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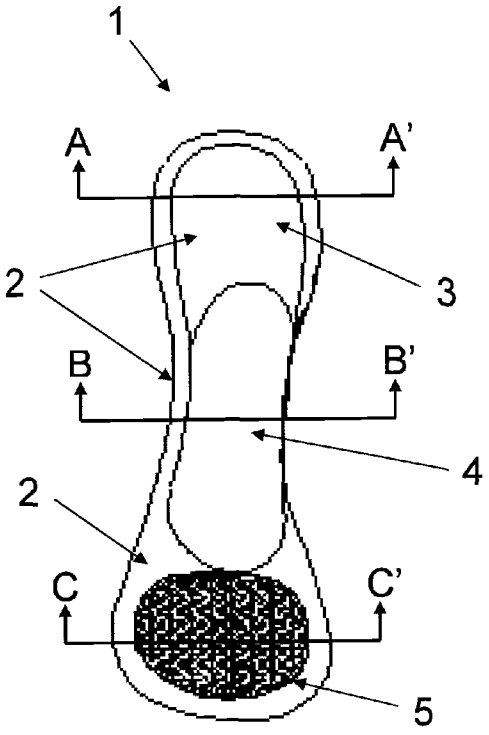

FIG. 1A

(57) Abstract: Disclosed is a footwear insole (1) for increasing comfort in high heel shoes by providing a base layer (2) extending from a heel to a forefoot of a foot, and a raised portion (4) prominent from the top of the base layer and situated substantially under an arch of the foot, in which the raised portion is configured to increase support of the plantar fascia of the foot.

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FOOTWEAR INSOLE FOR HIGH HEEL SHOES

Field of the Invention

[0001] The present invention relates to footwear insoles for increasing comfort in high heel shoes, and methods for using the insoles for increasing comfort in high heel shoes.

Background

[0002] High heel shoes with a heel height of approximately 1.5 inches or more may create changes in body posture, gait, foot pressures, ankle position, etc. during walking. Some of these changes have been well documented.

[0003] For example, increased heel height shifts a body's center of mass forward, mainly due to an increase in forward trunk lean. This shift of the body's center of mass forward has been shown to increase forefoot pressure and loading and has been associated with many foot problems for wearers of high heel shoes.

[0004] In addition, increased heel height causes vertical ground reaction forces to increase during heel strike and forefoot push-off, and stance time to decrease, thereby resulting in increased overall shock applied to the body during walking. Further, stability during the initial heel strike is reduced due to the higher landing height and the narrower landing platform of the heel.

[0005] Moreover, increased heel height places the ankle in a more plantar flexed position. This forces the arch of the foot to be more rigid, preventing movement through the arch's normal range of pronation. Thus, the plantar flexed position of the ankle diminishes the body's natural ability to cushion through pronation the shock applied to the body during walking.

[0006] Footwear insoles are generally inserted into shoes, in order to provide added cushioning or support for the wearer of the shoes. The insoles

may be removable and reusable, and they may be one-size-fits-all, specified shoe sizes, or custom-sized to the wearer.

[0007] Insoles offering additional cushioning by providing one or more cushioning layers to the soles of the wearer's shoes are known in the art. These insoles are generally used to decrease the impact felt by the wearer during walking, jogging, running, or other activities.

[0008] In addition at least one example of an insole device said to be adapted for use in high heel shoes is described in U.S. Patent No. 7,322,132, which, unlike the subject invention, has a crescent shaped apex position to lie under a calcaneus of the foot in a rear region, an apex lying under the second and third metatarsals of the foot in a forward region, and a middle region thinner than the apices of the rear and forward regions.

[0009] Thus there is a need for an insole that is uniquely designed to be worn in high heel shoes and that provides cushioning for comfort but in addition provides additional comfort and stability by its ability to transfer body weight towards the heel of the foot.

Summary

[0010] The invention described herein addresses these objectives by providing a footwear insole for increasing comfort that is specifically adapted to be worn in high heel shoes.

[0011] Thus the invention provides a removable insole for high heel shoes, comprising a base layer comprising a heel region, an arch region and a forefoot region; and a raised portion substantially in the arch region configured to support the plantar fascia of a foot when the foot is inserted in a high heel shoe in contact with the insole.

[0012] In a non-limiting embodiment of the invention, the base layer comprises polyurethane gel.

[0013] In an alternative non-limiting embodiment of the invention, the base layer comprises styrenic gel materials, in particular styrene-ethylene-butadiene-styrene (SEBS) gel.

[0014] In an alternative non-limiting embodiment of the invention, the raised portion comprises a polyurethane gel having a softer durometer than the base layer.

[0015] In an alternative non-limiting embodiment of the invention, the raised portion comprises SEBS gel having a softer durometer than the base layer.

[0016] In an alternative non-limiting embodiment of the invention, the base layer includes an indent under the heel of the foot.

[0017] The invention also provides a high heel shoe comprising an insole comprising a base layer comprising a heel region, an arch region and a forefoot region; and a raised portion substantially in the arch region configured to support the plantar fascia of a foot when the foot is inserted in a high heel shoe.

[0018] In a non-limiting embodiment of the invention, the insole is removable from the high heel shoe.

[0019] In another non-limiting embodiment of the invention, the insole is integrated into the high heel shoe.

[0020] The invention further provides a method for increasing comfort in high heel shoes, the method comprising incorporating in the high heel shoe an insole comprising a base layer comprising a heel region, an arch region and a forefoot region and a raised portion substantially in the arch region configured to support the plantar fascia of a foot when the foot is inserted in a high heel shoe.

[0021] The invention also provides a method for increasing stability during heel strike when walking in high heel shoes, the method comprising incorporating in the high heel shoe an insole comprising a base layer comprising a heel region, an arch region and a forefoot region and a raised

portion substantially in the arch region configured to support the plantar fascia of a foot when the foot is inserted in a high heel shoe.

[0022] The invention also provides a method for increasing stability of landing of a foot when walking in a high heel shoe, the method comprising incorporating in the high heel shoe an insole comprising a base layer comprising a heel region, an arch region and a forefoot region and a raised portion substantially in the arch region configured to support the plantar fascia of a foot when the foot is inserted in a high heel shoe, whereby the raised portion lengthens a heel platform thereby increasing the stability of the landing of the foot.

[0023] The invention further provides a method for reducing pressure exerted on a forefoot when in high heel shoes, the method comprising incorporating in the high heel shoe an insole comprising a base layer comprising a heel region, an arch region and a forefoot region and a raised portion substantially in the arch region configured to support the plantar fascia of a foot when the foot is inserted in a high heel shoe shifting body weight back to the heel by the raised portion, thereby reducing pressure in the forefoot.

[0024] Other features and aspects of the present invention will become more fully apparent from the following brief description of the drawings, the detailed description of the non-limiting embodiments, the appended claims and the accompanying drawings.

Brief Description of the Drawings

[0025] FIG. 1A is a top view of an embodiment of an exemplary footwear insole for high heel shoes, in accordance with the present invention.

[0026] FIG. 1B is a side view of the embodiment of the exemplary footwear insole for high heel shoes, in accordance with the present invention.

[0027] FIG. 1C is a bottom view of the embodiment of the exemplary footwear insole for high heel shoes, in accordance with the present invention.

[0028] FIG. 2A is a cross-sectional view, along line A-A' shown in FIG. 1A, of the embodiment of the exemplary footwear insole for high heel shoes, in accordance with the present invention.

[0029] FIG. 2B is a cross-sectional view, along line B-B' shown in FIG. 1A, of the embodiment of the exemplary footwear insole for high heel shoes, in accordance with the present invention.

[0030] FIG. 2C is a cross-sectional view, along line C-C shown in FIG. 1A, of the embodiment of the exemplary footwear insole for high heel shoes, in accordance with the present invention.

[0031] FIG. 2D is a front view of the embodiment of the exemplary footwear insole for high heel shoes, in accordance with the present invention.

[0032] FIG. 3A shows group means data for maximum force for 1.5 inch high heel shoes with no insoles, and 1.5 inch high heel shoes with insoles according to the present invention.

[0033] FIG. 3B shows group means data for peak pressure for 1.5 inch high heel shoes with no insoles, and 1.5 inch high heel shoes with insoles according to the present invention.

[0034] FIG. 3C shows group means data for contact time for 1.5 inch high heel shoes with no insoles, and 1.5 inch high heel shoes with insoles according to the present invention.

[0035] FIG. 3D shows group means data for contact area for 1.5 inch high heel shoes with no insoles, and 1.5 inch high heel shoes with insoles according to the present invention.

[0036] FIG. 3E shows group means data for maximum force for 3.0 inch high heel shoes with no insoles, and 3.0 inch high heel shoes with insoles according to the present invention.

[0037] FIG. 3F shows group means data for peak pressure for 3.0 inch high heel shoes with no insoles, and 3.0 inch high heel shoes with insoles according to the present invention.

[0038] FIG. 3G shows group means data for contact time for 3.0 inch high heel shoes with no insoles, and 3.0 inch high heel shoes with insoles according to the present invention.

[0039] FIG. 3H shows group means data for contact area for 3.0 inch high heel shoes with no insoles, and 3.0 inch high heel shoes with insoles according to the present invention.

[0040] FIG. 4A shows a bar graph of group means data for maximum force for 1.5 inch high heel shoes with no insoles, and 1.5 inch high heel shoes with insoles according to the present invention.

[0041] FIG. 4B shows a bar graph of group means data for peak pressure for 1.5 inch high heel shoes with no insoles, and 1.5 inch high heel shoes with insoles according to the present invention.

[0042] FIG. 4C shows a bar graph of group means data for contact time for 1.5 inch high heel shoes with no insoles, and 1.5 inch high heel shoes with insoles according to the present invention.

[0043] FIG. 4D shows a bar graph of group means data for contact area for 1.5 inch high heel shoes with no insoles, and 1.5 inch high heel shoes with insoles according to the present invention.

[0044] FIG. 5A shows a bar graph of group means data for maximum force for 3.0 inch high heel shoes with no insoles, and 3.0 inch high heel shoes with insoles according to the present invention.

[0045] FIG. 5B shows a bar graph of group means data for peak pressure for 3.0 inch high heel shoes with no insoles, and 3.0 inch high heel shoes with insoles according to the present invention.

[0046] FIG. 5C shows a bar graph of group means data for contact time for 3.0 inch high heel shoes with no insoles, and 3.0 inch high heel shoes with insoles according to the present invention.

[0047] FIG. 5D shows a bar graph of group means data for contact area for 3.0 inch high heel shoes with no insoles, and 3.0 inch high heel shoes with insoles according to the present invention.

[0048] FIG. 6A is a pressure map of feet wearing high heel shoes with no insole.

[0049] FIG. 6B is a pressure map of feet wearing high heel shoes with the embodiment of the exemplary footwear insole for high heel shoes, in accordance with the present invention.

[0050] FIG. 7A is another pressure map of feet wearing high heel shoes with no insole.

[0051] FIG. 7B is another pressure map of feet wearing high heel shoes with the embodiment of the exemplary footwear insole for high heel shoes, in accordance with the present invention.

Detailed Description of the Embodiments

[0052] Figures 1 and 2 depict an embodiment of an exemplary footwear insole 1 for high heel shoes, in accordance with the present invention. Although the Figures show a right-footed embodiment of the exemplary footwear insole 1, it is to be understood that a left-footed embodiment of the exemplary footwear insole 1 would be a mirror image of the Figures shown.

[0053] Figures 1A to 1C, and 2D show different views of an embodiment of an exemplary footwear insole 1 for high heel shoes. FIG. 1A is a top view, FIG. I B is a side view, FIG. 1C is a bottom view, and FIG. 2D is a front view of the embodiment of the exemplary footwear insole 1. Figures 1A, 1B, 1C, and 2D show a base layer 2 extending between a heel region 3 and a forefoot region 5 of the insole 1. The base layer 2 may extend from the region 3 underneath the heel to a region 5 underneath the forefoot but preferably not underneath the toes of the foot. However, it is understood that in use with smaller feet, e.g., Women's (US) size 5 and smaller, there may be some contact between the base layer and the toes. Preferably, the base layer 2 may have a length of 190.0 ± 4.0 mm, and a width in the forefoot region 5 of 64.0 ± 3.0 mm. The base layer 2 may be made of polyurethane gel, SEBS gel or any other similar material. In certain embodiments the base layer will have a Shore 000 durometer of between about 58 to about 74, and preferably

about 66. Optionally, the base layer 2 may include an indent or heel cup (not shown) in the heel region 3, into which the heel of the foot may fit.

[0054] Figures 1A, 1B, and 2D also show a raised portion 4 in the arch region prominent from the top surface of the base layer 2, i.e., the surface in contact with the bottom of a foot when in use. The raised portion 4 is configured so as to be approximately underneath the arch of the foot, more particularly in contact with the central area of the arch region of the foot so as to support the plantar fascia when the foot is in the high heel shoe. Preferably raised portion 4 is configured so as to support the plantar fascia distal to the calcaneus. The raised portion 4 may be made of polyurethane gel, SEBS gel or any other similar material. Preferably, raised portion 4 has a softer durometer range than the base layer 2. In certain embodiments raised portion 4 will have a Shore 000 durometer of between about 22 to about 38, and preferably about 30. In certain embodiments raised portion 4 has a compliant, tactile feel and may conform to the shape of the arch of the foot, preferably substantially under the plantar fascia of the foot, when the foot is inserted in the shoe. Further, raised portion 4 is configured to allow the foot to sink into the insole 1 and increase stability during heel strike.

[0055] Figures 2A, 2B, and 2C show different cross-sectional views of the embodiment of the exemplary footwear insole 1 for high heel shoes. Figure 2A shows a cross-sectional view in the heel region 3 along line A-A' shown in Figure 1A, Figure 2B shows a cross-sectional view through the arch region and raised portion 4 along line B-B' shown in Figure 1A, and Figure 2C shows a cross-sectional view in the forefoot region 5 along line C-C shown in Figure 1A.

[0056] In the cross-sectional view of Figure 2A, the base layer 2 has an approximately uniform thickness in the heel region 3. Preferably, the base layer 2 may have a thickness of 1.7 ± 1.0 mm in the heel region 3. If the heel region 3 includes an optional indent or heel cup (not shown), the cross-sectional view of Figure 2A may include a corresponding varying thickness of the base layer 2 in the heel region 3. In the cross-sectional view of Figure 2C,

the base layer 2 also has an approximately uniform thickness underneath the forefoot region 5. Preferably, the base layer 2 may have a thickness of 1.7 ± 0.5 mm in the forefoot region 5.

[0057] In the cross-sectional view of Figure 2B, the base layer 2 has an approximately uniform thickness underneath the arch of the foot. The raised portion 4 is prominent from the top surface of the base layer 2 and provides an increased thickness of the insole 1. The raised portion is preferably situated substantially centrally between the medial and lateral arch of a foot when the foot is in contact with the insole. Preferably, the raised portion 4 may have a maximum thickness of 6.7 ± 1.5 mm in the area of the crest 6.

[0058] By providing increased thickness of the insole 1 centrally underneath the arch region of the foot by raised portion 4 according to the present invention, the insole 1 creates more contact between the foot and shoe in the area of the plantar fascia of the foot when wearing high heel shoes. In addition, the insole 1 according to the present invention may reduce pressures under the ball of the foot in the forefoot region 5 when wearing high heel shoes.

[0059] Further, the insole 1 according to the present invention may have the effect of lengthening the heel platform and/or cupping the heel to increase the stability of landing. In addition, the insole 1 may allow the body's weight to be shifted back towards the heel region 3 to relieve excess pressure in the forefoot region 5, by increasing the heel landing platform and/or arch contact. Moreover, the insole 1 may increase arch contact by the prominent raised portion 4 during walking to facilitate a more natural walking stride. Furthermore, the insole 1 may improve posture by increasing comfort in high heel shoes, according to one or a combination of the above features.

[0060] In a preferred non-limiting embodiment of the present invention, the insole 1 may be a 3/4 length insole which extends longitudinally forward from the heel region 3 to a position in the forefoot region 5 rearward of the toes of the foot. The insole 1 may include a base layer 2 and a raised portion 4 prominent from the top surface of the base layer 2 substantially underneath

the arch of the foot. In addition, the raised portion 4 may include a crest 6 that fits into the arch of the foot, particularly in contact with the arch region of the foot to support the plantar fascia, when the foot is in the high heel shoe. Preferably raised portion 4 is configured so as to support the plantar fascia distal to the calcaneus. The base layer 2 may be made of polyurethane gel, and the arch bump 4 may be made of a polyurethane gel or SEBS gel or similar material softer than the material of the base layer 2. Further, the heel region 3 may include an indent or heel cup into which the heel of the foot may fit. The insole 1 may increase maximum force, peak pressure, and contact area in the arch of the foot while reducing maximum force and peak pressures in the heel region 3 and the forefoot region 5.

[0061] A method of using an insole 1 for increasing comfort in high heel shoes may comprise the step of increasing contact with an arch of a foot by a raised portion 4, in which the insole 1 includes a base layer 2 extending from a heel region 3 to a forefoot region 5 of the foot, and a raised portion 4 attached to the base layer 2 and situated in the arch region of the insole.

[0062] The method of using an insole 1 thus also provides a method for increasing stability during heel strike when walking in high heel shoes.

[0063] The method of using an insole 1 thus also provides a method for increasing stability during heel strike when walking in high heel shoes.

[0064] The method of using an insole 1 thus also provides a method for increasing stability of landing of a foot when walking in a high heel shoe whereby the raised portion 4 lengthens the heel platform of the shoe thereby increasing the stability of the landing of the foot.

[0065] The method of using the insole thus also provides a method for reducing pressure exerted on a forefoot when in high heel shoes a raised portion 4 substantially in the arch region configured to support the plantar fascia of a foot when the foot is inserted in a high heel shoe shifts body weight back to the heel region 3 by the raised portion 4, thereby reducing pressure in the forefoot.

[0066] Methods of manufacturing insoles from polyurethane or styrenic gels or similar materials are known in the art. Representative methods are disclosed in U.S. Patent Application Publication No. 20060026865 and references cited therein. The disclosure of that publication is hereby incorporated in its entirety into the present specification.

Experimental Procedures and Data

[0067] Embodiments of the exemplary footwear insole 1 for high heel shoes of the present invention were tested for increasing contact in the arch of the foot and reducing pressures in the forefoot region 3 of the foot. Ten female subjects were recruited for evaluation of the exemplary footwear insole 1 for high heel shoes. The subjects were screened based on a number of criteria including, for example, age, height, weight, foot size, general health, and others. In particular, subjects were required to have worn high heel shoes at least 1.5 inches high for a minimum of three days per week prior to the study.

[0068] For each subject, a Novel Electronics Pedar® measurement system was used to measure underfoot pressure. The system consisted of thin measurement insoles that were placed inside high heel shoes. Data were collected at 100 Hz, and the measured pressure and contact area output were used to calculate force. In addition, data were analyzed over the entire foot and within various sections of the foot.

[0069] Embodiments of the exemplary footwear insole 1 for high heel shoes were tested in two heel heights: 1.5 inches and 3.0 inches. All trials were conducted with subjects wearing the same brand and style of high heel shoes, except for a single subject due to shoe size accommodations.

[0070] The subjects randomly tested four experimental conditions: 1.5 inch heels with no insoles; 1.5 inch heels with insoles; 3.0 inch heels with no insoles; and 3.0 inch heels with insoles. Further, five trials were collected for each experimental condition for each subject. A trial consisted of a 20 meter walk at a self-selected pace.

[007 1] For each condition, the mean and standard deviation of peak pressure were calculated from the five trials. The two trials furthest from the mean were discarded, and the remaining three trials were further analyzed. For each of the three remaining trials, values for right and left feet were averaged together and then the three trials for each condition were averaged. The data were analyzed over the entire foot and within various sections of the foot. A paired T-test was used to compare group means within each heel height condition over the total foot and within the various sections of the foot (heel, arch, ball of foot, lateral forefoot, first toe, and toes). Statistical significance level was chosen to be $p \leq 0.05$.

[0072] The data are provided in Figures 3A to 3H. Figure 3A shows group means data for maximum force for 1.5 inch high heel shoes with no insoles, and 1.5 inch high heel shoes with insoles according to the present invention. As can be seen from the data, the maximum force at the heel, lateral forefoot, 1st toe, and toes decreases while the maximum force at the arch increases when using exemplary insoles according to the present invention.

[007 3] Figure 3B shows group means data for peak pressure for 1.5 inch high heel shoes with no insoles, and 1.5 inch high heel shoes with insoles according to the present invention. As can be seen from the data, the peak pressure at the heel, 1st toe, and toes decreases while the peak pressure at the arch increases when using exemplary insoles according to the present invention.

[007 4] Figure 3C shows group means data for contact time for 1.5 inch high heel shoes with no insoles, and 1.5 inch high heel shoes with insoles according to the present invention. As can be seen from the data, the contact time increases at both the heel and the arch when using exemplary insoles according to the present invention.

[007 5] Figure 3D shows group means data for contact area for 1.5 inch high heel shoes with no insoles, and 1.5 inch high heel shoes with insoles according to the present invention. As can be seen from the data, the contact

area at the heel decreases while the contact area at the arch increases when using exemplary insoles according to the present invention.

[007 6] Figure 3E shows group means data for maximum force for 3.0 inch high heel shoes with no insoles, and 3.0 inch high heel shoes with insoles according to the present invention. As can be seen from the data, the maximum force at the heel, ball, lateral forefoot, 1st toe, and toes decreases while the maximum force at the arch increases when using exemplary insoles according to the present invention.

[007 7] Figure 3F shows group means data for peak pressure for 3.0 inch high heel shoes with no insoles, and 3.0 inch high heel shoes with insoles according to the present invention. As can be seen from the data, the peak pressure at the heel, ball, and toes decreases while the peak pressure at the arch increases when using exemplary insoles according to the present invention.

[0078] Figure 3G shows group means data for contact time for 3.0 inch high heel shoes with no insoles, and 3.0 inch high heel shoes with insoles according to the present invention. As can be seen from the data, the contact time decreases at both the heel and the arch when using exemplary insoles according to the present invention.

[007 9] Figure 3H shows group means data for contact area for 3.0 inch high heel shoes with no insoles, and 3.0 inch high heel shoes with insoles according to the present invention. As can be seen from the data, the contact area at the heel decreases while the contact area at the arch increases when using exemplary insoles according to the present invention.

[0080] Figures 4A to 4D, and 5A to 5D graphically represent the data in Figures 3A to 3H. The asterisks highlighting various data points in Figures 4A to 4D, and 5A to 5D indicate data points having statistical significance, as set forth above. The remaining data points show trends in the data but may not include enough samples to achieve statistical significance.

[008 1] Figure 4A shows the maximum force group means for 1.5 inch heels, corresponding to the data of Figure 3A. These results show a

statistically significant reduction in maximum force in the toe area of the foot when using insoles 1 according to the present invention, as well as a decrease in maximum force in the heel and an increase in maximum force in the arch of the foot.

[0082] Figure 4B shows the peak pressure group means for 1.5 inch heels, corresponding to the data of Figure 3B. These results show a statistically significant reduction in peak pressure in the heel and the toe area of the foot when using insoles 1 according to the present invention, as well as an increase in peak pressure in the arch of the foot.

[0083] Figure 4C shows the contact time group means for 1.5 inch heels, corresponding to the data of Figure 3C. These results show an increase in contact time in both the heel and the arch when using insoles 1 according to the present invention.

[0084] Figure 4D shows the contact area group means for 1.5 inch heels, corresponding to the data of Figure 3D. These results show a statistically significant increase in contact area in the arch when using insoles 1 according to the present invention, as well as a decrease in contact area in the heel.

[0085] Figure 5A shows the maximum force group means for 3.0 inch heels, corresponding to the data of Figure 3E. These results show a statistically significant reduction in maximum force in the ball of foot area and a statistically significant increase in maximum force in the arch of the foot when using insoles 1 according to the present invention, as well as decreases in maximum force in the heel, lateral forefoot, first toe, and toes.

[0086] Figure 5B shows the peak pressure group means for 3.0 inch heels, corresponding to the data of Figure 3F. These results show a decrease in peak pressure in the heel, ball of foot, and toe areas, and an increase in peak pressure in the arch when using insoles 1 according to the present invention.

[0087] Figure 5C shows the contact time group means for 3.0 inch heels, corresponding to the data of Figure 3G. These results show a

statistically significant decrease in contact time in the arch when using insoles 1 according to the present invention, as well as a decrease in contact time in the heel.

[0088] Figure 5D shows the contact area group means for 3.0 inch heels, corresponding to the data of Figure 3H. These results show a statistically significant increase in contact area in the arch and a statistically significant decrease in contact area in the heel when using insoles 1 according to the present invention.

[0089] Based on the above data and graphs in Figures 3A to 3H, 4A to 4D, and 5A to 5D, exemplary insoles 1 according to the present invention create a change in the force and pressure dynamic, as well as a change in the contact dynamic. Generally, maximum force and peak pressure are reduced in the heel and forefoot regions, whereas maximum force and peak pressure are increased in the arch area. In addition, contact area is reduced in the heel region, whereas contact area is increased in the arch area.

[0090] Moreover, Figures 6A and 6B show one example set of pressure maps of feet wearing high heel shoes with no insoles (Fig. 6A) and with exemplary insoles (Fig. 6B), in accordance with the present invention. Further, Figures 7A and 7B show another example set of pressure maps of feet wearing high heel shoes with no insoles (Fig. 7A) and with exemplary insoles (Fig. 7B), in accordance with the present invention. In the pressure maps of these Figures, pressure is indicated on a scale ranging from relative low pressure P1 to relative high pressure P6. As can be seen in the Figures, when using insoles 1 according to the present invention, pressure is decreased in the forefoot and heel regions of the feet, while pressure is increased in the arches of the feet. These changes are shown in Figures 6B and 7B by smaller and fewer areas of high pressure in the forefoot and heel regions of the feet, and by markedly larger areas of increased pressure in the arches of the feet. In particular, in Figures 6B and 7B the increase in pressure under the metatarsals along the lateral side of the foot, in the region of the cuboid and distal thereof, demonstrates the effect of the centrally

located raised portion of the insole as opposed to a normal arch support which would show pressure in the medial arch.

[0091] Based on the above experimental data and results, significant positive effects were seen at both heel heights when using insoles 1 according to the present invention. The positive effects were more pronounced in the 3.0 inch heels than in the 1.5 inch heels. In the 3.0 inch heels, the results show that maximum force due to body weight was shifted significantly from the ball of foot to the arch when using insoles 1 according to the present invention. In addition, contact area in the arch increased significantly when using insoles 1 according to the present invention. Thus, the exemplary insoles 1 achieve a reduction in the force and pressure under the ball of the foot due to body weight by increasing contact area under the arch, thereby shifting the body's weight from the ball of the foot to the arch.

[0092] The foregoing description discloses only non-limiting embodiments of the present invention. Modification of the above-disclosed footwear insole for high heel shoes, as well as methods for using the same, which fall within the scope of the invention, will be readily apparent to those of ordinary skill in the art.

[0093] Accordingly, while the present invention has been disclosed in connection with the above non-limiting embodiments, it should be understood that other embodiments may fall within the spirit and scope of the invention, as defined by the following claims.

What Is Claimed Is:

1. A removable insole for high heel shoes, comprising:

a base layer comprising a heel region, an arch region and a forefoot region;

and a raised portion substantially in the arch region configured to support the plantar fascia of a foot when the foot is inserted in a high heel shoe in contact with the insole.

2. The insole of claim 1 wherein the raised portion is configured to support the plantar fascia distal to the calcaneus of the foot.

3. The insole of claim 1 wherein the raised portion is configured substantially centrally between the medial and lateral arch of a foot when the foot is in contact with the insole.

4. The insole of claim 1, wherein the insole is a non-planar structure.

5. The insole of claim 1, wherein the base layer comprises polyurethane gel.

6. The insole of claim 1, wherein the base layer comprises an SEBS gel.

7. The insole of claim 1, wherein the raised portion comprises polyurethane gel.

8. The insole of claim 1, wherein the raised portion comprises SEBS gel.

9. The insole of claim 1, wherein the raised portion comprises a material having a softer durometer than the base layer.

10. The insole of claim 1, wherein the base layer has a Shore 000 durometer between about 58 and about 74.

11. The insole of claim 10, wherein the base layer has a Shore 000 (.urometer of about 66.

12. The insole of claim 1, wherein the raised portion has a Shore 000 (.urometer between about 22 to about 38

13. The insole of claim 12, wherein the raised portion has a Shore 000 durometer of about 30.

14. The insole of claim 1, wherein the raised portion is configured to lengthen the heel platform of the shoe.

15. The insole of claim 1, wherein the base layer includes an indent in the heel region.

16. A high heel shoe comprising an insole comprising:

a base layer comprising a heel region, an arch region and a forefoot region;

and a raised portion substantially in the arch region configured to support the plantar fascia of a foot when the foot is inserted in a high heel shoe.

17. The high heel shoe of claim 16, wherein the insole is a removable insole.

18. The high heel shoe of claim 16, wherein the insole is integrated into the shoe.

19. A method for increasing comfort in high heel shoes, the method comprising incorporating in the high heel shoe an insole comprising a base layer comprising a heel region, an arch region and a forefoot region and a raised portion substantially in the arch region configured

to support the plantar fascia of a foot when the foot is inserted in a high heel shoe.

20. The method of claim 19, wherein the insole is a removable insole.

21. The method of claim 19, wherein the insole is integrated into the shoe.

22. The method of claim 19, wherein the base layer comprises polyurethane gel.

23. The method of claim 19, wherein the base layer comprises an SEBS gel.

24. The method of claim 19, wherein the raised portion comprises polyurethane gel.

25. The method of claim 19, wherein the raised portion comprises SEBS gel.

26. The method of claim 19, wherein the raised portion comprises a material having a softer durometer than the base layer.

27. The method of claim 19, wherein the base layer has a Shore 000 durometer between about 58 and about 74.

28. The method of claim 19, wherein the base layer has a Shore 000 durometer of about 66.

29. The method of claim 19, wherein the raised portion has a Shore 000 durometer between about 22 to about 38

30. The method of claim 19, wherein the raised portion has a Shore 000 durometer of about 30.

31. A method for increasing stability during heel strike when walking in high heel shoes, the method comprising incorporating in the high heel shoe an insole comprising a base layer comprising a heel region, an arch region and a forefoot region and a raised portion substantially in the arch region configured to support the plantar fascia of a foot when the foot is inserted in a high heel shoe.

32. The method of claim 31, wherein the insole is a removable insole.

33. The method of claim 31, wherein the insole is integrated into the shoe.

34. The method of claim 31, wherein the base layer comprises polyurethane gel.

35. The method of claim 31, wherein the base layer comprises an SEBS gel.

36. The method of claim 31, wherein the raised portion comprises polyurethane gel.

37. The method of claim 31, wherein the raised portion comprises SEBS gel.

38. The method of claim 31, wherein the raised portion comprises a material having a softer durometer than the base layer.

39. The method of claim 31, wherein the base layer has a Shore 000 durometer between about 58 and about 74.

40. The method of claim 39, wherein the base layer has a Shore 000 durometer of about 66.

41. The method of claim 31, wherein the raised portion has a Shore 000 durometer between about 22 to about 38

42. The method of claim 41, wherein the raised portion has a Shore 000 durometer of about 30.

43. A method for increasing stability of landing of a foot when walking in a high heel shoe, the method comprising incorporating in the high heel shoe an insole comprising a base layer comprising a heel region, an arch region and a forefoot region and a raised portion substantially in the arch region configured to support the plantar fascia of a foot when the foot is inserted in a high heel shoe, whereby the raised portion lengthens a heel platform thereby increasing the stability of the landing of the foot.

44. The method of claim 43, wherein the insole is a removable insole.

45. The method of claim 43 wherein the insole is integrated into the shoe.

46. The method of claim 43, wherein the base layer comprises polyurethane gel.

47. The method of claim 43, wherein the base layer comprises an SEBS gel.

48. The method of claim 43, wherein the raised portion comprises polyurethane gel.

49. The method of claim 43, wherein the raised portion comprises SEBS gel.

50. The method of claim 43, wherein the raised portion comprises a material having a softer durometer than the base layer.

51. The method of claim 43, wherein the base layer has a Shore 000 durometer between about 58 and about 74.

52. The method of claim 51 wherein the base layer has a Shore 000 durometer of about 66.

53. The method of claim 43, wherein the raised portion has a Shore 000 durometer between about 22 to about 38

54. The method of claim 53 wherein the raised portion has a Shore 000 durometer of about 30.

55. A method for reducing pressure exerted on a forefoot when in high heel shoes, the method comprising incorporating in the high heel shoe an insole comprising a base layer comprising a heel region, an arch region and a forefoot region and a raised portion substantially in the arch region configured to support the plantar fascia of a foot when the foot is inserted in a high heel shoe shifting body weight back to the heel by the raised portion, thereby reducing pressure in the forefoot.

56. The method of claim 55, wherein the insole is a removable insole.

57. The method of claim 55, wherein the insole is integrated into the shoe.

58. The method of claim 55, wherein the base layer comprises polyurethane gel.

59. The method of claim 55, wherein the base layer comprises an SEBS gel.

60. The method of claim 55, wherein the raised portion comprises polyurethane gel.

61. The method of claim 55, wherein the raised portion comprises SEBS gel.

62. The method of claim 55, wherein the raised portion comprises a material having a softer durometer than the base layer.

63. The method of claim 55, wherein the base layer has a Shore 000 (.urometer between about 58 and about 74.

64. The method of claim 63, wherein the base layer has a Shore 000 durometer of about 66.

65. The method of claim 55, wherein the raised portion has a Shore 000 durometer between about 22 to about 38

66. The method of claim 65, wherein the raised portion has a Shore 000 durometer of about 30.

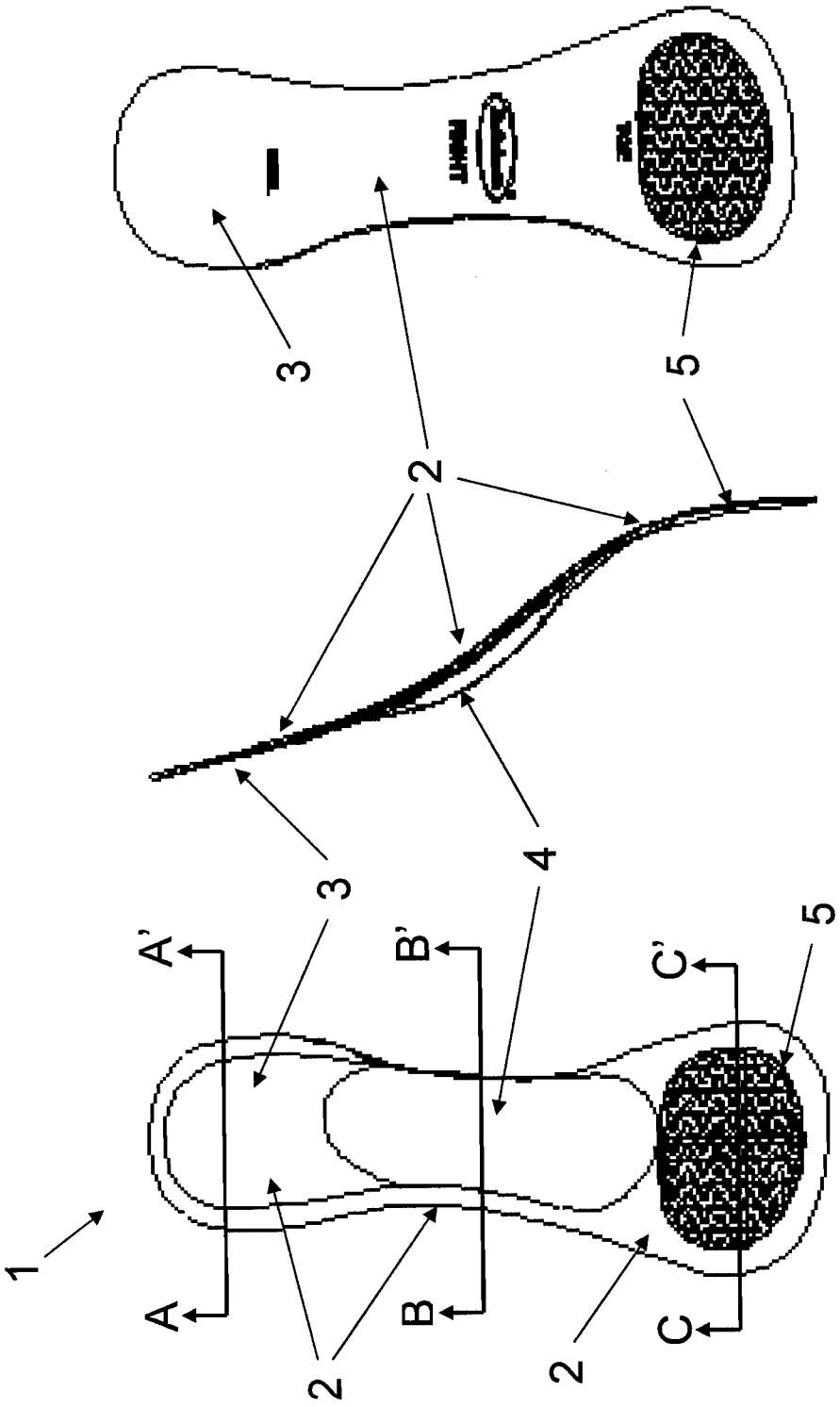

FIG. 1C

FIG. 1B

FIG. 1A

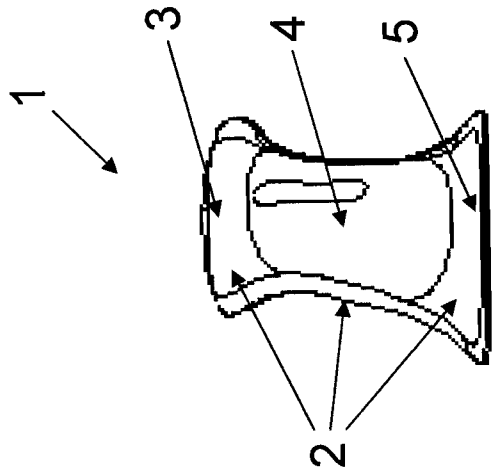

FIG. 2D

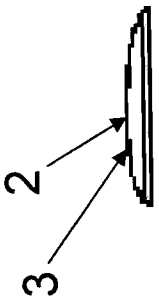

FIG. 2A
Section A-A'

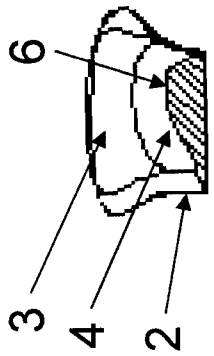

FIG. 2B
Section B-B'

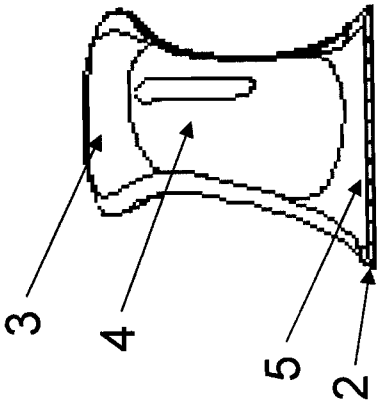

FIG. 2C
Section C-C'

FIG. 3A

		Max force [N]						
		Total	Heel	Arch	Ball	Lat.Forefoot	1st Toe	Toes
1.5 inch heel NO insole	Avg	814.16	434.11	131.10	259.84	323.67	88.86	67.84
	St Dev	196.20	123.39	65.41	79.00	82.42	30.35	25.20
1.5 inch heel INSOLE	Avg	800.52	425.79	146.81	263.36	311.48	83.86	58.57
	St Dev	187.54	105.90	55.74	76.74	76.23	29.70	24.69

FIG. 3B

		Peak Pressure [kPa]						
		Total	Heel	Arch	Ball	Lat.Forefoot	1st Toe	Toes
1.5 inch heel NO insole	Avg	375.09	272.37	137.44	302.25	345.73	280.09	150.24
	St Dev	35.04	57.30	66.93	63.38	38.79	50.68	29.45
1.5 inch heel INSOLE	Avg	376.39	256.71	140.80	311.74	347.30	272.58	128.94
	St Dev	44.56	49.40	43.08	68.44	48.38	52.79	25.89

FIG. 3C

		Contact Time [ms]		
		Total	Heel	Arch
1.5 inch heel NO insole	Avg	678.62	617.83	628.19
	St Dev	48.48	87.21	36.17
1.5 inch heel INSOLE	Avg	688.16	654.13	655.95
	St Dev	58.29	68.28	58.09

FIG. 3D

		Contact Area [cm²]		
		Total	Heel	Arch
1.5 inch heel NO insole	Avg	115.63	32.49	29.03
	St Dev	10.37	3.11	6.68
1.5 inch heel INSOLE	Avg	116.22	31.55	30.82
	St Dev	9.57	2.21	5.92

FIG. 3E

		Max force [N]						
		Total	Heel	Arch	Ball	Lat.Forefoot	1st Toe	Toes
3.0 inch heel NO insole	Avg	830.51	380.36	74.98	304.85	271.03	89.57	60.59
	St Dev	214.39	123.86	32.23	85.35	71.97	30.87	24.27
3.0 inch heel INSOLE	Avg	836.37	375.66	118.71	289.35	258.79	84.95	60.39
	St Dev	208.97	111.64	52.30	77.86	58.91	30.40	25.89

FIG. 3F

		Peak Pressure [kPa]						
		Total	Heel	Arch	Ball	Lat.Forefoot	1st Toe	Toes
3.0 inch heel NO insole	Avg	411.05	224.26	89.21	357.54	320.51	302.18	140.85
	St Dev	64.27	51.74	29.34	84.62	72.95	65.39	27.37
3.0 inch heel INSOLE	Avg	409.02	220.94	124.84	338.05	334.63	303.53	135.09
	St Dev	42.37	51.85	52.11	82.27	50.10	63.96	28.41

FIG. 3G

		Contact Time [ms]		
		Total	Heel	Arch
3.0 inch heel NO insole	Avg	688.16	666.98	671.32
	St Dev	41.25	70.58	28.86
3.0 inch heel INSOLE	Avg	678.78	642.44	636.64
	St Dev	39.30	72.80	45.07

FIG. 3H

		Contact Area [cm²]		
		Total	Heel	Arch
3.0 inch heel NO insole	Avg	110.34	33.20	23.90
	St Dev	8.16	3.61	4.41
3.0 inch heel INSOLE	Avg	111.00	31.66	27.00
	St Dev	7.66	2.78	5.29

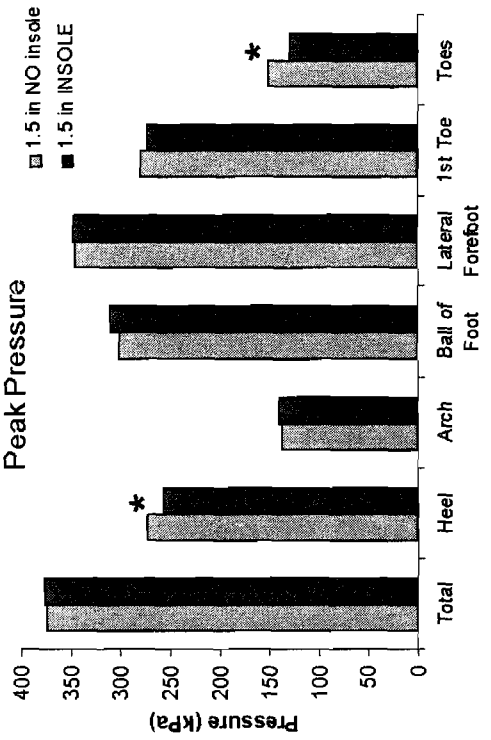
Peak Pressure
1.5 in NO insole
1.5 in INSOLE
Pressure (kPa)
400
350
300
250
200
150
100
50
0
Total
Heel
Arch
Ball of Foot
Lateral Forefoot
1st Toe
Toes
*
*

FIG. 4B

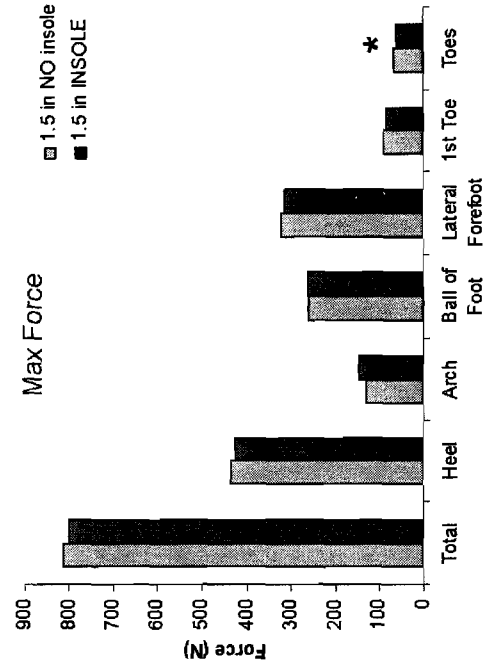
Max Force
1.5 in NO insole
1.5 in INSOLE
Force (N)
900
800
700
600
500
400
300
200
100
0
Total
Heel
Arch
Ball of Foot
Lateral Forefoot
1st Toe
Toes
*

FIG. 4A

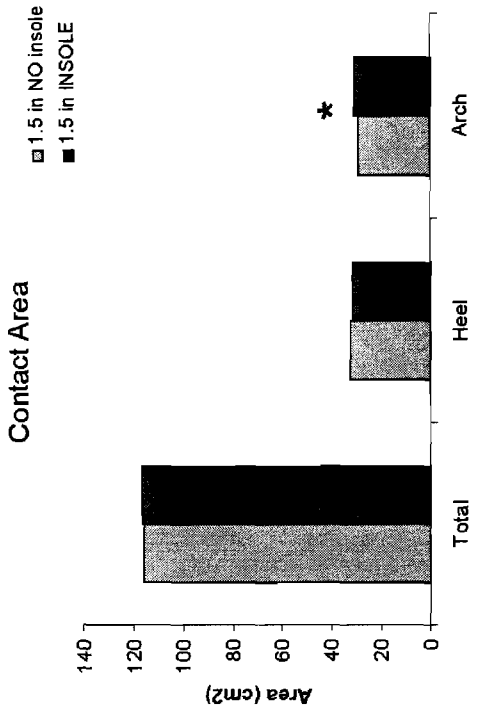
Contact Area
1.5 in NO insole
1.5 in INSOLE
*
Total
Heel
Arch
Area (cm2)
0
20
40
60
80
100
120
140

FIG. 4D

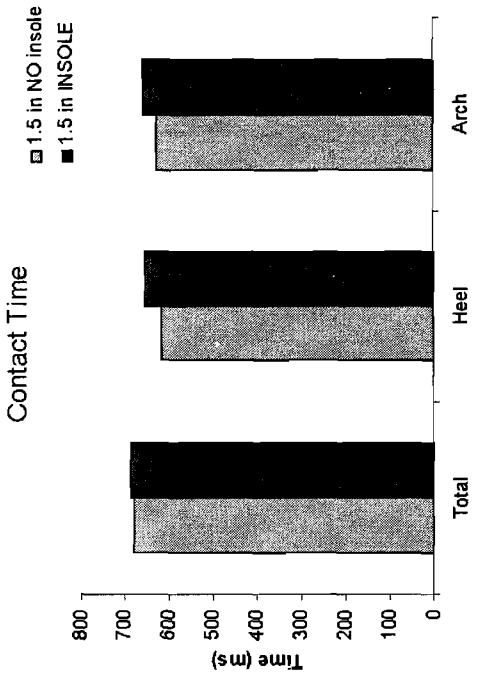
Contact Time
1.5 in NO insole
1.5 in INSOLE
Total
Heel
Arch
Time (ms)
0
100
200
300
400
500
600
700
800

FIG. 4C

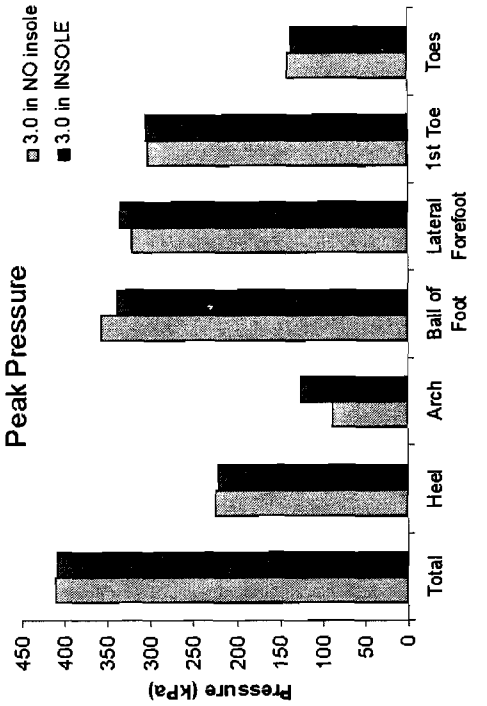
Peak Pressure
3.0 in NO insole
3.0 in INSOLE
Pressure (kPa)
0
50
100
150
200
250
300
350
400
450
Total
Heel
Arch
Ball of Foot
Lateral Forefoot
1st Toe
Toes

FIG. 5B

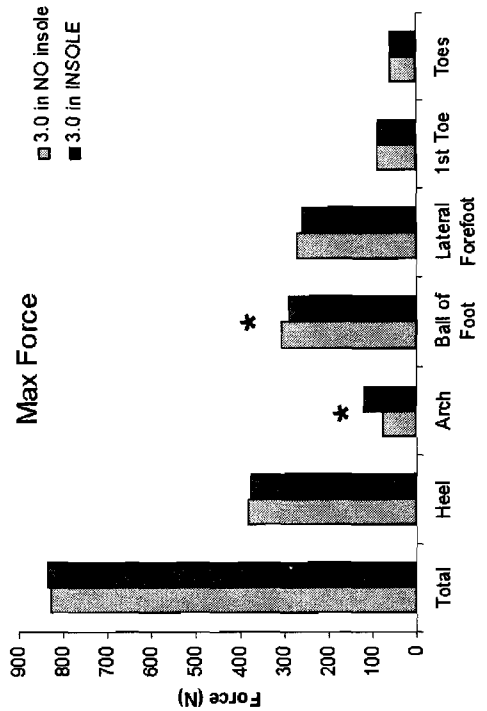
Max Force
3.0 in NO insole
3.0 in INSOLE
Force (N)
0
100
200
300
400
500
600
700
800
900
*
*
Total
Heel
Arch
Ball of Foot
Lateral Forefoot
1st Toe
Toes

FIG. 5A

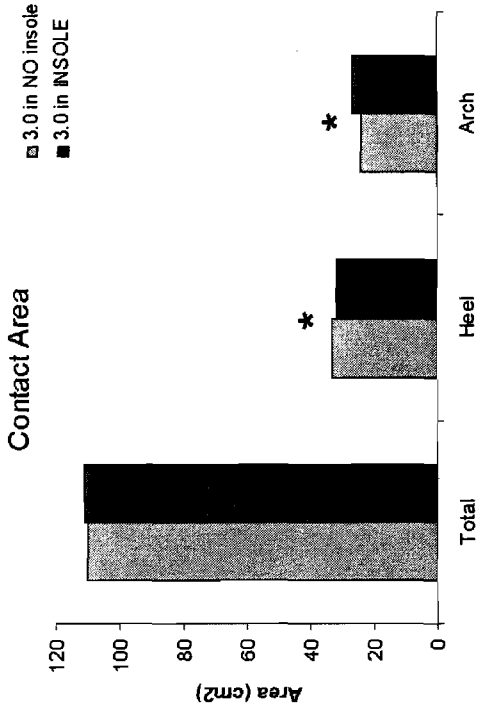
Contact Area
3.0 in NO insole
3.0 in INSOLE
Area (cm2)
0
20
40
60
80
100
120
Total
Heel
Arch
*
*

FIG. 5D

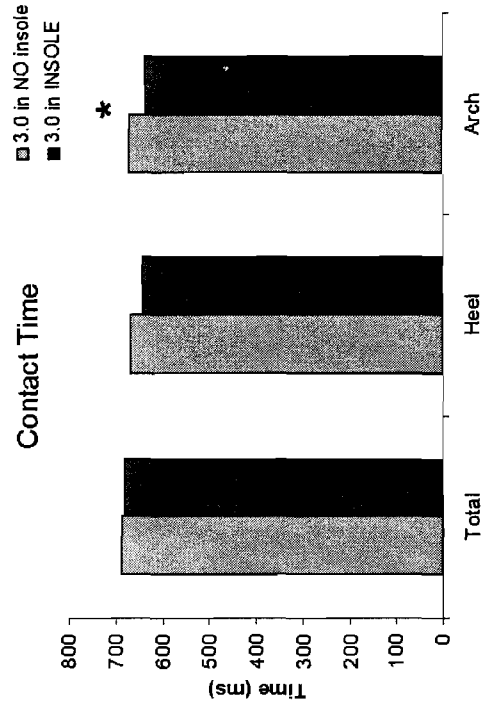
Contact Time
3.0 in NO insole
3.0 in INSOLE
Time (ms)
0
100
200
300
400
500
600
700
800
Total
Heel
Arch
*

FIG. 5C

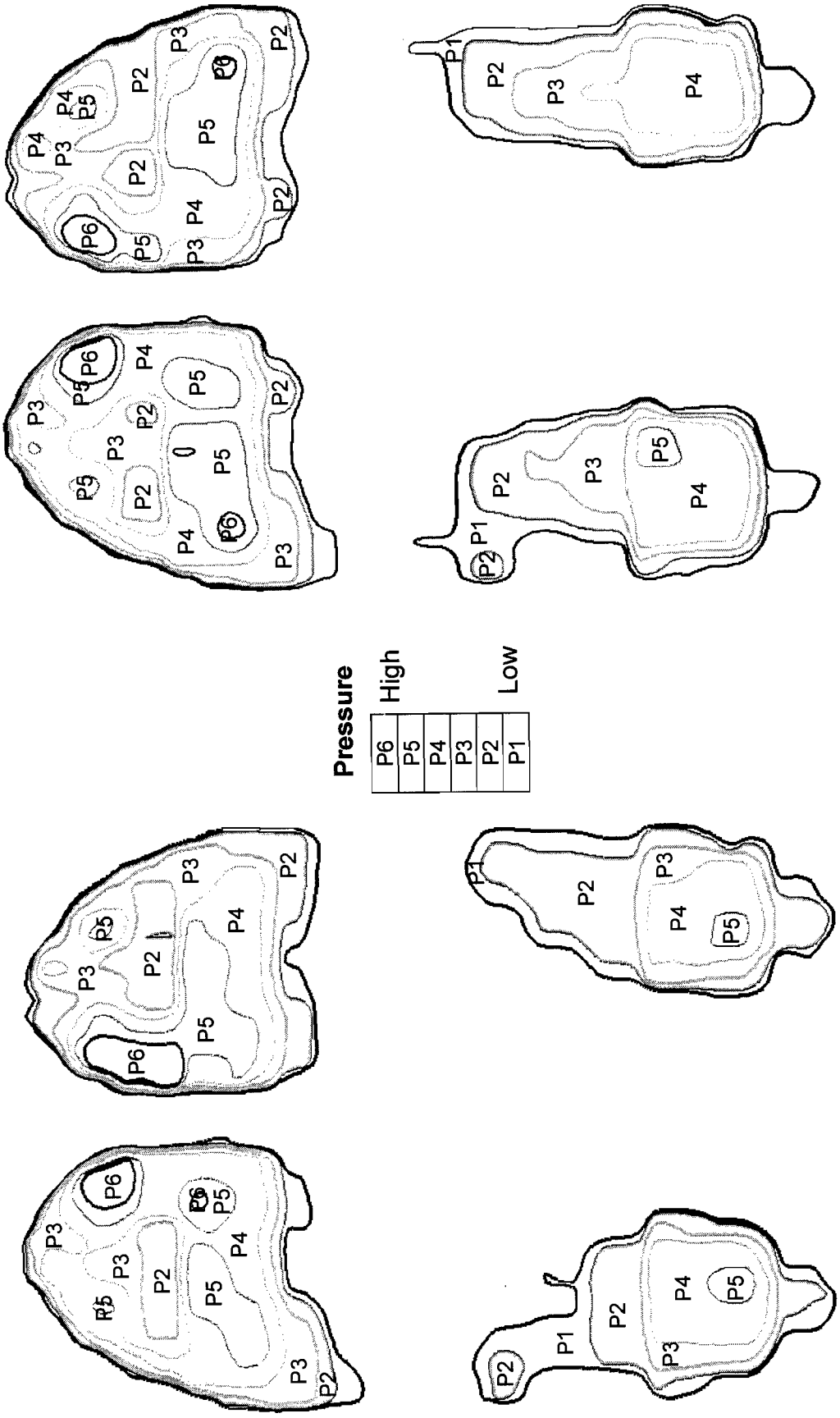

FIG. 6A

FIG. 6B

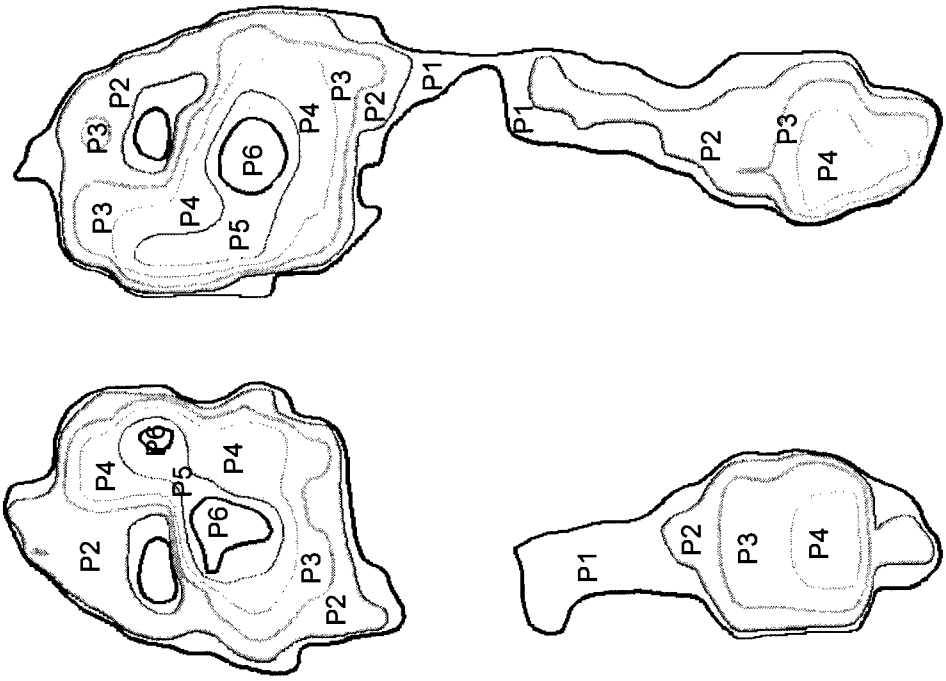
P1
P2
P3
P4
P5
P6

FIG. 7B


Pressure
High
Low
P6
P5
P4
P3
P2
P1

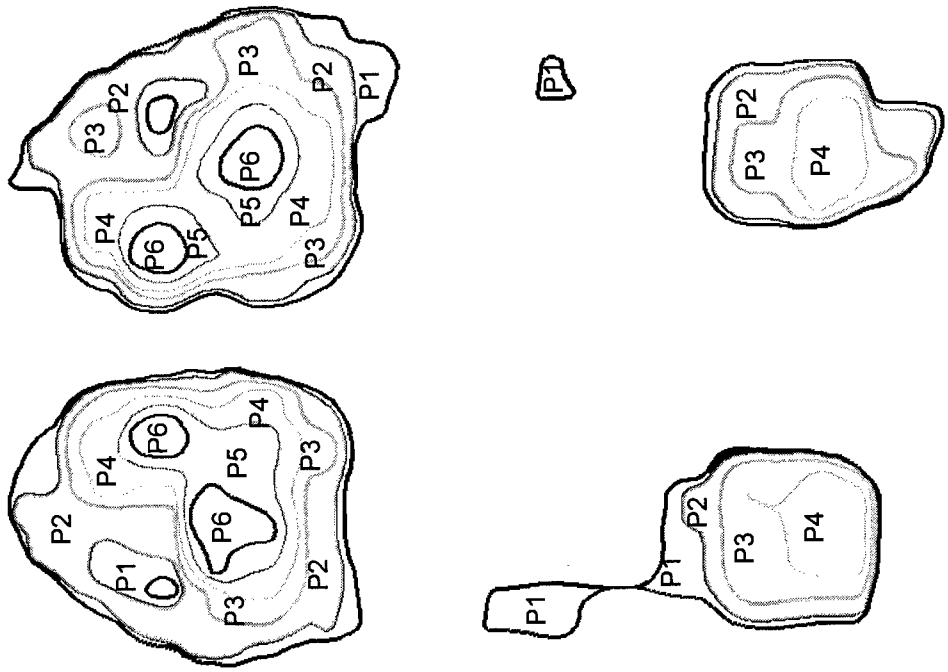
P1
P2
P3
P4
P5
P6

FIG. 7A

INTERNATIONAL SEARCH REPORT

Internat ional app lication No
PCT/US2009/067426

A. CLASSIFICATION OF SUBJECT MATTER
INV . A43B7/22 A43B17/02
ADD .

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)
A43B

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)

EPO-Internal , WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category"	Citation of document with indication where appropπate, of the relevant passages	Relevant to claim No
X	WO 2008/037977 A2 (PELUSI JULIE [GB]; SHEPHERD MARK [GB]) 3 April 2008 (2008-04-03)	1-4, 14, 16-21 , 31-33, 43-45, 55-57
Y	figures page 3 , lines 20-24 - page 6 , lines 13-21 page 10 - page 12	22-30, 34-42, 46-54, 58-66
X	US 2008/271340 Al (GRISONI BERNARD F [US] ET AL) 6 November 2008 (2008-11-06)	1-15
Y	paragraphs [0028] - [0029], [0 31], [0 36] - [0037], [0 40] - [0042]; figure 6	22-30, 34-42, 46-54, 58-66

-/--

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

[X] See patent family annex

* Special categoπes of cited documents

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

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

"L' document which may throw doubts on priority claιm(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"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 pnoπty date claimed

"T" later document published after the international filing date or pπoπty 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 docu¬ments, 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
23 Apri l 2010	03/05/2010

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, Fax (+31-70) 340-3016	Herry, Manuel

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2009/067426

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No
X A	US 5 282 326 A (SCHROER JR CHARLES F [US] ET AL) 1 February 1994 (1994-02-01) column 3, lines 4-8 - column 4, lines 50-52; figures column 6, lines 3-9 - column 8; claims	1-8, 14, 15 16, 19, 31,43, 55
X	US 1 974 161 A (RILEY WILLIAM J) 18 September 1934 (1934-09-18) the whole document	1-4, 16, 17, 19-21, 31-33, 43-45, 55-57
X	US 2004/035023 Al (MASTROMATTEO GIOVANNI [IT]) 26 February 2004 (2004-02-26) the whole document	1-4, 14, 16-21, 31-33, 43-45, 54-56
X A	US 6 315 786 Bl (SMUCI^LER ARTHUR H [US]) 13 November 2001 (2001-11-13) column 3 - column 4; figures	1-4, 14, 15 16, 19, 31,43,55
X,P A,P	WO 2009/041993 Al (SINGLETON ANGELA [US]) 2 April 2009 (2009-04-02) the whole document	16, 19, 31,43,55 1
X,P A,P	US 2009/193683 Al (IGDARI SASHANAZ HASHEMPOUR [US]) 6 August 2009 (2009-08-06) the whole document	16, 19, 31,43,55 1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2009/067426

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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us 2009193683 A1	06-08-2009	NONE	