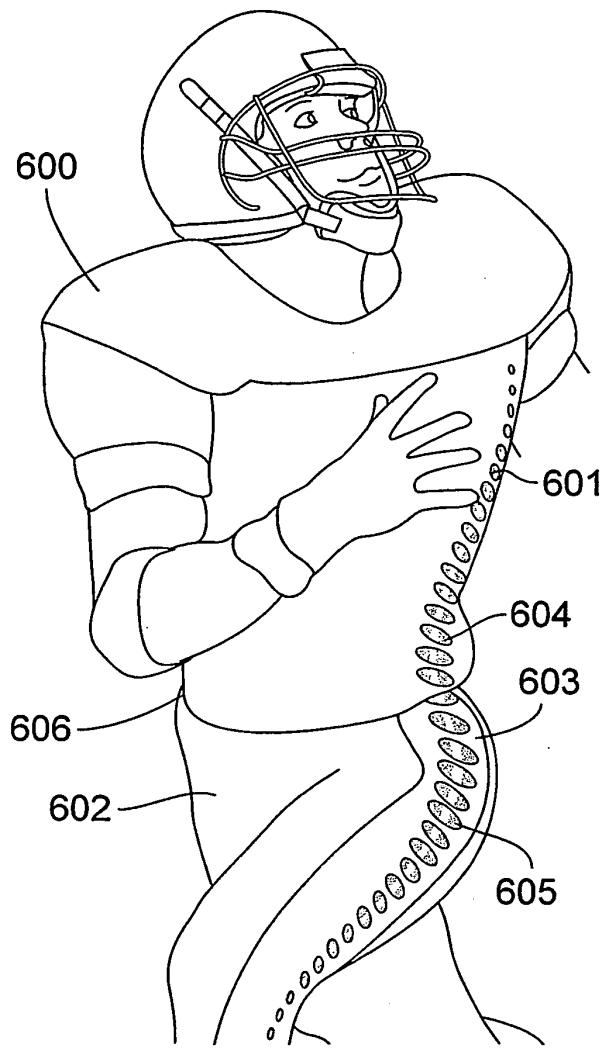


FIG. 6A

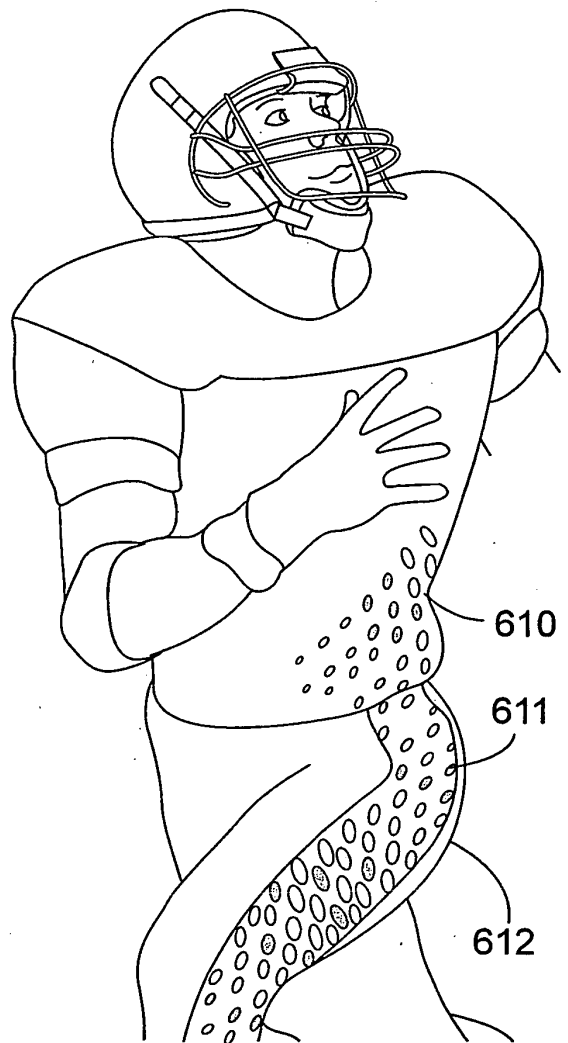


FIG. 6B

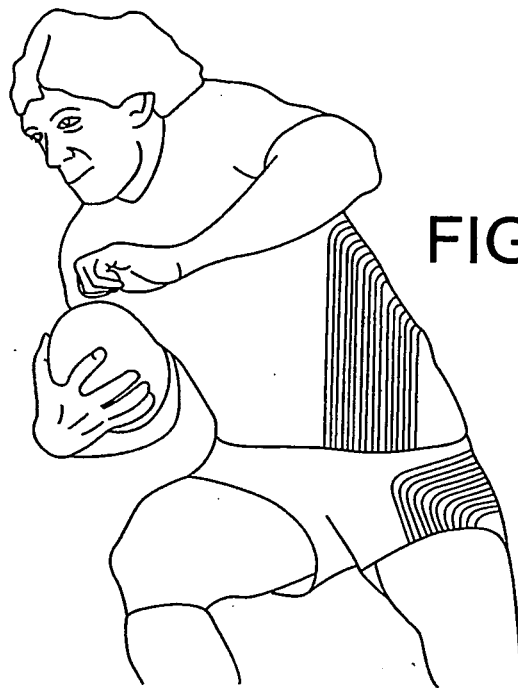


FIG. 6C

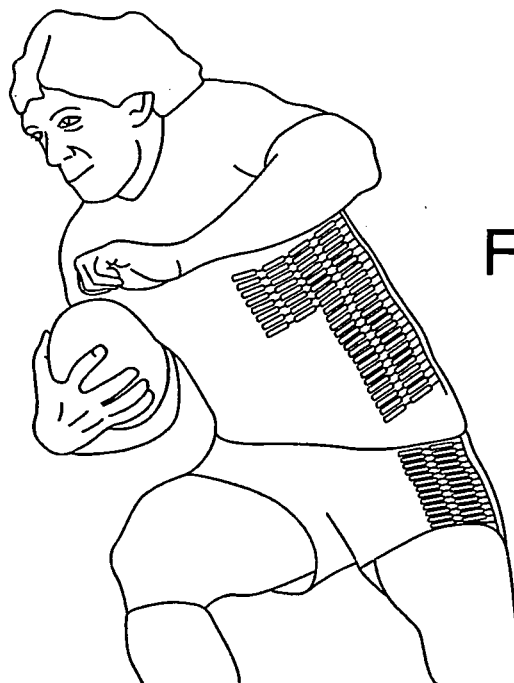


FIG. 6D

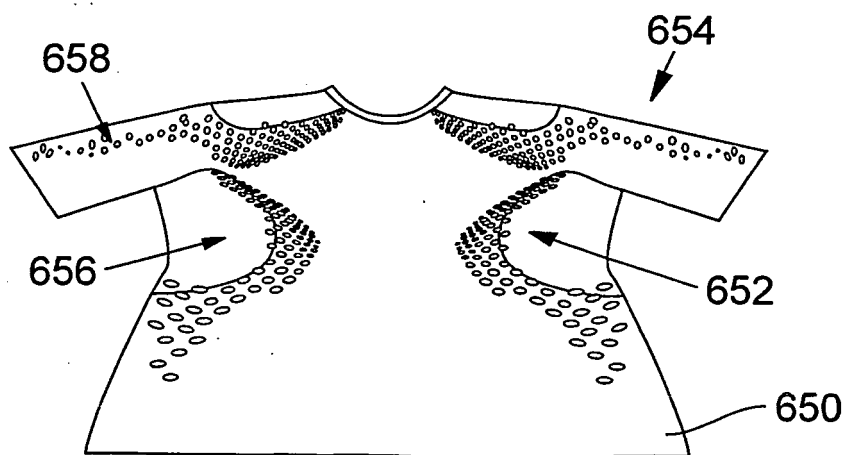
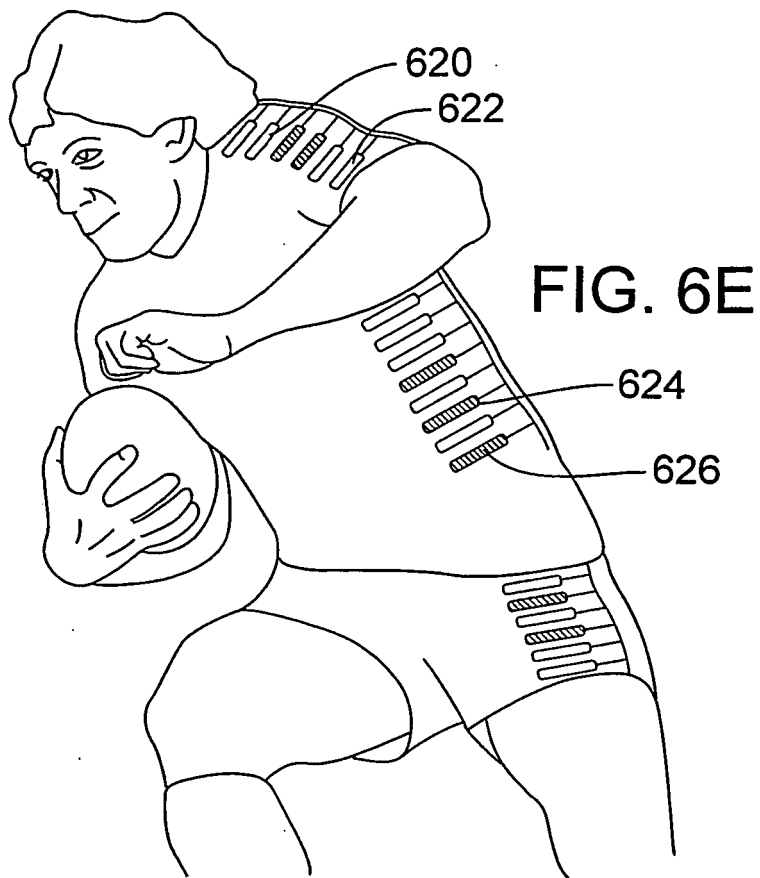


FIG. 6F

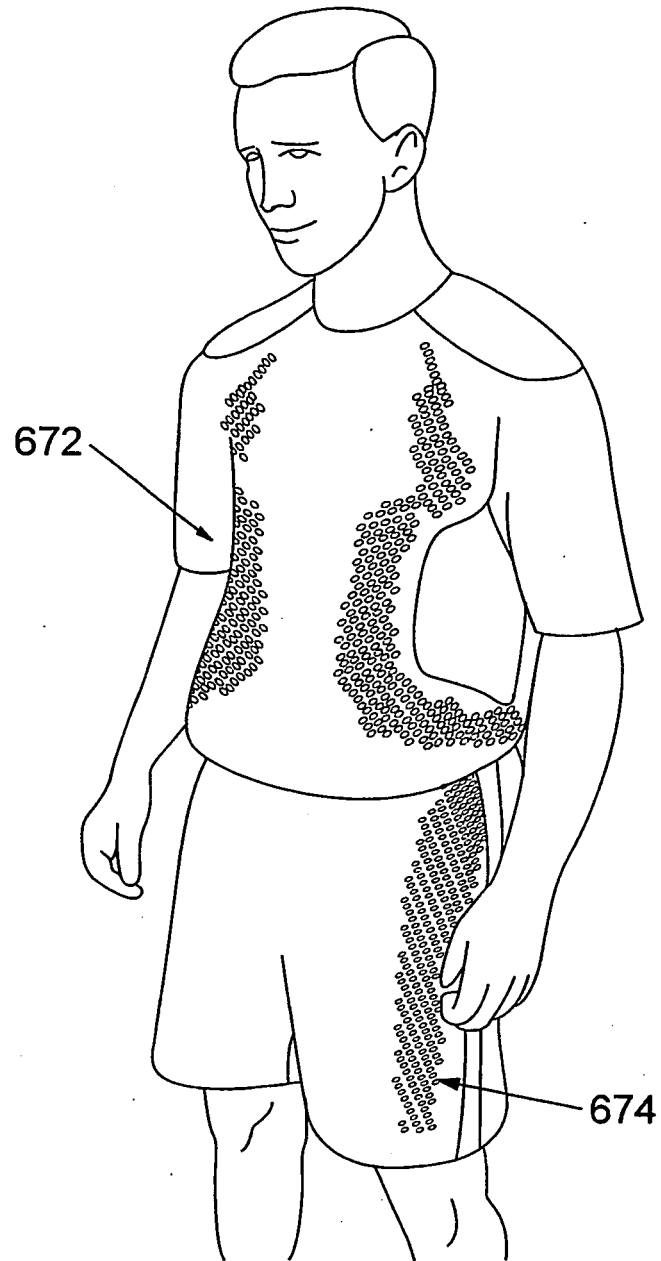


FIG. 6G

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 6128783 A [0003]