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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : A43B 23/02, D03D 1/00

A1

(11) International Publication Number: **WO 98/43506**

(43) International Publication Date: 8 October 1998 (08.10.98)

(21) International Application Number: PCT/US98/06300

(22) International Filing Date: 27 March 1998 (27.03.98)

(30) Priority Data:
08/828,409 28 March 1997 (28.03.97) US

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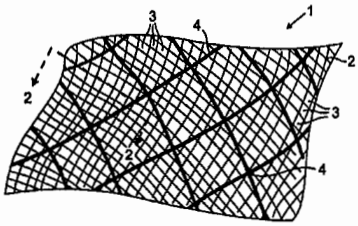
(81) Designated States: CA, MX, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

Published
With international search report.
Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.

(54) Title: ENGINEERED TEXTILE

(57) Abstract

A lightweight, strong, durable engineered textile for use in a shoe upper and other applications is described. In one aspect, a first stretchable layer is formed. Stitching lines overlay the layer, and reinforce it against stresses. An alternate embodiment of the engineered textile includes a second layer. The second layer may be inter–woven with the first layer, or may be attached to the first layer via the stitching lines.



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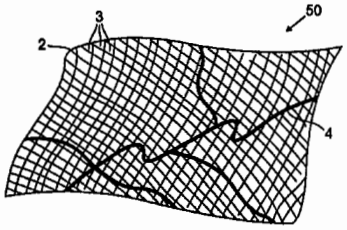

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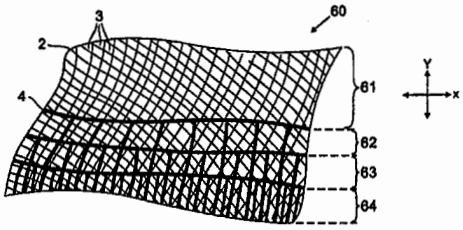

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ENGINEERED TEXTILE

Background of the Invention

The invention relates to a lightweight, strong, durable, engineered textile. The engineered textile may be used in a variety of applications, such as in a shoe upper.

Shoes for use in various athletic activities, such as running, training, basketball, soccer, baseball, football and the like have uppers constructed of various materials, such as leather or synthetic materials, and some combine materials. For example, it is known to construct shoe uppers with one or more areas of multiple layers. Although such shoes are durable, the use of multiple layers of material can cause hot spots, and can make the shoe upper bulky and uncomfortable to wear.

Synthetic uppers have been generally preferred for running shoes because they are lightweight and generally retain properties of comfort and softness during use. Some synthetic uppers move about the foot during use causing friction instead of stretching to conform to the foot, while other synthetic materials are not air permeable, resulting in overheating problems within the shoe.

Regarding competitive running shoes, the weight of such running shoes is of primary importance, and thus relatively thin fine leather has been used to construct the upper. The stretching capability of the fine leather permits such uppers to mold to the form of the particular users foot. However, relatively thin leather can sometimes stretch unabated, so that the upper eventually stretches out of shape. Further, the foot of a competitive runner will perspire during training or a race, and fine leather uppers typically do not provide adequate ventilation to cool the foot.

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Competitive runners also sometimes compete under difficult weather conditions which can adversely affect the shoe upper and thus the runner's performance. For example, if it rains, shoe uppers made of leather and/or a multi-layer construction tend to get wet easily and retain water and mud for days. Prolonged use of such shoes can result in blisters and such maladies as trench-foot.

Thus, there is a need for a strong, lightweight, durable and air permeable textile for use in shoe uppers, which also will dry quickly.

Summary of the Invention

In general, in one aspect, the invention features a lightweight, strong, durable and engineered textile including a first stretchable layer, and stitching lines overlaying the first layer.

Preferred embodiments include the following features. The first layer may be a mesh-like layer having apertures. A second mesh-like layer having apertures may be cross-woven into the first layer, or attached to the first layer by the stitching lines, and may have apertures of a different size than the apertures of the first mesh-like layer. Alternately, a second non-stretchable layer could be applied to at least a portion of the first layer, and may be attached to the first layer by some of the stitching lines. The stitching lines form a pattern that is substantially evenly distributed across at least a portion of the layer or layers. The stitching pattern could also form a non-evenly distributed, non-random pattern across at least a portion of the mesh-like layer. Alternately, the stitching lines form a pattern that is substantially random and distributed over at least a portion of the layer or layers. The textile may further include a

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wicking layer, and/or an insulating layer. When used to form the upper of a shoe, the engineered textile may comprise one or more air permeable layers. The engineered textile provides a stabilized and strengthened sidewall portion without requiring additional layers or underlying support members. Embodiments include an upper embodying a textile layer having a stitching pattern resembling a net, and another having a stitching line pattern resembling the cabling of a suspension bridge. A U-shaped lacing area maybe contained in the upper having attached lace elements. In some embodiments, at least some of the stitching lines terminate at or near the lace elements.

Use of the textile according to the invention improves breathability of a shoe upper and the cross ventilation of the foot. In addition, the synthetic mesh construction enables the engineered textile to dry quickly when wet. When a runner's foot perspires, the textile permits the moisture to dissipate, thus cooling the foot. Further, the textile is light weight and the stitching pattern provides tensile lateral strength. In addition, when a mesh-like layer is used, the aperture size of each opening is such that ventilation is permitted but solid objects, such as rocks, sand, insects and the like, are screened from entering the interior of the shoe.

The engineered textile can be used in any items where performance is affected by weight and stress considerations. For example, the textile according to the invention could be used in shoe uppers, outdoor gear, sailing gear, duffel bags, apparel and the like, where high strength and durability is necessary, and where it is desirable to keep weight at a minimum.

Other advantages and features will become apparent from the following description and the claims.

Brief Description of the Drawings

Fig. 1A illustrates a section of a lightweight, strong, durable, engineered textile;

Fig. 1B illustrates a section of another embodiment of an engineered textile having a substantially random pattern of stitching lines;

Fig. 1C is another embodiment of a section of an engineered textile;

Fig. 2A is a sectional view along lines A-A of the textile of Fig. 1;

Fig. 2B is a sectional view of an alternate embodiment of the textile of Fig. 1;

Fig. 2C is a sectional view of the embodiment of Fig 2B, including an additional material layer;

Figs. 3A and 3B are side and bottom views, respectively, of a shoe upper incorporating the engineered textile;

Figs. 3C and 3D are side and top views, respectively, of the upper of Figs. 3A and 3B, shown attached to a sole;

Figs. 4A and 4B are side and top views, respectively, of a second embodiment of a shoe having an upper incorporating the engineered textile;

Figs. 5A-5G illustrate an alternate construction of the engineered textile; and

Fig. 6 is a perspective view of a tent incorporating the engineered textile.

Description of the Preferred Embodiments

Figs. 1A-1C depict sections of a lightweight, strong, tear-resistant, durable, engineered textile 1, 50, 60 not drawn to scale, for use in a variety of products. An engineered textile is a textile that is woven or computer stitched to serve a specific function in an item. Examples of applications for the engineered

textile include tents, other camping or outdoor equipment, duffel bags, suitcases, show uppers, jackets and other apparel.

Referring to Fig. 1A, the engineered textile 1 includes a layer 2, which may be a woven polyester or woven monofilament nylon mesh-like fabric such as Codura™. However, the layer 2 may also comprise a waterproof stretch material such as neoprene, depending on the intended use. The layer 2 preferably has a tear-strength that is capable of withstanding stresses that may be encountered, is stretchable, and exhibits adequate abrasion qualities to resist tearing during repeated use.

In the example shown in Fig. 1A, the layer 2 is made of a mesh that may be able to stretch over 200 percent from its normal shape without tearing, depending on the material it is made from. The openings or apertures 3 of the mesh-like material may be square, rectangular, oval or circular, and permit air to pass through to provide ventilation. Mesh-like layers may be manufactured to contain repeating shapes of openings, or may be woven so that different patterns of aperture shapes are the result. The size of the apertures 3 depends on the use to which the material 1 is to be applied. For example, for a shoe upper, oval apertures on the order of 0.5-2.0 millimeters in the largest diameter are adequate for providing ventilation and to prevent debris from entering the shoe; however, depending on the application the apertures could be made smaller or larger.

Overlaying at least a portion of the layer 2 is a closely-spaced weaving of stitching lines 4 of suitably strong fiber or thread. For example, nylon, 210 dernier two-ply nylon, Kevlar™, or other high-strength thread could be used. Alternately, the fiber of the

stitching can be made of the same fabric as the mesh-like material.

The stitching lines 4 may form a pattern over some or all of the layer 2, wherein the lines of stitching preferably are located along the lines of stress of the item that the engineered textile 1 defines. The stitching line pattern thus provides a support structure, and may be substantially evenly distributed over all or part of the material. Fig. 1B illustrates a section of another embodiment of the engineered textile 50 having the same overall construction as the textile 1 of Fig. 1A, but where the stitching lines 4 have been substantially randomly applied to the layer 2. In some applications, only part of the layer 2 requires reinforcement by stitching lines 4, and thus random patterns may be applied in those areas, or a pattern that is pleasing to the eye could be chosen.

Fig. 1C illustrates another embodiment of an engineered textile 60 similar in structure to the engineered textiles 1 and 40 of Figs. 1A and 1B. The engineered textile 60 does not have any stitching lines in area 61, so that the layer 2 can stretch to its full capability in area 61 in both the x and y directions. However, in area 62, the stitching lines 4 limit the stretch capability of the layer in both the x and y directions. Similarly, in area 63, the increased number of stitch lines severely limits stretching capabilities in the Y direction while slightly impacting the stretch capabilities in the X direction. The addition of more stitch lines in area 64 effectively prevents stretching in the Y direction, but some stretching is still permitted in the X direction. Fig. 1C thus illustrates an engineered material 60 having different stretch capabilities in different areas depending on the placement of the stitching lines 4.

The stitching lines 4 illustrated in Figs 1A to 1C may be applied to the layer 2 by a computer-controlled sewing machine. Different stitching line patterns of different thicknesses can be programmed into the sewing machine, and one chosen during manufacturing so that the engineered textile will contain an appropriate stitching line pattern that provides support and limits stretching, suitable for its intended use.

Fig. 2A is a sectional view of the engineered textile 1 taken generally along dotted line A-A of Fig. 1A. The textile includes a first mesh-like layer 2 and the stitching lines 4, which reinforce and limit stretching of the mesh-like layer. The embodiments 40,50 of Figs. 1B and 1C may be of the same construction. Such a construction results in an engineered textile that is strong, lightweight and breathable, because the vast majority of the apertures 3 of the mesh-like layer are unimpeded.

Fig. 2B illustrates a sectional view of an alternate embodiment of an engineered textile 5, wherein like components from Figs. 1A - 1C have been numbered the same. The textile 5 comprises two mesh-like layers. The first mesh-like layer 2 may be connected via the stitching 4 to a second mesh-like layer 6. Alternately, the first and second mesh-like layers 2, 6 may be cross-woven into each other to form a stretchable, three-dimensional, air permeable textile material. If the textile 5 is used in a garment, the inner layer could be of soft material such as lycra or cotton. Such a construction provides comfort for a wearer, and the closely related mesh layers improve the cross-ventilation and thus breathability of the garment. Further, the mesh-like layers may have dissimilar apertures (in size and/or shape), may be made of different materials, and may be of different colors. However, if the engineered

textile must be air permeable for its intended use, care must be taken to ensure that a suitable inner layer 6 of mesh-like material is chosen so that a majority of the apertures of the first or outer layer 2 of mesh-like material are not obstructed. When the textile 5 will be used in clothing or shoe uppers, care should be taken to ensure that the sizes of the apertures of the outer mesh-like layer are adequate to provide ventilation, but are small enough to prevent solid objects such as pebbles, sand or insects from passing through the textile material.

The structure of the air permeable textile 5 may include an open area 8 between the first 2 and second 6 mesh-like layers. Alternatively, as shown in Fig. 2C, the textile 5 can have a material layer 9 sandwiched between the first and second mesh-like layers to provide additional performance characteristics. For example, the material layer 9 could be an insulating layer for heat retention or a wicking layer to help remove moisture. Such layers could also be otherwise attached to the material 5. In addition, a third mesh-like layer could be utilized. In order to provide strength, it is preferred that all of the layers are joined together by the stitching 4. Thus, additional layers could be incorporated without significantly increasing the weight of the item, to add desired performance characteristics to the engineered textile. However, it should be understood that the use of some or all of such additional layers could affect the air circulation and/or breathability capability of the textile 5, and further could affect its stretching characteristics.

Figs. 3A and 3B illustrate a shoe upper 10, not drawn to scale, made from the engineered textile 1 or 5 of Figs. 2A and 2B, and Figs. 3C and 3D illustrate the upper 10 attached to a sole 21. Referring to Figs. 3A

and 3B, it is preferred to construct the shoe upper 10 as a shell-like encapsulating structure, shaped to wrap around and encase a foot inserted into foot opening 7. The fibers of the mesh-like layer 2 are preferably capable of stretching somewhat to conform to the shape of the foot of a wearer, and the apertures of the mesh-like layer permit air to circulate within the shoe while also preventing sand and the like from entering the shoe. If a synthetic fiber is used to weave the mesh-like layer then the upper 10 will be capable of drying quickly when wet by rain, a riverbed, a puddle or the like. In addition, ventilation is provided at the top of the foot in the area 25 to cool the runners foot.

As shown in Fig. 3A, the stitching lines 4 on the sidewalls of the upper 10 form a pattern to provide support to the sidewalls from lateral stresses, two of which are illustrated by the arrows B, that occur during use of the shoe. The stitching pattern shown is a criss-cross pattern resembling a net, but other patterns could be utilized.

Fig. 3B is a bottom view 11 of the upper 10 of Fig. 3A, and shows the vertical line initiation points 26 of the stitching 4. The initiation points 26 of the stitching are preferably located below the lasting margin line 16 of the upper (see Fig. 3C) so that when a sole is attached it will anchor the initiation points. A seam 29, shown stitched together in Fig. 3B, would also be reinforced by attachment of the sole 21.

In Fig. 3A, the vertical termination points of the stitching 4 are shown attached to lace elements 12, because when the laces are pulled taut and when the shoe is in use, tension or stress is applied along the side walls of the upper 11 in the direction of arrows B. Although such attachment is not required, the vertical termination points should at least continue to a point

close to the lace elements. Similarly, the horizontal lines of the stitching have termination points 27 in the toe area and end points 28 in the heel area, which may be anchored by attachment of a toe element 18 and a heel element 20 (see Fig. 3C). The horizontal and vertical stitching lines stabilize and strengthen the sidewalls of the upper, and help to ensure that the upper retains its shape so that it will be comfortably snug during the lifetime of the shoe.

Figs. 3C and 3D are side and top views of the shoe upper 10 of Figs. 3A and 3B shown attached to a sole 21. The shoe upper contains lace elements 12 for accepting shoelaces 15. The lace elements 12 may be stitched or otherwise attached to a lacing opening 13. A tongue 14 may be included, and may be made of the material 1. Alternatively, the upper 10 could be so constructed to eliminate a tongue, by using a textile layer that can stretch to accommodate insertion of the foot into the shoe. The upper may also include a toe element 18, a collar element 19 about foot opening, a heel pull tab 17 and a heel element 20. The toe, collar and heel elements may be attached to the upper mesh-like material 1 to anchor the stitching pattern 4 and provide further support. The use of such elements should be sparse to keep the weight of the shoe to a minimum, and the elements may be made of leather, rubber, polyurethane or other material commonly used in athletic shoes.

The sole 21 includes an outer sole layer 22 and a midsole layer 24. The outer sole layer 22 is made of a resilient and durable rubber and includes a plurality of gripping projections 23 which may be integrally molded. The midsole layer 24 may be a single layer or multiple layers of material, may include a thickened heel portion, and is composed of a resilient

cushioning material such as sponge rubber, EVA or other known materials.

The upper 10 of Figs. 3A-3D could be formed of the engineered textile 5 of Fig. 2B. When utilizing a three-dimensional or two-layer upper textile 5, the inner layer 6 could comprise a soft and stretchable material that feels comfortable against a wearer's foot. A portion of the entire outer layer 2 could comprise a durable, less stretchable and somewhat coarse fabric such as Codura™ for long wear. Further, the inner layer 6 could have apertures of larger size and/or different shape than the outer layer. Such a structure creates a layer of air about the foot for comfort to cool the foot in warm weather, and to provide a relatively warm layer of air to warm the foot in cold weather. As described above, when the textile 5 is used then an intermediate material layer 9 or layers, such as a wicking layer, an insulation layer, and/or a waterproof layer and the like, could be sandwiched between the inner layer 6 and outer layer 2 without adding substantial weight to the shoe. However, such additional intermediate layers may affect the stretchability of the textile 5, and the breathability of the shoe upper.

Figs. 4A and 4B are side and top views, respectively, of a second embodiment of a running shoe 30, not drawn to scale, wherein like components with regard to the shoe of Figs. 3A-3D are numbered the same. The shoe 30 has a shoe upper 10 made of the engineered textile 1 or 5 described above, attached to a sole 21. The upper 10 includes a plurality of lace elements 12 for accepting shoelaces 15. The lace elements 12 may be stitched or otherwise attached to the upper. Also shown are a toe element 34, a side element 35, an eyelet element 36 and a heel and side element 37. The sole 21 may be of known construction, as discussed above.

The upper of the shoe 30 is preferably formed as a shell, utilizing a substantially continuous piece of a stretchable textile shaped to encapsulate the foot as described above with reference to Fig. 3A. The textile is preferably capable of stretching to conform to the shape of the foot of a wearer, and includes apertures to provide air circulation within the shoe. The stretching characteristics of the textile permit a more even fit across the foot, and allow an upper design that eliminates the tongue normally associated with conventional shoes. The elimination of the tongue results in a lighter-weight, comfortable and less bulky shoe, as shown in Figs. 4A and 4B.

In Figs. 4A and 4B, the pattern of the stitching 4 on the textile layer resembles the cable support structure of a suspension bridge, and provides support for the side walls of the upper. As discussed above regarding Figs. 3A and 3B, the stitching of the upper of Figs. 4A and 4B preferably begins below the lasting margin line 16 so that the sole 21 anchors the initiation points when the sole is attached during construction of the shoe. In the embodiment shown, the stitching 4 surrounds and is attached to each of the plurality of lace elements 12. However, alternate embodiments are contemplated. For example, a collar of leather or like material could be stitched or glued to the upper in the lacing area 31 to which the lace elements 12 would be attached, and the stitching could be anchored by the collar at points near to, or apart from, the lace elements.

Again referring to Figs. 4A and 4B, shoe 30 includes a toe element 34, side elements 35, eyelet elements 36 and a heel and side element 37, which may be made of leather, rubber, polyurethane or other material commonly used in athletic shoes. These elements are

attached to the upper as shown to provide further support for the upper, and/or to anchor the stitching pattern 4. As shown in Fig. 4B, an element 32 is provided for grasping when inserting the foot into the shoe, and the toe element 34 contains an opening 38 wherein the air permeable layer provides for air circulation in the region of the upper foot.

Although preferred embodiments of shoe uppers have been described with reference to Figs. 3A to 4B, the textile layer or layers forming the upper 11 could be formed in sections and attached together by any number of other techniques such as sewing. In addition, one or more of the described toe, side, collar and heel elements could be absent from the upper, and other elements used. Further, although a tongue 14 is shown in Figs. 3A and 3B, the upper 10 could be formed as a substantially continuous piece of stretchable textile so that there is no tongue per se, even though a lacing opening having a plurality of lace elements and laces for cinching by a wearer is present. Each of the lace elements 12 also could be supported by connecting straps, which run from below the lasting line to each lace element. Such straps may be sewn or otherwise attached to the upper and may be made of Kevlar™ or other strong fabric. In addition, the plurality of lace elements 12 could be replaced with conventional eyelets or other lace accepting means, and an eyelet reinforcing member made of leather or the like could be integrated along the length of the lacing opening. Other commonly used attachment means such as hook and loop fasteners could be utilized in a shoe upper made of the described engineered textile to fasten the shoe to the foot.

Figs. 5A-5G illustrate alternate embodiments of the engineered textile in the form of a shoe upper. Fig. 5A shows what is generally known as a stretch sock

40 constructed to conform precisely to the contours of the foot. The stretch sock could be made of air-permeable material such as a mesh, or a waterproof material such as neoprene or coated stretch lycra. The important characteristic is that the sock 40 can stretch, either slightly or greatly depending on its fabric composition. In Fig. 5B a layer of thin non-stretch material 41 has been added. The non-stretch material 41 can be a textile or non-woven material. This layer 41 can be fitted to the inside or outside of the stretch sock 40, may or may not be glued in place, and need not cover all of the area shown. Next, in Fig. 5C a pattern of stitching lines 42, or embroidery stitching lines, is sewn through the sock 40 to form a shoe upper 43. The stitching lines 42 connect the non-stretch material 41 to the stretch sock 40 to strategically limit the stretch capability of the upper 43 in the area of the non-stretchable material. The upper 43 is thus an engineered textile which has been designed to stretch and conform to the foot in only those places where necessary, without additional overlay materials. Fig. 5D illustrates an alternate embodiment shoe upper 44, where the stitching lines 42 have been applied directly to the stretch sock 40. The thickness of the stitch lines and the pattern used determines the amount of support provided to the upper 44. Since the stretch sock 40 is capable of stretching to allow entry of the foot, and then stretching to conform to the foot, the shoe uppers 43, 44 do not require a tongue, laces, or any fastening devices.

Figs. 5E-5G show examples of alternate shapes of non-stretch material overlays 41A, 41B and 41C that could be attached to the stretch sock 40 before stitching lines are applied. Of course, many different shapes of non-stretch material could be applied to other portions

of the stretch sock 40, alternate patterns of stitching lines 42 could be used, and such an engineered textile could be used in a variety of products other than shoe uppers. In addition, the stretchable textile of the sock could be manufactured simultaneously with a non-stretchable material portion or portions, or the stretchable textile and non-stretchable material could be simultaneously fabricated to form an item.

Fig. 6 is a perspective view of a tent 70 employing an engineered textile. The textile may comprise one or more lightweight and durable layers 71, which may be a woven polyester fabric or woven nylon mesh such as Codura™. Alternately, the layer 71 may be a stretch textile as described above. In whichever form, the layer 71 is stretchable, has a tear-strength that is capable of withstanding stresses that may be encountered during use of the tent, and exhibits adequate abrasion qualities to withstand repeated outdoor use. Overlaying the layer 71 is a closely spaced weaving or stitching 72 of suitably strong fiber or thread, shown as being a plurality of substantially triangular shapes, each triangle having its apex at the top of the tent pole and terminating at the bottom of the tent walls. It is preferred that at least some of the stitched support lines 72 terminate at stress points, such as grommets 74. In the example shown, the grommets 74 are used to attach ropes 76 that are attached to stakes 78 to secure the tent to the ground. It may be preferred to utilize a multiple textile layer construction for the tent 70 including an intermediate waterproof insulating layer, especially if the tent is for use under harsh weather conditions.

While the preferred embodiments have been described and shown, it will be obvious to those skilled in the art that various changes and modifications may be

made without departing from the scope of the invention as defined in the appended claims.

What is claimed is:

1. An engineered textile, comprising:
a first stretchable layer; and
stitching lines overlaying the first layer.

2. The textile of claim 1, wherein the first layer is a mesh-like layer having apertures.

3. The textile of claim 2, further comprising a second mesh-like layer having apertures.

4. The textile of claim 3, wherein the second mesh-like layer is cross-woven into the first layer.

5. The textile of claim 3, wherein the second mesh-like layer is attached to the first mesh-like layer by the stitching lines.

6. The textile of claim 3, wherein the apertures of the second mesh-like layer are of a different size than the apertures of the first mesh-like layer.

7. The textile of claim 1, further comprising a second non-stretchable layer applied to at least a portion of the first layer.

8. The textile material of claim 7, wherein the second layer is attached to the first layer by some of the stitching lines.

9. The textile of claim 1, wherein the stitching lines form a pattern that is substantially evenly

distributed across at least a portion of the first layer.

10. The textile of claim 1, wherein the stitching lines form a non-evenly distributed, non-random pattern across at least a portion of the first layer.

11. The textile of claim 1, wherein the stitching lines form a pattern that is substantially random, and wherein the pattern covers at least a portion of the first layer.

12. The textile of claim 1, further comprising a wicking layer.

13. The textile of claim 1, further comprising an insulating layer.

14. An engineered textile, comprising:
a first mesh-like layer having apertures;
a second mesh-like layer having apertures; and
stitching lines overlaying the first and second layers, wherein the stitching lines form a pattern that is substantially evenly distributed across at least a portion of the layers.

15. The textile of claim 14, wherein the second layer is cross-woven into the first layer.

16. The textile of claim 14, wherein the second layer is attached to the first layer by the stitching lines.

17. The textile of claim 14, wherein the apertures of the second mesh-like layer are of a

different size than the apertures of the first mesh-like layer.

18. A method for manufacturing a textile, comprising:

forming a first stretchable layer into the shape of an item; and

stitching an overlaying pattern of lines onto the layer.

19. The method of claim 18, further comprising attaching a second non-stretchable layer to at least a portion of the first layer.

20. The method of claim 15, further comprising attaching a second stretchable layer to at least a portion of the first layer.

21. A shoe upper, comprising:

a mesh-like first layer with apertures; and

stitching lines overlaying the mesh-like layer.

22. The upper of claim 21, further comprising a structure to anchor the initiation points of the stitching lines.

23. The upper of claim 21, further comprising a second air permeable, mesh-like layer having a plurality of apertures.

24. The upper of claim 23, wherein the second mesh-like layer is cross-woven into the first mesh-like layer.

25. The upper of claim 23, wherein the second mesh-like layer is attached by the stitching lines to the first mesh-like layer.

26. The upper of claim 21, wherein the apertures of the second mesh-like layers are of a different size than the apertures of the first mesh-like layer.

27. The upper of claim 21, wherein the stitching lines form a pattern that is substantially evenly distributed across at least a portion of the mesh-like layer.

28. The upper of claim 27, wherein the stitching line pattern resembles a net.

29. The upper of claim 27, wherein the stitching line pattern resembles the cabling of a suspension bridge.

30. The upper of claim 23, further comprising a U-shaped lacing area and attached lace elements.

31. The upper of claim 30, wherein at least some of the stitching lines terminate near the lace elements.

32. The upper of claim 30, wherein at least some of the stitching lines terminate at the lace elements.

33. The upper of claim 21, wherein the mesh-like layer is stretchable in the area over the forefoot so that a tongue is not necessary.

34. A shoe, comprising:

an upper having a mesh-like first layer with apertures;

stitching lines overlaying the mesh-like layer; and

a structure attached to the upper to anchor the initiation points of the stitching lines.

35. The shoe of claim 34, wherein the structure is a shoe sole.

36. The shoe of claim 34, further comprising a second air permeable, mesh-like layer having a plurality of apertures.

37. The shoe of claim 36, wherein the second mesh-like layer is cross-woven into the first mesh-like layer.

38. The shoe of claim 36, wherein the second mesh-like layer is attached by the stitching lines to the first mesh-like layer.

39. The shoe of claim 34, wherein the stitching lines form a pattern that is substantially evenly distributed across at least a portion of the mesh-like layer.

40. The shoe of claim 34, further comprising a U-shaped lacing area in the upper and attached lace elements.

41. The shoe of claim 40, wherein at least some of the stitching lines terminate near the lace elements.

42. The shoe of claim 40, wherein at least some of the stitching lines terminate at the lace elements.

43. The shoe of claim 34, further comprising a toe element attached to the upper.

44. The shoe of claim 34, further comprising a heel element attached to the upper.

45. The shoe of claim 34, further comprising at least one side element attached to the upper.

46. A shoe, comprising:

an upper having first and second textile layers;

stitching lines overlaying the textile layers, wherein the stitching lines form a pattern that is substantially evenly distributed across at least a portion of the layers; and

a structure attached to the upper to anchor the initiation points of the stitching lines.

47. The shoe of claim 46, wherein the structure is a shoe sole.

48. The shoe of claim 46, further comprising a U-shaped lacing area in the upper and attached lace elements.

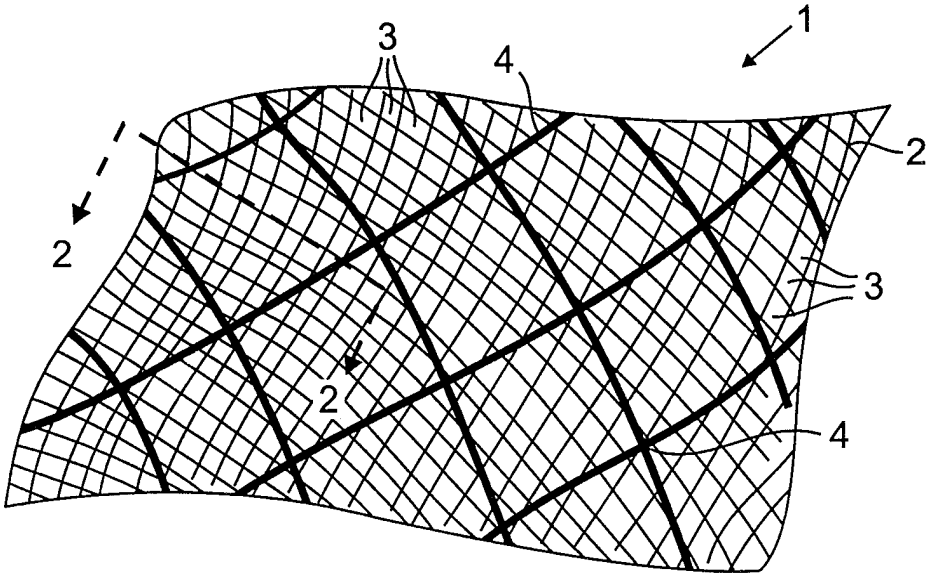

FIG. 1A

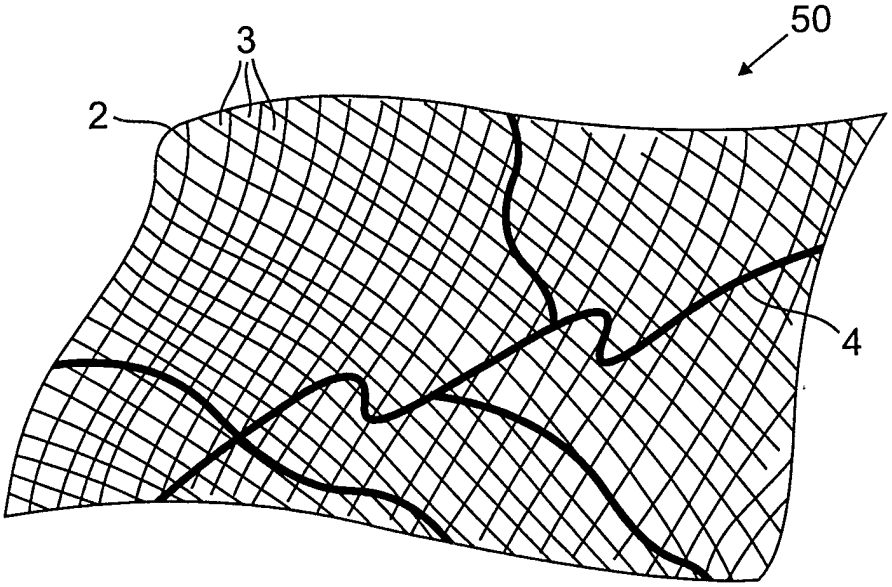

FIG. 1B

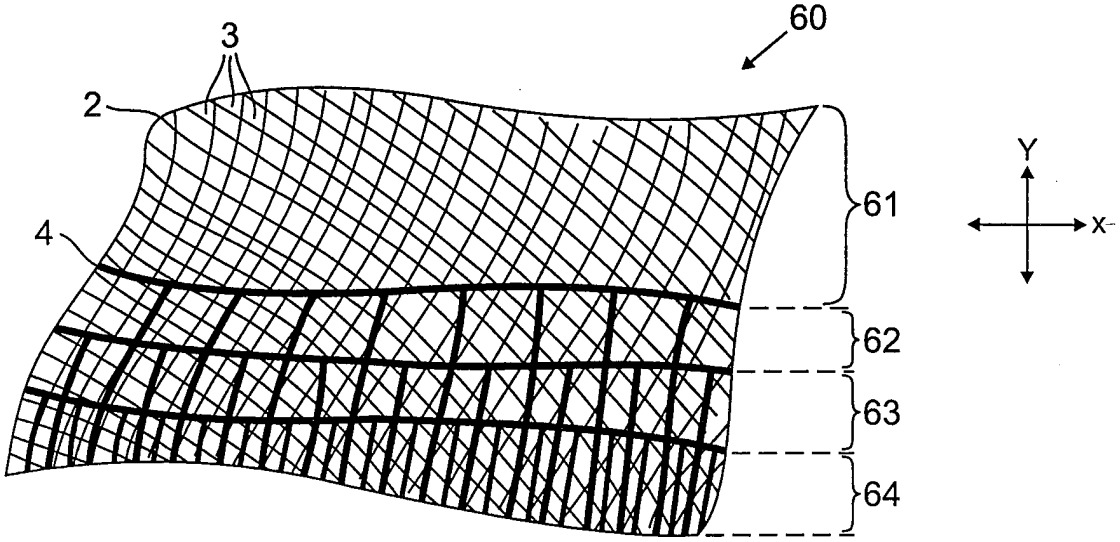

FIG. 1C

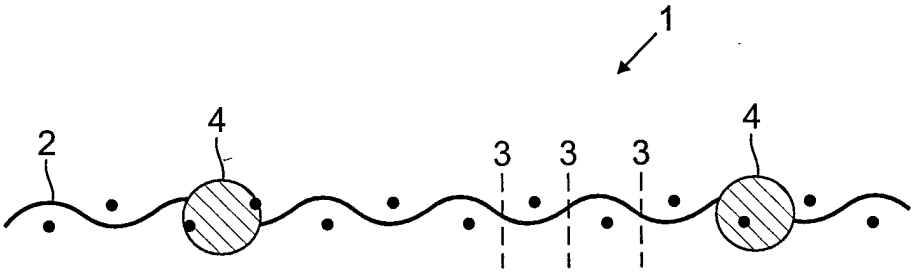

FIG. 2A

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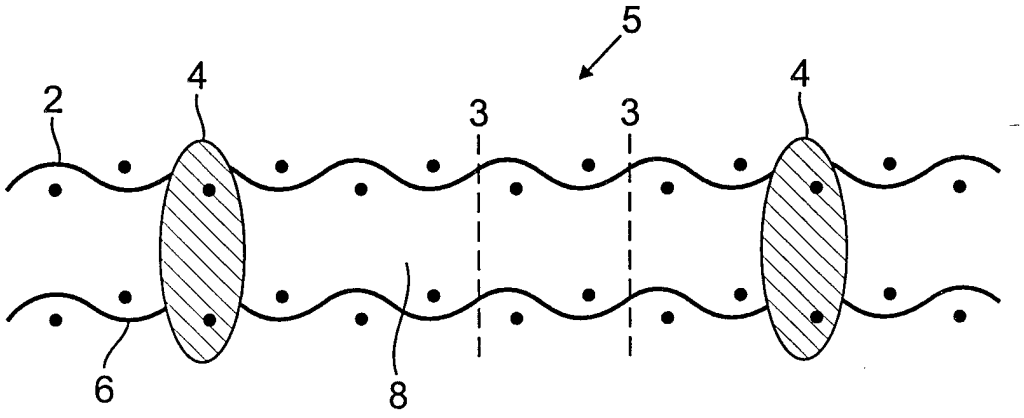

FIG. 2B

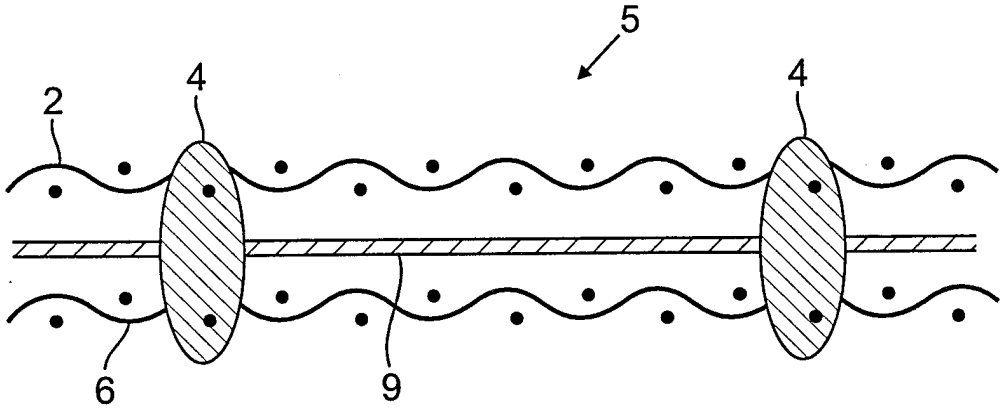

FIG. 2C

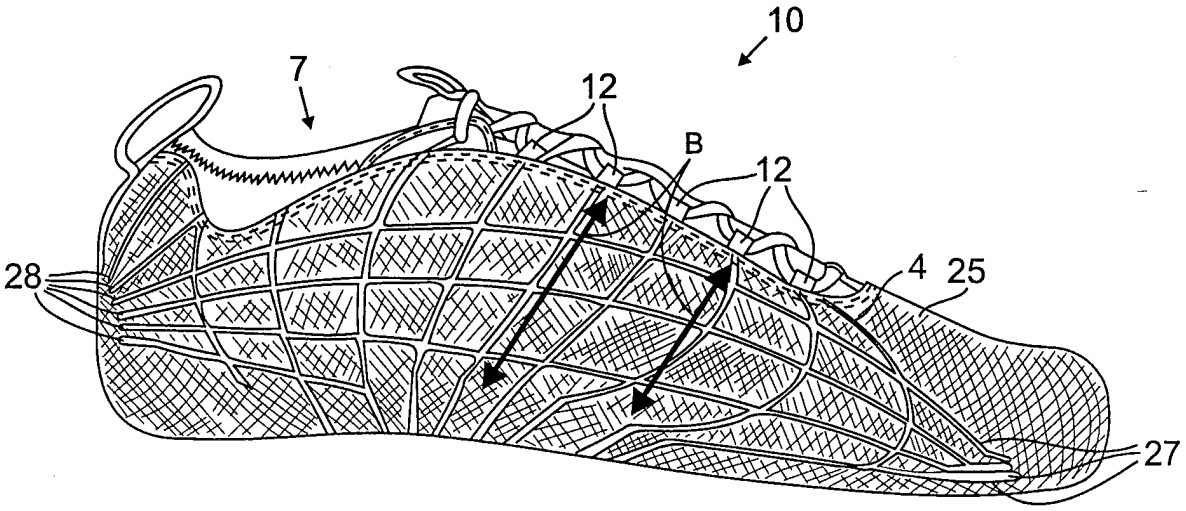

FIG. 3A

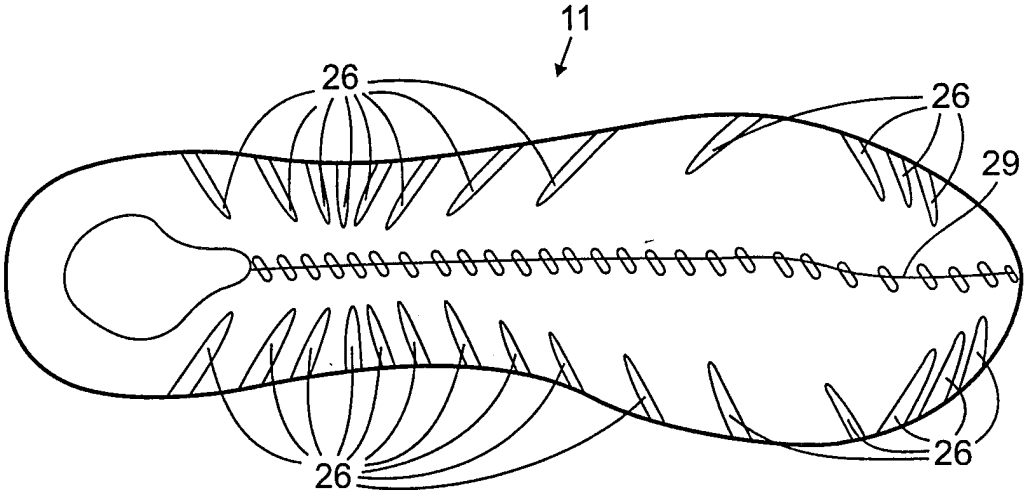

FIG. 3B

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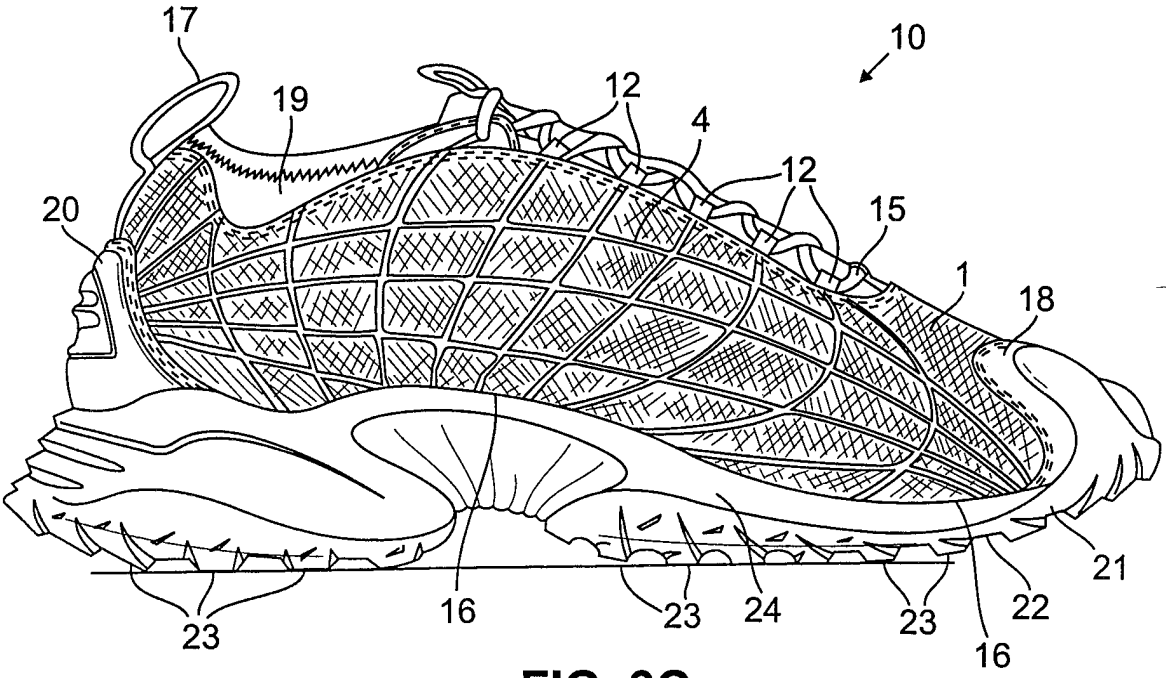

FIG. 3C

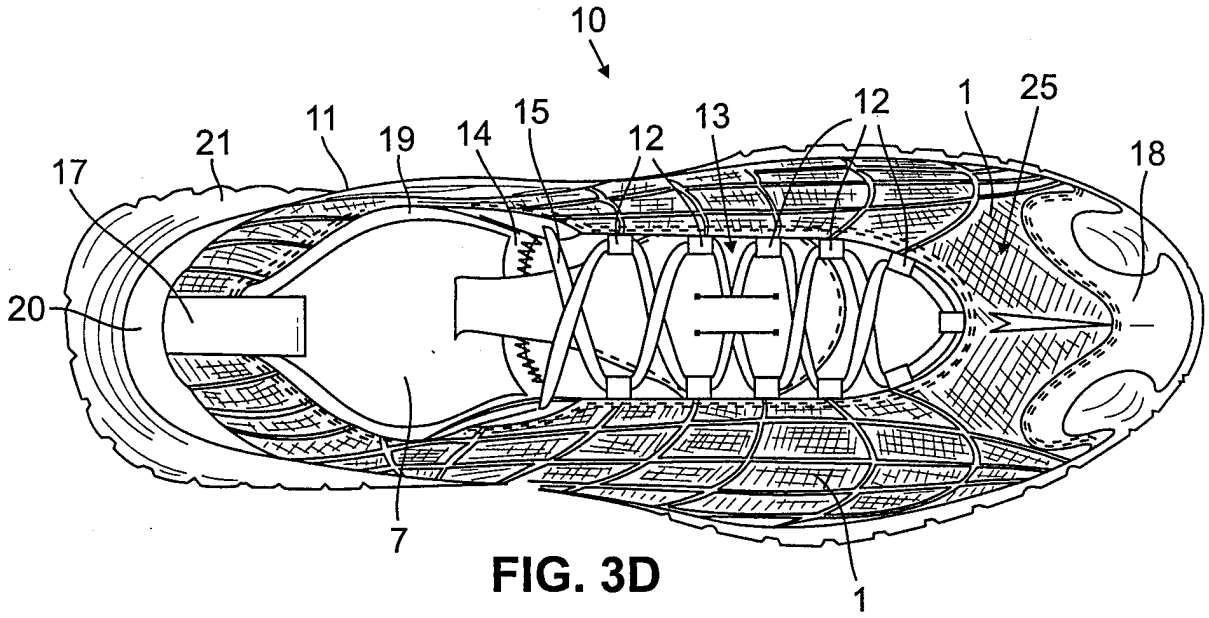

FIG. 3D

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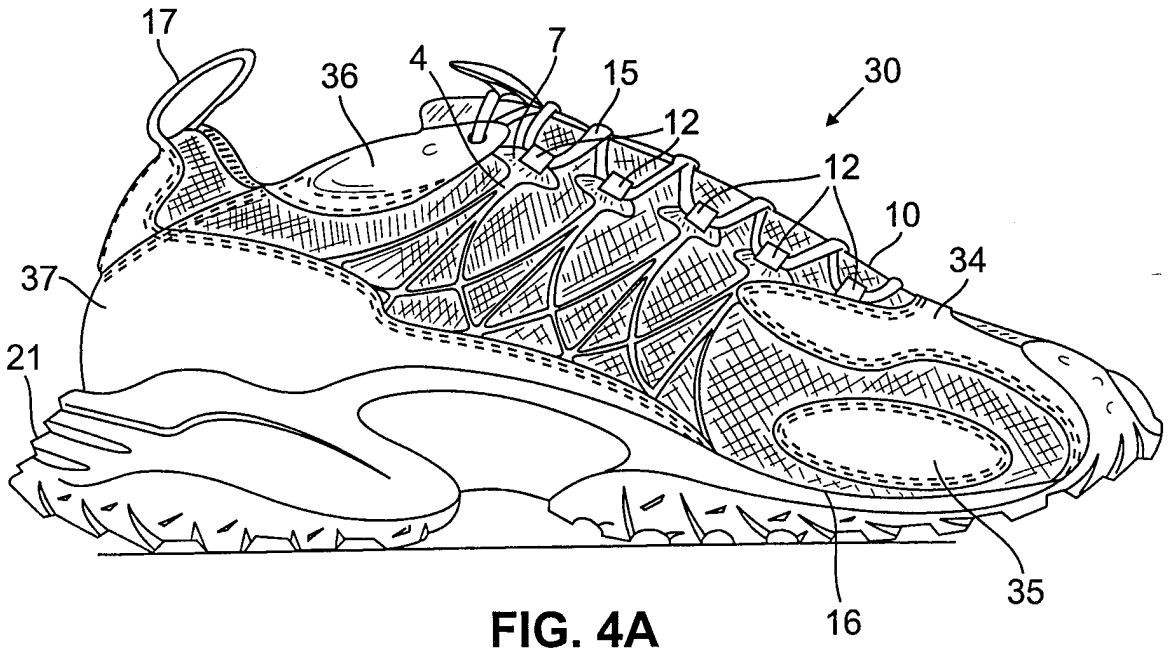

FIG. 4A

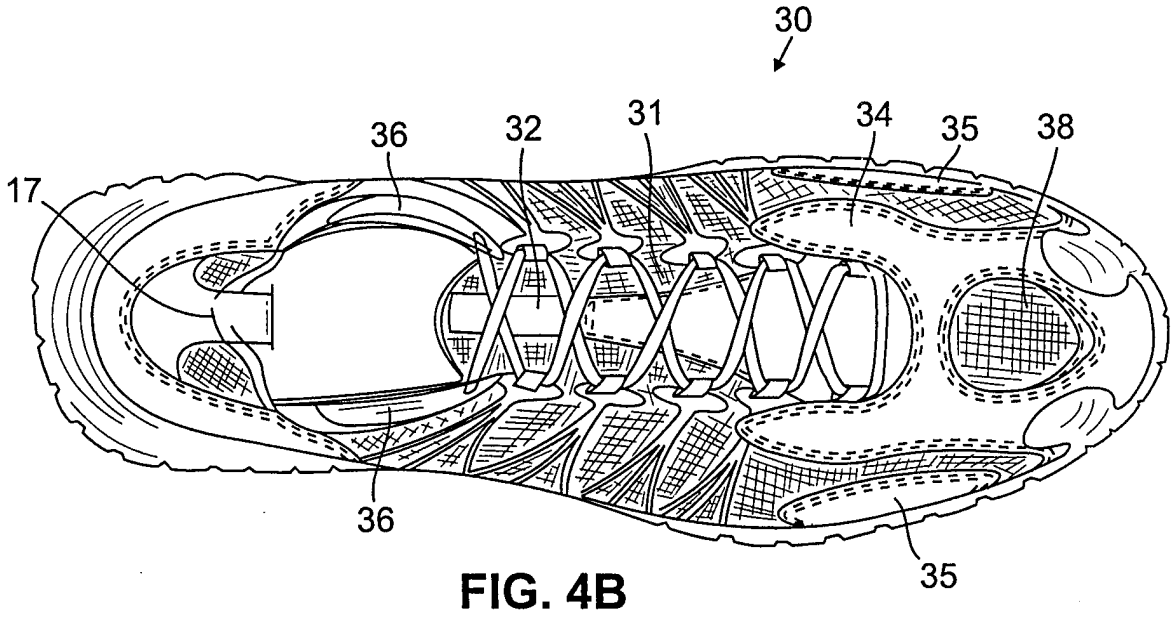

FIG. 4B

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FIG. 5A

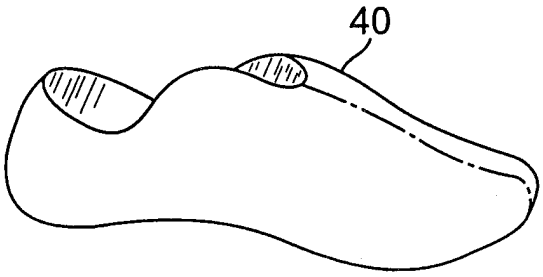


FIG. 5B

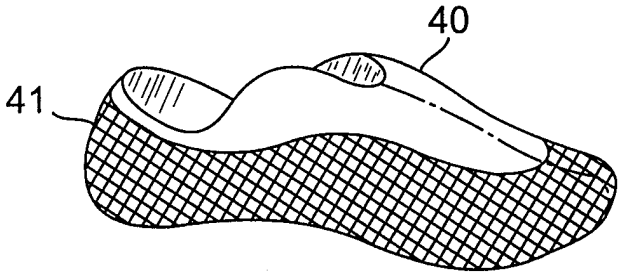


FIG. 5C

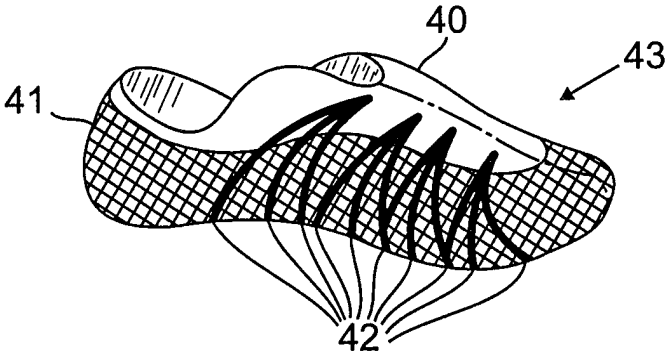


FIG. 5D

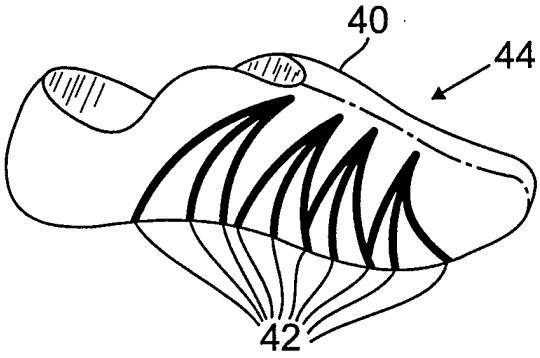


FIG. 5E

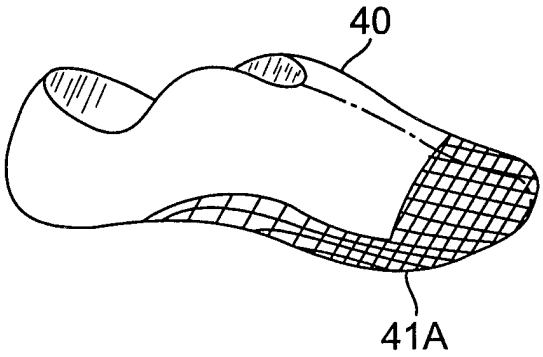


FIG. 5F

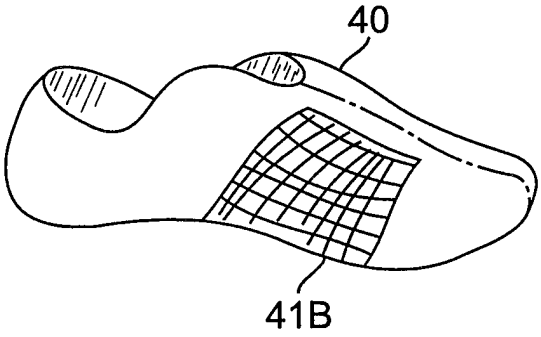
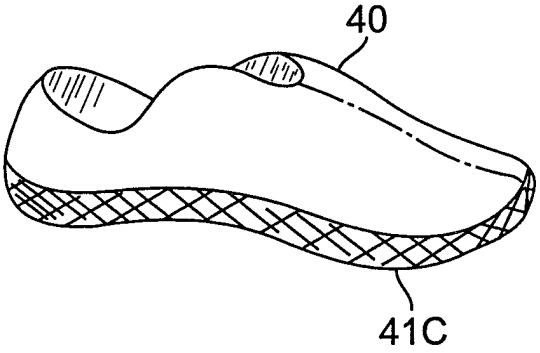


FIG. 5G



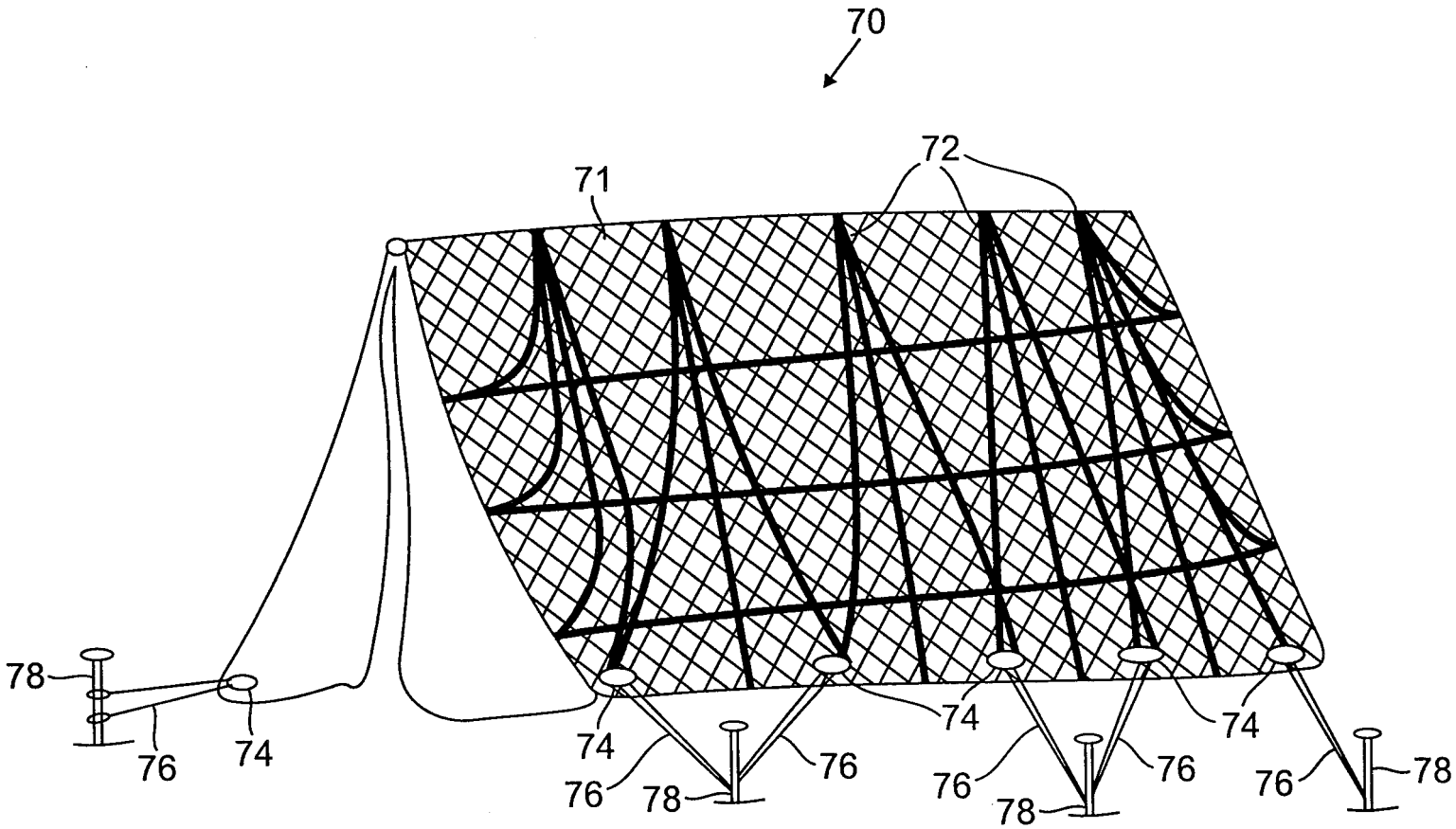


FIG. 6

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INTERNATIONAL SEARCH REPORT

Inter onal Application No
PCT/US 98/06300

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 A43B23/02 D03D1/00

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 6 A43B A41D D04H D03D B32B

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

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 082 824 A (FRANCALANCI NATALINO) 29 June 1983 see page 2, line 21 - line 30; claims 1,2; figure	1,21,34
A	see page 3, line 6 - line 13; claim 4	9-11,22, 27,28, 30,31, 35,39-41

X	FR 2 457 651 A (FRAPIMA SARL) 26 December 1980 see page 2, paragraph 1 - paragraph 9 see page 3, line 13 - line 19 see page 3, line 1 - line 5	1,21,34
A		2,3,5,6, 9,14,16, 25,27, 28,38,39

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
18 August 1998	31/08/1998

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Barathe, R

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Form PCT/ISA/210 (second sheet) (July 1992)

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INTERNATIONAL SEARCH REPORT

Inte onal Application No
PCT/US 98/06300

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
A	GB 1 272 249 A (FREEMAN-HORN COMPANY LIMITED) 26 April 1972 see the whole document -----	1-31

2

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INTERNATIONAL SEARCH REPORT

Information on patent family members

Inte onal Application No
PCT/US 98/06300

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
EP 0082824	A	29-06-1983	NONE	
FR 2457651	A	26-12-1980	NONE	
GB 1272249	A	26-04-1972	NONE	

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