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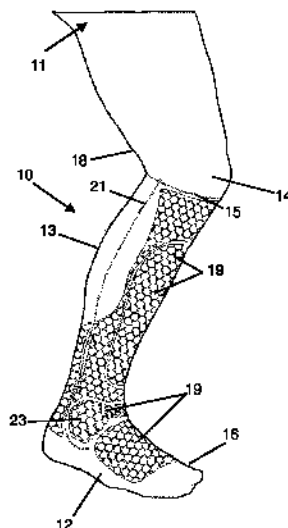
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(54) Title: PROTECTIVE LOWER LEG GARMENT



(57) Abstract: A protective garment (10) is adapted to embrace a user's lower leg (13) and/or foot (12) to provide enhanced performance and protection against injury during the performance of sporting activities. The garment (10) has an outer surface (16), an inner surface (17) adapted for contact with a user's skin (18), and one or more special features, which may include: a web of elastic fibres or yarns (22) to apply pressure to the user's ankle (23) and/or calf; an adhesive layer (26) applied to the inner surface (17) and a smooth finish applied to the outer surface (16); a flexible network of interconnected cells (19) to absorb and/or disperse applied force; one or more shock-absorbing elements (35) overlying potential injury sites; one or more sensory enhancement elements (27) to impart enhanced perception; a removable seam (21) to enable quick removal of the garment (10) in the event of injury; and/or a thermally sensitive material incorporated into the garment (10) to provide a closer fit by contraction upon the application of heat.

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

Protective Lower Leg Garment

This invention relates to a protective garment intended to be worn on a user's lower leg and/or foot. In particular, it relates to such a garment to be worn during the performance of sporting activities to provide enhanced
5 performance and protection against injury.

Participation in sport, and other high risk or physically demanding activities, often requires the wearing of high performance apparel to protect the participant from injury and to enable them to perform at an optimum level. In practice however, known protective clothing can often be rather
10 cumbersome, thus having a detrimental effect on the user's comfort and range of motion. This in turn can compromise the user's performance.

In view of the highly competitive nature of many sports, it has become common for sportsmen and sportswomen to minimise the level of protection which they select, in order also to minimise the detrimental effect on their
15 mobility. For example, in many contact ball sports such as soccer, rugby, American football and hockey, it is customary for the players to wear shin pads to protect their lower legs from the force of the impacts which occur during a game. However, since shin pads are typically rigid structures, they tend to restrict the players' mobility and comfort. Because of this, many
20 players select the smallest and least obtrusive pads - or in some cases even dispense with shin protection altogether - so as to minimise the impact on their performance. The inevitable consequence of this is that players place themselves at a far greater risk of sustaining an injury as a result of an impact.

Soccer provides a further example: the part of the foot which is most
25 important in striking the ball is the dorsal area, overlying the metatarsal bones. Soccer boots are available which provide protection to this area of the foot in the form of padding. However, these boots tend to be unpopular with soccer players because the increased thickness of the boot in this area has a detrimental effect on the player's sensory perception of the ball, leading again
30 to poorer performance. Perhaps unsurprisingly, metatarsal fracture is one of the most commonly encountered injuries amongst soccer players.

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A further problem with conventional protective equipment is that a user will often require more than one form of protection during the performance of an activity, particularly if he is carrying or recovering from a previous injury. For example, a rugby or soccer player might require shin pads, calf support
5 bandages, ankle protectors *etc.* These separate components lead to increased bulk and can have negative interactions with one another resulting in protection being compromised.

The present invention seeks to address the above issues by providing a garment which offers a user the required degree of protection against injury,
10 without having a detrimental effect on the user's comfort or mobility, and hence without compromising the user's performance. By combining several functions in one garment, the present invention also seeks to overcome the bulk and interference problems associated with the use of multiple components. The present invention further seeks to incorporate additional
15 features having impact absorption, muscle and joint support, and fatigue resistance properties to enhance the performance of the user's musculoskeletal, nervous and vascular systems.

The present invention has been developed for use in contact ball sports such as soccer, rugby, American football and hockey. Nevertheless, it
20 is believed that the present invention may be adapted for use in a range of other applications including, but not limited to: other contact and non-contact team and individual sports, water sports, extreme sports, snow sports, motor sports, equine sports, military applications, medical and physiotherapeutic applications, and occupational applications such as the emergency services
25 and manual labour.

According to the present invention there is provided a protective garment adapted to embrace at least a user's lower leg and/or foot, said garment comprising an outer surface, an inner surface adapted for contact with a user's skin, and at least one of the following features:

30 (A) a web of elastic fibres or yarns adapted and oriented to apply pressure to a user's ankle and/or calf;

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(B) an adhesive layer applied to the inner surface and a smooth finish applied to the outer surface;

(C) a flexible network of interconnected cells adapted to absorb and/or disperse an applied impacting force;

5 (D) one or more shock-absorbing elements provided at pre-determined locations overlying potential injury sites on the user;

(E) one or more sensory enhancement elements provided at pre-determined locations to impart enhanced sensory perception to the user;

10 (F) a removable seam adapted to enable quick removal of the garment in the event of injury to the user; and/or

(G) a thermally sensitive material incorporated into the garment, and adapted to contract upon the application of heat, thereby to provide a closer fit with the user's lower leg and/or foot.

15 In a currently preferred embodiment, the garment take the form of a tubular sock, encompassing the user's foot and lower leg up to just below the user's knee. In alternative embodiments however, the garment may either take the form of an ankle sock, thus encompassing the user's foot only; or may take the form of a sleeve extending from the user's ankle to just below the knee, so as to encompass the user's lower leg only.

20 Whilst discussed here in terms of a single garment, it will be appreciated that in practice the garment will be supplied in pairs to be worn on the user's left and right legs and/or feet. The garment is intended to be worn next to the user's skin, and depending on the application may either be worn beneath a user's conventional sock, or preferably be worn in place of the
25 conventional sock, forming an intermediary layer between the user and his outer apparel, such as footwear.

In increasing order of preference, the garment may comprise a combination of any two, three, four, five or six features selected from features (A) to (G). Most preferably, the garment comprises each of features (A) to (G)
30 in combination.

The elastic fibres or yarns of the physiotherapeutic taping feature (A) are oriented to adopt one or more of a range of physiotherapeutic taping

arrangements, which are known in the art. Preferably, this range comprises arrangements known as basket weave, stirrup and graduated compression. Most preferably, the elastic fibres or yarns are oriented to adopt each of the basket weave, stirrup and graduated compression arrangements
5 simultaneously.

In the basket weave arrangement, the elastic fibres or yarns commence at the mid-foot and completely cover the user's ankle joint up to about 20mm above the joint. This arrangement encourages the foot into its neutral position, perpendicular to the lower leg.

10 In the stirrup arrangement, continuous fibres or yarns extend between points part-way between the knee and ankle joints, on either side (medial and lateral) of the ankle joint. The fibres or yarns pass under the sole of the foot, with further like fibres or yarns oriented in a repeating parallel arrangement to form a stirrup having a width in the range of from 20 to 30 mm.

15 For each of the above described physiotherapeutic taping arrangement, the compression imparted by the elastic fibres or yarns to the user's ankle and/or calf is preferably substantially 2.67 kPa (20mmHg).

In the graduated compression arrangement, circumferential elastic fibres or yarns are arranged in parallel from the rim of the garment just below
20 the knee to the ankle joint. The pressure imparted to the user increases towards the ankle joint at which it reaches a maximum level of 2.67 kPa (20mmHg).

The compression imparted to the user by the above described physiotherapeutic taping arrangements provides a number of benefits,
25 including:

- promotion of proprioception (the subconscious perception of movement and spatial orientation);
- stabilising of the ankle joint;
- stimulation of the sensory mechanisms within the joint so as to
30 heighten sensory awareness;
- reduction of muscle vibration during exercise, which in turn reduces tissue trauma and muscular fatigue;

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- improvement of venous flow, which has been shown to reduce fatigue;
- stabilising the muscles, ligaments and tendons of the foot, ankle and leg, thus reducing the likelihood of injuries such as rupture, strain or avulsion, caused by overstretching; and

- 5 - enhancing the inherent secondary heart pump effect caused by leg motion, so as to maintain or improve cardiac output without increasing the user's heart rate.

The application, in feature (B), of an adhesive layer to the inner surface and a smooth finish applied to the outer surface of the garment, is intended to
10 prevent the occurrence of blisters during the performance of exercise. This is done by eliminating or reducing abrasion between the user's skin and his garments. Blisters generally occur in the presence of the following factors: heat, causing swelling; moisture, causing slippage; and a poorly fitting garment, causing localised pressure. These factors combine to cause the
15 skin to rub against the garment leading to inflammation.

The inner surface of the garment is preferably sprayed or painted prior to use with a mild adhesive. This adhesive forms a sacrificial layer, which temporarily adheres the inner surface of the garment to the user's skin. In combination with this, the outer surface of the garment is preferably formed
20 from, or provided with a region of, synthetic material adapted to impart a low friction, abrasion resistant finish. Most preferably, this synthetic material is or includes Teflon®.

The effect of this is that movement between the inner surface garment and the user's skin is reduced or eliminated, whilst low friction movement
25 between the outer surface of the garment and the user's outer apparel, such as footwear, is permitted.

The flexible network of interconnected cells in feature (C), can be thought of as an array of miniature shin pads, each designed to absorb or disperse an applied impacting force. The advantage in providing a protective
30 array according to such a construction lies in the increased flexibility compared to conventional shin pads. The user's mobility is therefore maintained without compromising the level of protection.

The network of interconnected cells preferably forms a repeating geometric pattern, with a network of hexagonal cells being the most preferred. Each cell may comprise one or more impact-absorbing layers, constructed from impact-absorbing elastomer or foam, and each said layer may have
5 differing impact-absorbing properties. In one preferred embodiment of the present invention, the cells comprise a hard outer layer, and an internal protective element. A so-called shape memory contact layer may also be incorporated.

In an alternative preferred embodiment of the present invention, at
10 least some of the cells comprise a cavity adapted to receive injection of an impact-absorbing fluid material. Suitable materials for injection into such cells may include silicon elastomers, polymer foams and non-Newtonian fluids, which remain flexible during normal use but become rigid upon the application of an impacting force. By varying the nature or amount of the injected
15 material, the shock-absorbing properties of different regions of the network can be adjusted. This can be used to provide targeted protection for existing injuries or injury-prone areas.

The physical arrangement of the cells can also be tailored to the individual user. This is achieved by providing detachable engagement means
20 enabling cells to be interchangeably engaged and disengaged with adjacent cells at will. Suitable engagement means include a hook and loop fastening system. This enables the shape of the garment to be configured to the shape of the individual user's leg.

The cellular network arrangement provides enhanced impact protection
25 reducing the likelihood of bruising, fracture or other injury to the user's metatarsals, Achilles tendons, malleolus, tibia, fibula and lower leg muscles.

The present invention provides further protection against injury to the user in the form of the shock-absorbing elements of feature (D). In contrast to the impact-absorbing cellular network of feature (C), the elements of feature
30 (D) are intended to protect the user from shocks and stresses attributable to physical features of his own apparel, rather than from forceful impacts. For example, modern football and rugby boots have a variety of stud and lace

patterns which can create areas of pressure on the plantar and dorsal surfaces of the foot. These areas of pressure can cause irritation, discomfort, and ultimately injury, during the performance of exercise.

The shock-absorbing material is thus arranged at pre-determined
5 locations corresponding to the position of laces and/or studs on the user's footwear. Preferably, the shock-absorbing material comprises silicon gel and/or wadding. This may either be in the form of a raised component at the pre-determined location or may comprise a negative impression to receive the intruding stud or lace. The precise location of the shock-absorbing elements
10 may be tailored to the shape of the individual user's feet, and indeed may take account of variance between a user's left and right feet.

By use of these shock-absorbing elements, specific areas of the foot may be targeted for protection. For example, the fat pads on the plantar surface (sole) of the foot may be afforded protection against breakdown.

15 A further feature (E) of the present invention is the provision of sensory enhancement elements. These are intended to compensate the user for any perceived loss of sensory input attributable to the wearing of protective apparel. A particular application of this is the dorsal area of the foot in soccer, where increased protection in the form of padding is often associated with a
20 loss of sensory perception of the ball when striking.

The sensory enhancement elements preferably comprise inwardly-directed protrusions arranged in a geometric pattern. Most preferably, the protrusions are formed from nylon, have a diameter of less than 5mm, and are firm and smooth. The protrusions are intended to contact the user's skin so
25 as to promote a sensory response by increasing blood flow and stimulating nerves.

Where the sensory enhancement elements of feature (E) are employed in combination with the impact-absorbing cellular network of feature (C), the protrusions may preferably be provided on the inner faces of the cells.

30 Where the sensory enhancement elements of feature (E) are employed in combination with the alternative preferred embodiment of the impact-absorbing cellular network of feature (C), the sensory enhancement elements

may instead take the form of loose particles located in at least some of the cavities.

The protective garment of the present invention is further provided with quick release means in the form of a removable seam feature (F). This
5 enables the garment to be quickly removed or loosened in the event of an injury to the user.

The seam is preferably aligned with the longitudinal axis of the garment, running from below the knee to the heel, and is formed as a single continuous yarn or fibre. The yarn or fibre is preferably a high strength material such as
10 nylon.

In a currently preferred embodiment of the present invention, the seam is formed with an exposed loop adapted such that cutting of said loop enables quick removal or loosening of the seam. In this embodiment, the loop is preferably provided with a lock or seal to prevent accidental removal or
15 loosening of the seam.

Alternatively, the seam may be formed from a degradable polymer adapted to dissolve on contact with a selected solvent.

Feature (G) of the present invention provides for the inclusion of a thermally sensitive material within the garment. The material is adapted to
20 contract upon the application of heat, providing a shrink-to-fit garment which will adopt the precise shape of the user's lower leg and/or foot. This will eliminate any wrinkles or loose material in the garment, provide enhanced comfort to the user, and further reduce the risk of blisters and other skin irritation caused by abrasion.

In order that the user may set the garment to his own shape, it is
25 preferred that the thermally sensitive material undergoes an irreversible contraction upon the application of heat. Most preferably, the thermally sensitive material is adapted to contract upon the application of heat from a domestic hair dryer or similar appliance. Suitable materials for incorporation
30 into the garment include thermosetting or heat shrink polymers.

In order that the present invention may be fully understood, preferred embodiments will now be described in detail, though only by way of example, with reference to the accompanying drawings in which:

Figure 1 shows a protective garment for a user's lower leg and foot, according to a preferred embodiment of the present invention;

Figure 2 shows a protective garment as in Figure 1, with the outer layers removed to illustrate the physiotherapeutic taping feature (A), and details thereof;

Figure 3 shows a protective garment as in Figures 1 and 2, with further layers removed to illustrate details of the blister prevention feature (B), the sensory enhancement feature (E), and the shrink-to-fit feature (G);

Figure 4 shows a protective garment as in Figures 1 to 3, with particular emphasis on the impact absorption feature (C), and details thereof;

Figure 5 shows a protective garment as in Figures 1 to 4, with layers removed to illustrate the shock absorption feature (D);

Figure 6 shows various orientations of a user's lower leg and foot wearing a protective garment as in Figures 1 to 5, to illustrate the areas afforded particular protection by features (C) and (D); and

Figure 7 shows a protective garment as in Figures 1 to 6, with particular emphasis on the quick release feature (F).

Referring first to Figure 1, there is shown a protective garment, generally indicated 10, according to a preferred embodiment of the present invention, being worn by a user, generally indicated 11. The garment 10 is formed as a tubular sock, encompassing the foot 12 and lower leg 13 of the user 11, and terminating in a rim 15 just below the user's knee 14.

The garment 10 has an outer surface 16 and an inner surface 17 (not visible in Figure 1) in contact with the skin 18 of the user 11, as will be described in more detail below with reference to Figure 3. Incorporated into and between these outer 16 and inner 17 surfaces are a range of protective and/or performance enhancing features (A) to (G), as will be described in more detail below with reference to Figures 2 to 7. Different combinations of one or more of these features may be present in different embodiments of the

present invention. The features readily visible from the outer surface 16 of the garment 10 as shown in Figure 1 are: the impact absorption feature (C), which takes the form of a network of interconnected hexagonal cells 19, as will be described in more detail below with reference to Figures 4 and 6; and the quick release feature (F), which takes the form of a removable seam 21, as will be described in more detail below with reference to Figure 7.

Referring now to Figure 2, this shows the garment 10 with the outer surface 16 removed to reveal the physiotherapeutic taping feature (A). This takes the form of a web of elastic fibres or yarns 22, which are arranged and oriented on the foot 12 and lower leg 13 of the user 11 so as to adopt a range of known physiotherapeutic taping arrangements, as shown in details □ □ and □. As with the incorporation of features (A) to (G) into the garment, different combinations of one or more of these arrangements may be present in different embodiments of the present invention.

Detail □ of Figure 2 illustrates the basket weave arrangement, in which the elastic fibres or yarns 22 commence at the mid-point of the foot 12 and completely cover the ankle joint 23 up to about 20mm above the joint 23. This arrangement encourages the foot 12 into its neutral position, perpendicular to the lower leg 13.

Detail □ of Figure 2 illustrates the stirrup arrangement, in which continuous fibres or yarns 22 extend between points 24 part-way between the knee 14 and ankle 23 joints, on either side (medial and lateral) of the ankle joint 23. The fibres or yarns 22 pass under the sole 25 of the foot 12, with further like fibres or yarns 21 oriented in a repeating parallel arrangement to form a stirrup supporting the ankle joint 23.

The main part of Figure 2 illustrates the graduated compression arrangement, in which circumferential elastic fibres or yarns 22 are arranged in parallel from the rim 15 of the garment 10 just below the knee 14, to the ankle joint 23. The pressure imparted to the user 10 is graduated to increase in the direction of the ankle joint 23. Detail □ of Figure 2 shows a schematic illustration of this graduated compression.

Referring now to Figure 3, this shows representations of the garment's blister prevention feature (B), sensory enhancement feature (E) and shrink-to-fit feature (G), as illustrated in details □ □ and □ respectively.

The blister prevention feature (B), as illustrated in detail □ of Figure 3, takes the form of a sacrificial layer of adhesive 26 applied to the inner surface 17 of the garment 10. This adheres to the skin 18 of the user 10, thus preventing or reducing movement between the user's skin 18 and the inner surface 17 of the garment 10. To complement this, the outer surface 16 of the garment 10 is provided with a smooth low friction surface, so as to permit movement between said outer surface 16 and the user's footwear (not shown).

Detail □ of Figure 3 illustrates the sensory enhancement feature (E), which takes the form of an array of inwardly-directed protrusions 27 provided on the inner surface 17 of the garment 10. The protrusions 27 bear against the user's skin 18 to stimulate blood flow and stimulate nerves, thus enhancing sensory perception. A particular application of this feature (E) of the present invention is in enhancing the sensory perception of the dorsal area 28 of foot 12 of a soccer player to provide improved "feel" of the ball during striking.

Detail □ of Figure 3 illustrates the shrink-to-fit feature (G), in which a thermally-sensitive material is incorporated into the fabric of the garment 10. When heat, as indicated by arrow x, such as that from a domestic hairdryer, is applied to the garment 10, it contracts to follow the contours of the user's foot 12 and lower leg 13. The shrink-fitting is permanent, so that the garment 10 is set to a user's own individual shape.

Referring now to Figure 4, this shows the garment 10 with its outer surface 16 restored to illustrate the impact absorption feature (C), as is further illustrated in detail □. The impact absorption feature (C) takes the form of a flexible network of interconnected hexagonal cells 19, which act like miniature shin pads, each cell 19 absorbing or dispersing an applied impacting force. As illustrated in detail □, each cell 19 may comprise one or more impact-absorbing layers 29 having differing impact-absorbing properties.

Alternatively, the cells 19 may comprise a cavity 31 adapted to receive injection, as indicated by arrow y of an impact-absorbing fluid material 32.

Detachable engagement means (not shown) may also be provided to enable cells 19 to be interchangeably engaged and disengaged with adjacent
5 cells 19 at will. This enables the shape of the outer surface 16 of the garment 10 to be configured to suit the size and shape of the user's lower leg 13 and foot 12. The impact absorption feature (C) can be used to provide protection to key areas of the user's foot 12 and lower leg 13, as will also be described below with reference to Figure 6. These key areas are: the dorsal foot area
10 28, overlying the metatarsals; the heel area 32, overlying the Achilles tendons; the ankle area 23, including the malleolus; and core 33 and peripheral 34 areas of the shin, giving protection to the tibia, fibula and the muscles of the lower leg 13.

Referring now to Figure 5, this shows representations of the garment's
15 shock absorption feature (D). This takes the form of wadding material 35 arranged within the garment 10 to overlie target areas where the pressure or shock caused by the user's own footwear can lead to irritation, discomfort or injury. In particular, the wadding 35 is applied to areas of the garment 10 corresponding to the dorsal area 28 of the foot 12 to absorb shock associated
20 with the lace patterns 36 of soccer or rugby boots; and to the plantar (sole) area 25 of the foot 12 to absorb shock associated with the stud patterns 37 of soccer or rugby boots.

Referring now to Figure 6, this provides further illustration of the areas
25 of a user's lower leg 13 and foot 12 which are afforded protection by the impact absorption feature (C) and the shock absorption feature (D) of the protective garment 10 of the present invention: the malleolus and ankle joints 23 are provided with impact absorption by feature (C); the metatarsals and dorsal area 28 of the foot 12 are provided with both impact absorption by feature (C) and shock absorption by feature (D); the Achilles tendons and heel
30 area 32 are provided with impact absorption by feature (C); the tibia, fibula, muscles of the lower leg 13, core 33 and peripheral 34 shin areas are provided

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with impact absorption by feature (C); and the plantar area 25 of the foot 12 is provided with shock absorption by feature (D).

Referring finally to Figure 7, this shows the garment 10 with the quick release feature (F) illustrated. This feature (F) takes the form of a removable
5 seam 21, running from the rim 15 of the garment 10 to the ankle 23, and formed as a single continuous yarn or fibre. As shown in detail □ of Figure 7, the upper end of the seam 23 is formed as a loop 38 protruding beyond the rim 15. When quick removal or loosening of garment 10 is required, for example if the user 11 is injured, the loop 38 may be cut, as indicated by
10 arrow z. One of the resultant free ends of the seam 23 may then be pulled to loosen the seam 23, or remove it completely from the garment 10.

Claims

1. A protective garment adapted to embrace at least a user's lower leg and/or foot, said garment comprising an outer surface, an inner surface adapted for contact with a user's skin, and at least one of the following features:
 - (A) a web of elastic fibres or yarns adapted and oriented to apply pressure to a user's ankle and/or calf;
 - (B) an adhesive layer applied to the inner surface and a smooth finish applied to the outer surface;
 - (C) a flexible network of interconnected cells adapted to absorb and/or disperse an applied impacting force;
 - (D) one or more shock-absorbing elements provided at pre-determined locations overlying potential injury sites on the user;
 - (E) one or more sensory enhancement elements provided at pre-determined locations to impart enhanced sensory perception to the user;
 - (F) a removable seam adapted to enable quick removal of the garment in the event of injury to the user; and/or
 - (G) a thermally sensitive material incorporated into the garment, and adapted to contract upon the application of heat, thereby to provide a closer fit with the user's lower leg and/or foot.
2. A garment as claimed in claim 1, comprising any two, three, four, five or six features selected from (A) to (G).
3. A garment as claimed in claim 1 comprising each of features (A) to (G).
4. A garment as claimed in any of the preceding claims, wherein feature (A) is present, and wherein the elastic fibres or yarns are oriented to adopt one or more of a range of physiotherapeutic taping arrangements.
5. A garment as claimed in claim 4, wherein the range of physiotherapeutic taping arrangements comprises the so-called basket weave, stirrup and graduated compression arrangements as described herein.
6. A garment as claimed in claim 5, wherein the elastic fibres or yarns are oriented to adopt each of the basket weave, stirrup and graduated compression arrangements simultaneously.

7. A garment as claimed in any of claims 4 to 6, wherein the web of elastic fibres or yarns is adapted and oriented to apply a pressure of substantially 2.67 kPa to the user's ankle and/or calf.
8. A garment as claimed in any of the preceding claims, wherein feature (B) is present, and wherein the inner surface of the garment is adapted to be sprayed or painted prior to use with a mild adhesive, said adhesive forming a sacrificial layer for temporary adhesion to the user's skin.
9. A garment as claimed in claim 8, wherein the outer surface of said garment is formed from, or provided with a region of, synthetic material adapted to impart a low friction, abrasion resistant finish.
10. A garment as claimed in claim 9, wherein said synthetic material is or includes Teflon®.
11. A garment as claimed in any of the preceding claims, wherein feature (C) is present, and wherein said network of interconnected cells forms a repeating geometric pattern.
12. A garment as claimed in claim 11, wherein the cells are hexagonal.
13. A garment as claimed in claim 11 or claim 12, wherein each cell comprises one or more impact-absorbing layers.
14. A garment as claimed in claim 13, wherein at least some cells comprise a plurality of layers having differing impact-absorbing properties.
15. A garment as claimed in claim 14, wherein said cells comprise a hard outer layer, and an internal protective element.
16. A garment as claimed in claim 14, wherein at least some cells comprise a cavity adapted to receive injection of an impact-absorbing fluid material, thereby to enable the shock-absorbing properties of different regions of the network to be adjusted.
17. A garment as claimed in any of claims 11 to 16, wherein at least some cells are detachably engaged with adjacent cells, thereby to enable the arrangement of said cells in the garment to be adjusted.
18. A garment as claimed in any of the preceding claims, wherein feature (D) is present, and wherein said shock-absorbing material is arranged at pre-

determined locations corresponding to the position of laces and/or studs on the user's footwear.

19. A garment as claimed in claim 18, wherein the shock-absorbing material comprises silicon gel and/or wadding.

20. A garment as claimed in any of the preceding claims, wherein feature (E) is present, and wherein said sensory enhancement elements comprise a plurality of inwardly-directed protrusions arranged in a geometric pattern.

21. A garment as claimed in claim 20, wherein said protrusions are formed from nylon and have a diameter of less than 5mm

22. A garment as claimed in claim 20 or claim 21, wherein said inwardly-directed protrusions are provided at a location corresponding to the user's dorsal foot.

23. A garment as claimed in any of claims 20 to 22, wherein feature (C) is present and said inwardly-directed protrusions are provided on the inner faces of said cells.

24. A garment as claimed in claim 16, wherein feature (E) is present in the form of one or more loose particles located in at least some of said cavities.

25. A garment as claimed in any of the preceding claims, wherein feature (F) is present, and wherein said seam is aligned with the longitudinal axis of the garment and is formed as a single continuous yarn or fibre.

26. A garment as claimed in claim 25, wherein said seam is formed with an exposed loop adapted such that cutting of said loop enables quick removal or loosening of said seam.

27. A garment as claimed in claim 25, wherein said seam is formed from a degradable polymer adapted to dissolve on contact with a selected solvent.

28. A garment as claimed in any of the preceding claims, wherein feature (G) is present, and wherein the contraction of said thermally sensitive material upon the application of heat is irreversible.

29. A garment as claimed in claim 28, wherein said thermally sensitive material is adapted to contract upon the application of heat from a domestic hair dryer or similar appliance.

Figure 1

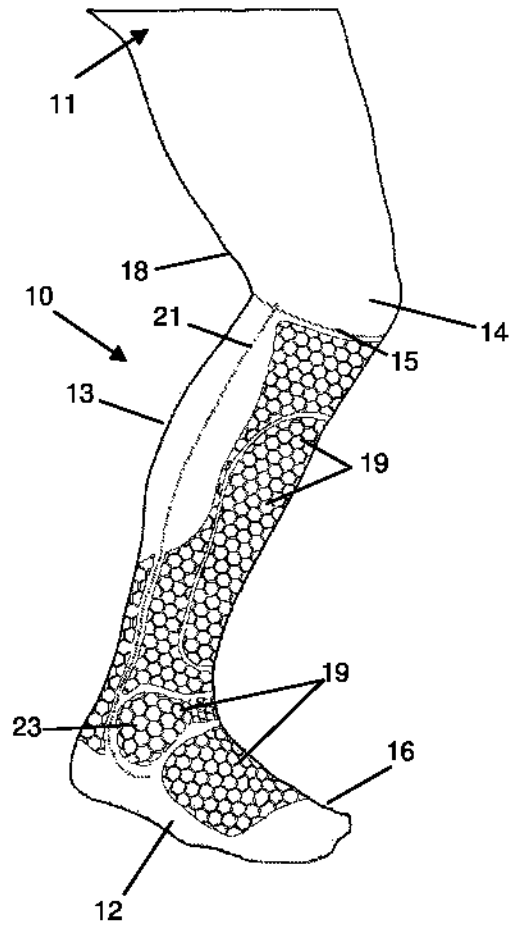


Figure 2

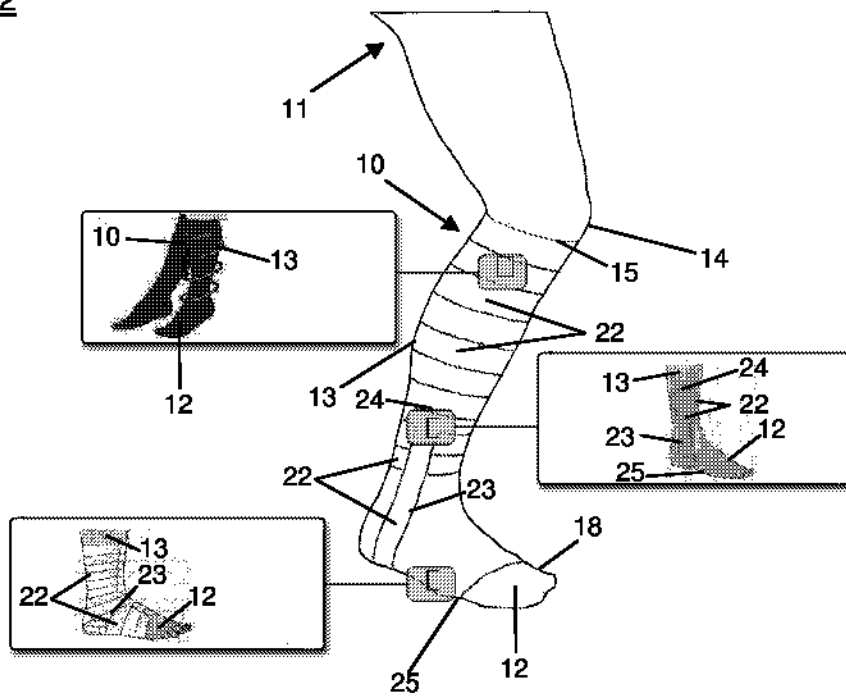


Figure 3

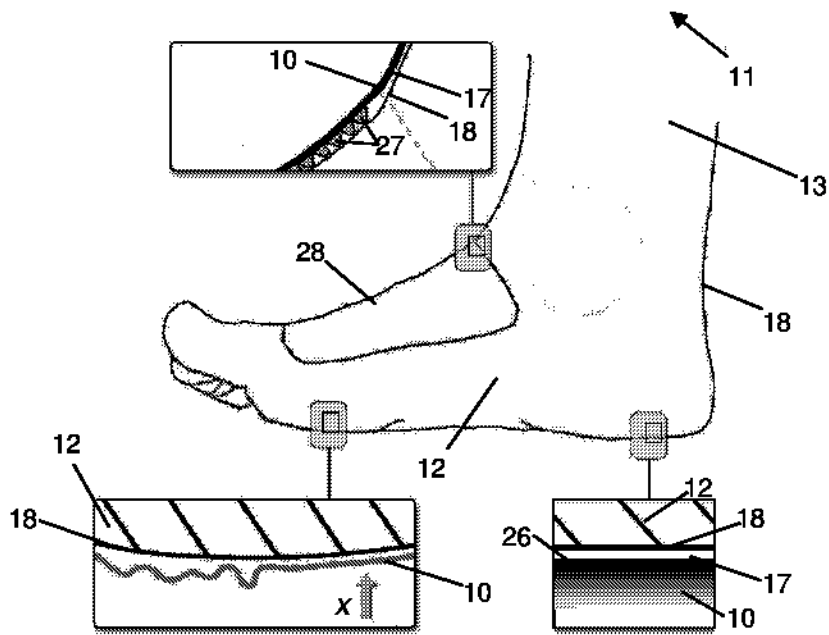


Figure 4

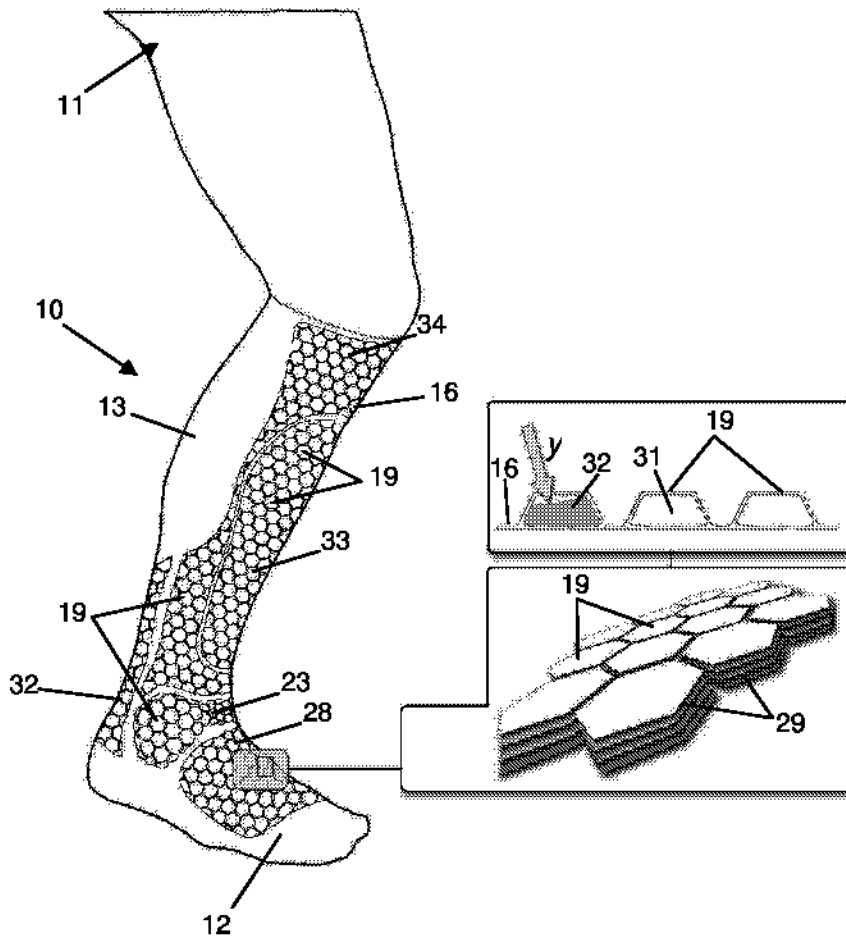


Figure 5

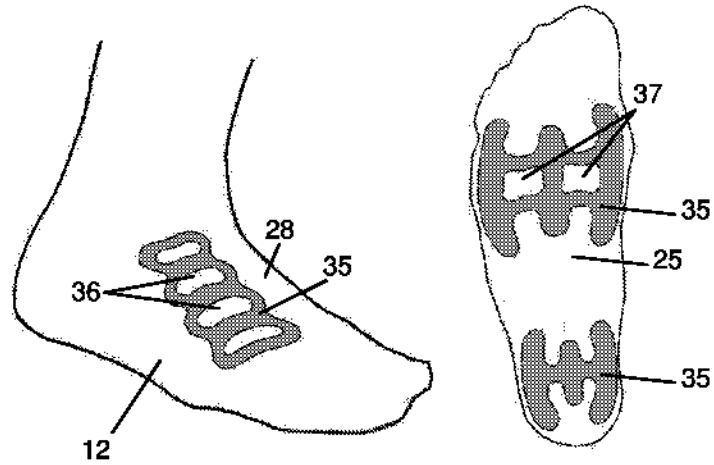


Figure 6

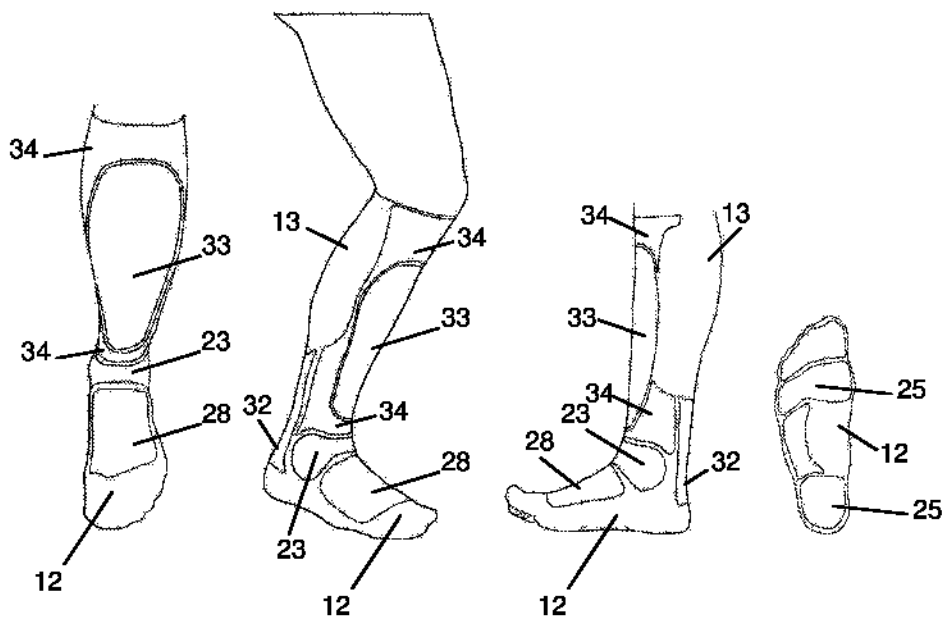


Figure 7

