[0065] The forefoot pad 120, lateral midfoot pod 121, lateral heel pod 122, and medial heel pod 123 are constructed with a criss-cross groove pattern on the bottom surface of the pod or pad. The criss-cross groove pattern introduces air gaps into the pod/pad surfaces. Such air gaps and criss-cross groove patterns positively influence the impact absorption properties of each pod and pad. It also allows for use of less material and therefore a lighter insole while still providing the desired cushioning function. Preferably, the forefoot criss-cross groove pattern 120 is approximately 0.75 mm deep. Preferably the lateral midfoot and heel criss-cross groove patterns 121 and 122 are approximately 1.00 to 3.00 mm deep. Preferably, the medial heel criss-cross groove pattern 123 is approximately 1.00 to 2.50 mm deep. Preferably the TPR pods have the deeper criss-cross groove pattern and the PU pods have the shallower criss-cross groove pattern due to the compression characteristics of the materials. The criss-cross groove patterns assists with securing the insole in the shoe cavity and keeping the insole in place such that it will not move or slide around The criss-cross groove pattern also allows for air circulation and/or provides different cushioning and spring properties.

[0066] For a men's size 11-12 insole, the width of the forefoot pad from the medial to lateral side is about 85 to 95 mm. The height is about 100 to 110 mm. The depth is about 0.95 to 1.50 mm.

[0067] It is desirable to minimize the total weight of the insoles by selection of materials working with the structural features of the insole. It is desirable that the total weight of the preferred embodiment of the insole (men's size 10/11) be about 4.0 ounces. It is desirable that the total weight of an alternate embodiment of the insole be about 5.0 to 6.0 ounces for a men's size 10/11 and about 6.5 to 7.5 ounces for a men's size 12/13. Other sizes will be proportional. Using the criss-cross groove pattern designs will help provide a lighter insole.

[0068] In a preferred embodiment, base 102 is covered with top sheet 101 from toe to heel areas of the insole, which is preferably a non-woven fabric layer with a low coefficient of friction so as to minimize the possibility of blisters. Preferably, top sheet 101 is made of a cooling fabric which contains a special low temperature jade obtained from a natural source. The form of jade in the fabric is a jadeite. In a preferred embodiment, the fabric is treated with an antibacterial agent, which in combination with a moisture barrier reduces odor causing bacteria and fungi.

[00106] The configuration, material and position of the lateral heel pod 514 provides cushioning and works in association with the medial heel pod 515 to stabilize the ankle. The hardness of the lateral heel pod is preferably essentially the same as the lateral midfoot pod, which work in concert to help reduce the incidence of lateral ankle roll-overs. It is preferably made of TPR or PU of a hardness of about Shore C 45-50. If TPR is used, a fabric is in turn secured to the base 502 in the lateral heel pod opening 511 of said base 502. The fabric component allows the TPR to properly adhere to the base 502.

[00107] Stability cradle 506 defines a medial heel pod opening 515 that extends through the heel area along the medial side of heel area on the bottom surface of base 502 just short of the heel end. Medial heel pod 516 is shaped essentially the same as medial heel pod opening 515 and is secured to the bottom surface of base 502 within the stability cradle recession area 505 in a location that correlates to the medial heel pod opening 515 and allows medial heel pod 516 to extend out through said medial heel pod opening 515. The medial heel pod 516 has essentially a pea-pod shape, it has a medial edge and a lateral edge which are connected to one another at a first distal apex and a second proximal apex. The edges widen out opposite one another to define said medial heel pod.

[00108] Medial heel pod 516 is preferably made from TPR or PU of a hardness of about 60 ASKER C ±3. If TPR is used, a fabric is in turn secured to the base 502 in the medial heel pod opening 515 of said base 502. The fabric component allows the TPR to properly adhere to the base 502.

[00109] Foot contact with the ground is generally divided into three phases: heel strike, midfoot support, and toe off. During heel strike, the heel of the foot impacts the ground with significant force. To cushion the impact, lateral heel pod 514 is positioned along the rear and lateral side of the calcaneus (heel bone) and extends outwardly below stability cradle 506. Preferably, lateral heel pod 514 is made of a material having suitable cushioning properties and are selected based on an intended type of activity.

[00110] Following the initial impact of the heel with the ground, the foot twists, or pronates, bringing the medial side of the heel into contact with the ground. The foot is sensitive to the amount of pronation as well as the rate at which the pronation occurs. Pronation is natural, and some degree of pronation is desirable because it serves to absorb the stresses and forces on the foot during walking or running. However, an excessive amount or rate of pronation results in injury.

so that energy put into compressing forefoot pad 508 is returned to help propel the foot at toe-off.

[00117] During toe off, the first metatarsal naturally flexes downward. Preventing this natural downward flex of the first metatarsal causes the arch of the foot to flatten and the foot to over pronate, increasing stress on the ankles and knees. To accommodate the downward flex, the medial portion of forefoot pad 508 extends rearward into a corresponding concave edge portion of the distal edge of stability cradle 506. The shape of the stability cradle 506 and forefoot pad 508 permit the first metatarsal to flex more naturally and thereby encourage loading of the great toe during toe off.

[00118] Base 502 is preferably made of foam or other material having suitable cushioning properties. Preferably, base 502 comprises an Ethylene vinyl acetate ("EVA") foam, which is a copolymer of ethylene and vinyl acetate, or a Thermoplastic Rubber ("TPR")/EVA mix. A preferred EVA or TPR/EVA mix has a durometer (hardness) of about Asker C 45-50.

[00119] Forefoot pad 508 is preferably made from a Thermoplastic Rubber ("TPR") or Polyurethane ("PU"). The hardness of the TPR or PU used in the forefoot pad is preferably about 30 Asker C ±3.

[00120] The forefoot pad 520, lateral midfoot pod 521, lateral heel pod 522, and medial heel pod 523 are constructed with a criss-cross groove pattern on the bottom surface of the pod or pad. The criss-cross groove pattern introduces air gaps into the pod/pad surfaces. Such air gaps and criss-cross groove patterns positively influence the impact absorption properties. It also allows for use of less material and therefore a lighter insole while still providing the desired cushioning function. Preferably, the forefoot criss-cross groove pattern 520 is approximately 0.75 mm deep. Preferably the lateral midfoot and heel criss-cross groove patterns 521 and 522 are approximately 1.00 to 3.00 mm deep. Preferably, the medial heel criss-cross groove pattern 523 is approximately 1.00 to 2.50 mm deep. Preferably the TPR pods have the deeper criss-cross groove pattern and the PU pods have the shallower criss-cross groove pattern due to the compression characteristics of the materials. The criss-cross groove patterns also assists with keeping the insole in place and not move or slide around within the shoe.

example, the firmness of lateral heel pod 914 and medial heel pod 916 differs by about 20-30 % for an insole to be used during light to moderate activities.

[00186] Carrying a heavy backpack or other articles significantly increases the load on the foot and the rate of pronation during and following heel strike. Accordingly, medial heel pod 916 is made significantly firmer in an insole designed for use while backpacking. As an example, a difference in firmness of about 20-40% is more appropriate for such activities.

[00187] Lateral midfoot pod 912 provides cushioning and control to the lateral side of the foot during the midstance portion of a step. Typically, lateral midfoot pod is formed of a material having the same properties, e.g., firmness, as lateral heel pod 914. However, a material having different characteristics may also be used.

[00188] The use of dual density heel pods is employed to cause a kinetic change in foot function to promote ankle stability. It is also not out of the scope of the invention to have the medial heel pod softer than the lateral heel pod and/or lateral midfoot pod or any combination thereof to address different joint moments or ankle rolls.

[00189] At the beginning of the propulsion or toe-off phase of a step, the heel begins to lift from the ground and weight shifts to the ball of the foot. Forefoot pad 908 is located under this part of the foot. Preferably, forefoot pad 908 is formed of a relatively resilient material so that energy put into compressing forefoot pad 908 is returned to help propel the foot at toe-off.

[00190] During toe off, the first metatarsal naturally flexes downward. Preventing this natural downward flex of the first metatarsal causes the arch of the foot to flatten and the foot to over pronate, increasing stress on the ankles and knees. To accommodate the downward flex, the medial portion of forefoot pad 908 extends rearward into a corresponding concave edge portion of the distal edge of stability cradle 906. The shape of the stability cradle 906 and forefoot pad 908 permit the first metatarsal to flex more naturally and thereby encourage loading of the great toe during toe off.

[00191] The forefoot pad 920, lateral midfoot pod 921, lateral heel pod 922, and medial heel pod 923 are constructed with a criss-cross groove pattern on the bottom surface of the pod or pad. The criss-cross groove pattern introduces air gaps into the pod/pad surfaces. Such air gaps and criss-cross groove patterns positively influence the impact absorption

[00202] Traverse arch support 1038 preferably lies under the second to fourth metatarsal heads. Traverse arch support 1038 provides additional stability to the forefoot and middle of the foot.

[00203] FIG. 11 illustrates a cross section 11-11 as identified in FIGS. 4 and 5. Insole 1100 preferably comprises a top sheet 1101 and a base 1102 having a top surface secured to said top sheet 1101 and an opposite bottom surface. The bottom surface of base 1102 defines a forefoot pad recession area and a stability cradle recession area.

[00204] The stability cradle recession area 1105 is located in the midfoot and heel areas of the bottom surface of base 1102. The stability cradle recession area 1105 extends from a medial edge approximate the medial border to a lateral edge approximate the lateral border of the base and from a distal edge slightly proximal of the forefoot recession area to a proximal edge approximate the heel end of the base. A medial portion of the distal edge is shaped to accommodate downward motion of the 1st metatarsal during toe off. Stability cradle 116 is shaped essentially the same as stability cradle recession area 1105 and has a base facing surface and a shoe facing surface. The base facing surface is secured to said stability cradle recession area 1105. Stability cradle 1106 has walls that wrap up the sides and rear of base 102 to provide support for the foot.

[00205] Preferably, the shoe facing surface of stability cradle 1106 has a "faceted" surface texture. This textured faceted surface increases the ability of the insole to "stay in place" when a user's foot is being placed into or out of the shoe. Swapping shoes and running gear is a very common practice during triathlon events and practice sessions. As such, these faceted textures significantly improves the use and performance of these insoles for this particular use.

[00206] The stability cradle 1106 preferably defines one or more rib-shaped openings 1131. In a preferred embodiment, the rib-shaped openings 1131 allow said ribs 1132 of base 1102 to extend therethrough. Preferably, base 1102 is molded so that the ribs 1132 project into rib-shaped openings 1131 so that the ribs 1132 are approximately flush with the outer surface of stability cradle 1106 and mechanically lock stability cradle 106 and base 1102 together. Advantageously, the ribs 1132 are also able to bulge through rib-shaped openings 1131 when base 1102 is compressed (e.g., while walking or running) to provide additional cushioning and support to the arch of the foot. Preferably said ribs 1132 extend outwardly approximately 0.50 mm to 1.5 mm and have a width of approximately 4 mm. The rib-

[00224] Lateral heel area 1469 extends from a front edge just behind the cuboid or adjacent the front edge of heel area 1495 to the heel end. The width of lateral heel area extends from a diagonal medial edge to the lateral border where diagonal medial edge extends from about a third of the insole width medially from the lateral border along the front edge of the heel area 1495 to a point just medial of the heel end.

[00225] Medial heel area 1468 extends from the front edge of the heel area 1495 to the medial border just medial of the heel end. The width of medial heel area 1468 extends from the lateral diagonal edge of proximal medial arch area 1467 to the medial diagonal edge of lateral heel area 1469.

[00226] Forefoot pad recession area 1467 preferably extends the entire length of the metatarsal head area 1492 on the medial half and from the front diagonal edge of metatarsal head area 1492 to 3rd through 5th metatarsal heads on the lateral half. Forefoot pad 1468 is secured to the forefoot pad recession area 1467.

[00227] Stability cradle 1406 is located in the entire midfoot area 1494 and heel area 1495. A portion of stability cradle 1406 on the lateral half extends forward into metatarsal head area 1492 to just behind the 3rd through 5th metatarsal heads.

[00228] In a preferred embodiment, ribs 1432 of base 1402 extend through rib openings 1431 and are located in the majority of the distal medial arch area 1465 and proximal medial arch area 1467. In an alternate embodiment, the ribs or protrusions are defined by the stability cradle 1406 and extending outwardly from the stability cradle 1406 and are located in the majority of the distal medial arch area 1465 and proximal medial arch area 1467.

[00229] Lateral midfoot pod opening is located approximately in the middle third of the lateral midfoot area 1466. Lateral midfoot pod opening extends essentially the entire length of lateral midfoot area 1466. Lateral midfoot pod 1412 is secured to lateral midfoot pod opening.

[00230] Medial heel pod opening is located in the majority of the medial heel area 1468. Medial heel pod 1416 is secured to medial heel pod opening. Lateral heel pod opening is located in the majority of the lateral heel area 1469. Lateral heel pod 1414 is secured to lateral heel pod opening.

[00248] Stability cradle 1506 defines a lateral midfoot pod opening 1511 that extends from the behind the 3rd though 5th metatarsal heads proximally to the back of the cuboid. The length of the lateral midfoot pod opening 1511 is preferably sufficient to provide cushioning to the lateral aspect of the midfoot. Lateral midfoot pod 1512 is shaped essentially the same as lateral midfoot pod opening 1511 and is secured to the bottom surface of base 1502 within the stability cradle recession area 1505 in a location that correlates to the lateral midfoot pod opening 1511 and allows lateral midfoot pod 1512 to extend out through said lateral midfoot pod opening 1511.

[00249] Lateral midfoot pod 1512 is preferably made from TPR or PU of a hardness of about 45-50 ASKER C. If TPR is used, a fabric is in turn secured to the base 1502 in the lateral midfoot pod opening 1511 of said base 1502. The fabric component allows the TPR to properly adhere to the base 1502.

[00250] Stability cradle 1506 also defines a lateral heel pod opening 1513 that extends through the lateral side of the heel area of stability cradle 1506 from approximately rearward of the lateral midfoot pod opening 1511 toward the heel end. Lateral heel pod 1514 is shaped essentially the same as lateral heel pod opening 1513 and is secured to the bottom surface of base 1502 within the stability cradle recession area 1505 in a location that correlates to the lateral heel pod opening 1513 and allows lateral heel pod 1514 to extend out through said lateral heel pod opening 1513. Lateral heel pod 1514 has a lateral edge which extends along the lateral border of insole 1500 from said heel end to a lateral heel edge spaced apart from said lateral midfoot pod. The lateral edge curves in the area of the heel to follow the outline of the insole heel end. The lateral heel pod 1514 also has a medial curvilinear edge. The overall configuration is roughly a multi-sided geometric shape with curved edges as described rather than straight lines.

[00251] The configuration, material and position of the lateral heel pod 1514 provides cushioning and works in association with the medial heel pod 515 to stabilize the ankle. The hardness of the lateral heel pod is preferably essentially the same as the lateral midfoot pod, which work in concert to help reduce the incidence of lateral ankle roll-overs. It is preferably made of TPR or PU of a hardness of about Shore C 45-50. If TPR is used, a fabric is in turn secured to the base 1502 in the lateral heel pod opening 1511 of said base 1502. The fabric component allows the TPR to properly adhere to the base 1502.

of the stability cradle 1506 and forefoot pad 1508 permit the first metatarsal to flex more naturally and thereby encourage loading of the great toe during toe off.

[00263] Base 1502 is preferably made of foam or other material having suitable cushioning properties. Preferably, base 1502 comprises an Ethylene vinyl acetate ("EVA") foam, which is a copolymer of ethylene and vinyl acetate, or a Thermoplastic Rubber ("TPR")/EVA mix. A preferred EVA or TPR/EVA mix has a durometer (hardness) of about Asker C 45-50.

[00264] Forefoot pad 1508 is preferably made from a Thermoplastic Rubber ("TPR") or Polyurethane ("PU"). The hardness of the TPR or PU used in the forefoot pad is preferably about 30 Asker C ±3.

[00265] The forefoot pad 1520, lateral midfoot pod 1521, lateral heel pod 1522, and medial heel pod 1523 are constructed with a criss-cross groove pattern on the bottom surface of the pod or pad. The criss-cross groove pattern introduces air gaps into the pod/pad surfaces. Such air gaps and criss-cross groove patterns positively influence the impact absorption properties. It also allows for use of less material and therefore a lighter insole while still providing the desired cushioning function. Preferably, the forefoot criss-cross groove pattern 1520 is approximately 0.75 mm deep. Preferably the lateral midfoot and heel criss-cross groove patterns 1521 and 1522 are approximately 1.00 to 3.00 mm deep. Preferably, the medial heel criss-cross groove pattern 1523 is approximately 1.00 to 2.50 mm deep. Preferably the TPR pods have the deeper criss-cross groove pattern and the PU pods have the shallower criss-cross groove pattern due to the compression characteristics of the materials. The criss-cross groove patterns also assists with keeping the insole in place and not move or slide around within the shoe.

[00266] For a men's size 11-12 insole, the width of the forefoot pad from the medial to lateral side is about 85 to 95 mm. The height is about 100 to 110 mm. The depth is about 0.95 to 1.50 mm.

[00267] It is desirable to minimize the total weight of the insoles by selection of materials working with the structural features of the insole. It is desirable that the total weight of the preferred embodiment of the insole (men's size 10/11) be about 4.0 ounces. It is desirable that the total weight of an alternate embodiment of the insole be about 5.0 to 6.0 ounces for

midfoot pod opening 1511 and allows lateral midfoot pod 1512 to extend out through said lateral midfoot pod opening 1511.

[00302] Lateral midfoot pod 1512 is preferably made from TPR or PU of a hardness of about 45-50 ASKER C. If TPR is used, a fabric is in turn secured to the base 1502 in the lateral midfoot pod opening 1511 of said base 1502. The fabric component allows the TPR to properly adhere to the base 1502.

[00303] Stability cradle 1506 also defines a lateral heel pod opening 1513 that extends through the lateral side of the heel area of stability cradle 1506 from approximately rearward of the lateral midfoot pod opening 1511 toward the heel end. Lateral heel pod 1514 is shaped essentially the same as lateral heel pod opening 1513 and is secured to the bottom surface of base 1502 within the stability cradle recession area 1505 in a location that correlates to the lateral heel pod opening 1513 and allows lateral heel pod 1514 to extend out through said lateral heel pod opening 1513. Lateral heel pod 1514 has a lateral edge which extends along the lateral border of insole 1500 from said heel end to a lateral heel edge spaced apart from said lateral midfoot pod. The lateral edge curves in the area of the heel to follow the outline of the insole heel end. The lateral heel pod 1514 also has a medial curvilinear edge. The overall configuration is roughly a multi-sided geometric shape with curved edges as described rather than straight lines.

[00304] The configuration, material and position of the lateral heel pod 1514 provides cushioning and works in association with the medial heel pod 1515 to stabilize the ankle. The hardness of the lateral heel pod is preferably essentially the same as the lateral midfoot pod, which work in concert to help reduce the incidence of lateral ankle roll-overs. It is preferably made of TPR or PU of a hardness of about Shore C 45-50. If TPR is used, a fabric is in turn secured to the base 1502 in the lateral heel pod opening 1511 of said base 1502. The fabric component allows the TPR to properly adhere to the base 1502.

[00305] Stability cradle 1506 defines a medial heel pod opening 1515 that extends through the heel area along the medial side of heel area on the bottom surface of base 1502 just short of the heel end. Medial heel pod 1516 is shaped essentially the same as medial heel pod opening 1515 and is secured to the bottom surface of base 1502 within the stability cradle recession area 1505 in a location that correlates to the medial heel pod opening 1515 and allows medial heel pod 1516 to extend out through said medial heel pod opening 1515. The medial heel pod 1516 has essentially a pea-pod shape; it has a medial edge and a lateral

rather than straight lines. Lateral heel pod opening 1513 is designed to allow a lateral heel pod to extend there through.

[00409] Medial heel pod opening 1515 extends through the heel area along the medial side of heel area on the bottom surface of base 1502 just short of the heel end. The medial heel pod opening 1515 has essentially a pea-pod shape; it has a medial edge and a lateral edge which are connected to one another at a first distal apex and a second proximal apex. The edges widen out opposite one another to define said medial heel pod opening. Medial heel pod opening 1515 is designed to allow a medial heel pod to extend there through.

[00410] Stability cradle 1506 provides firm support along the medial portion of the foot to help control the amount of pronation.

[00411] FIG. 15D-1 to 15D-5 shows a medial side, bottom, lateral side, prospective and a cross-section of the insole pads 1512, 1514 and 1516.

[00412] Figure 15D-1 to 15D-5 show a medial side, bottom, lateral side, prospective and one cross-section view of the insole pads 1512, 1514 and 1516. Stability cradle 1506 also defines a lateral heel pod opening 1513 that extends through the lateral side of the heel area of stability cradle 1506 from approximately rearward of the lateral midfoot pod opening 1511 toward the heel end. Lateral heel pod 1514 is shaped essentially the same as lateral heel pod opening 1513 and is secured to the bottom surface of base 1502 within the stability cradle recession area 1505 in a location that correlates to the lateral heel pod opening 1513 and allows lateral heel pod 1514 to extend out through said lateral heel pod opening 1513. Lateral heel pod 1514 has a lateral edge which extends along the lateral border of insole 1500 from said heel end to a lateral heel edge spaced apart from said lateral midfoot pod. The lateral edge curves in the area of the heel to follow the outline of the insole heel end. The lateral heel pod 1514 also has a medial curvilinear edge. The overall configuration is roughly a multi-sided geometric shape with curved edges as described rather than straight lines.

[00413] The configuration, material and position of the lateral heel pod 1514 provides cushioning and works in association with the medial heel pod 1515 to stabilize the ankle. The hardness of the lateral heel pod is preferably essentially the same as the lateral midfoot pod, which work in concert to help reduce the incidence of lateral ankle roll-overs. It is preferably made of TPR or PU of a hardness of about Shore C 45-50. If TPR is used, a

made from a firmer material than lateral heel pod 1514. A firmer or stiffer material does not compress as much or as fast as a softer material under the same load. Thus, a medial heel pod 1516 made from a firmer material would compress less than a lateral heel pod 1514 made of a softer material. As a result, medial heel pod 1516 tends to resist or counteract pronation and thereby help to reduce the degree and rate of pronation. Conversely, making medial heel pod 1516 from a softer material than lateral heel pod 1514 would tend to increase the amount and rate of pronation.

[00419] Preferably, the firmness of the material used in medial heel pod 1516 is selected based on the firmness of lateral heel pod 1514 and on the type of intended activity. For example, the firmness of lateral heel pod 1514 and medial heel pod 1516 differs by about 20-30 % for an insole to be used during light to moderate activities.

[00420] Carrying a heavy backpack or other articles significantly increases the load on the foot and the rate of pronation during and following heel strike. Accordingly, medial heel pod 1516 is made significantly firmer in an insole designed for use while backpacking. As an example, a difference in firmness of about 20-40% is more appropriate for such activities.

[00421] Lateral midfoot pod 1512 provides cushioning and control to the lateral side of the foot during the midstance portion of a step. Typically, lateral midfoot pod 1512 is formed of a material having the same properties, e.g., firmness, as lateral heel pod 1514. However, a material having different characteristics may also be used.

[00422] FIG. 15E-1 to 15E-4 shows a medial side, bottom, cross section prospective view of the forefoot pad.

[00423] Figures 15E-1 to 15E-4 show a medial side, bottom, cross-section and prospective view of the forefoot pad 1508. Forefoot pad 108 is preferably made from a Thermoplastic Rubber ("TPR") or Polyurethane ("PU"). The hardness of the TPR or PU used in the forefoot pad is preferably about 30 Asker C ±3. The forefoot pad 1520, lateral midfoot pod 1521, lateral heel pod 1522, and medial heel pod 1523 are constructed with a criss-cross groove pattern on the bottom surface of the pod or pad. The criss-cross groove pattern introduces air gaps into the pod/pad surfaces. Such air gaps and criss-cross groove patterns positively influence the impact absorption properties of each pod and pad. It also allows for use of less material and therefore a lighter insole while still providing the desired

opening 1613 has a lateral edge which extends along the lateral border of insole from said heel end to a lateral heel edge spaced apart from said lateral midfoot pod opening 1611. The lateral edge curves in the area of the heel to follow the outline of the insole heel end. The lateral heel pod opening 1613 also has a medial curvilinear edge. The overall configuration is roughly a multi-sided geometric shape with curved edges as described rather than straight lines. Lateral heel pod opening 1613 is designed to allow a lateral heel pod to extend there through.

[00642] Medial heel pod opening 1615 extends through the heel area along the medial side of heel area on the bottom surface of base 1602 just short of the heel end. The medial heel pod opening 1615 has essentially a pea-pod shape; it has a medial edge and a lateral edge which are connected to one another at a first distal apex and a second proximal apex. The edges widen out opposite one another to define said medial heel pod opening. Medial heel pod opening 1615 is designed to allow a medial heel pod to extend there through.

[00643] Stability cradle 1606 provides firm support along the medial portion of the foot to help control the amount of pronation.

[00644] FIG. 16C-1 to 16C-5 shows a bottom and side views of the lateral midfoot pod, medial heel pod, and lateral heel pod, and a section view of the medial heel pod and lateral heel pod.

[00645] Figure 16D-1 to 16D-5 show a medial side, bottom, lateral side, prospective and one cross-section view of the insole pads 1612, 1614 and 1616. Stability cradle 1606 also defines a lateral heel pod opening 1613 that extends through the lateral side of the heel area of stability cradle 1606 from approximately rearward of the lateral midfoot pod opening 1611 toward the heel end. Lateral heel pod 1614 is shaped essentially the same as lateral heel pod opening 1613 and is secured to the bottom surface of base 1602 within the stability cradle recession area 1605 in a location that correlates to the lateral heel pod opening 1613 and allows lateral heel pod 1614 to extend out through said lateral heel pod opening 1613. Lateral heel pod 1614 has a lateral edge which extends along the lateral border of insole 1600 from said heel end to a lateral heel edge spaced apart from said lateral midfoot pod. The lateral edge curves in the area of the heel to follow the outline of the insole heel end. The lateral heel pod 1614 also has a medial curvilinear edge. The overall configuration is roughly a multi-sided geometric shape with curved edges as described rather than straight lines.

[00651] Stability cradle 1606 provides firm support along the medial portion of the foot to help control the amount of pronation. Medial heel pod 1616 helps to control the rate of pronation by forming medial heel pod 1616 out of a material having different characteristics than lateral heel pod 1614. For example, to reduce a pronation rate, medial heel pod 1616 is made from a firmer material than lateral heel pod 1614. A firmer or stiffer material does not compress as much or as fast as a softer material under the same load. Thus, a medial heel pod 1616 made from a firmer material would compress less than a lateral heel pod 1614 made of a softer material. As a result, medial heel pod 1616 tends to resist or counteract pronation and thereby help to reduce the degree and rate of pronation. Conversely, making medial heel pod 1616 from a softer material than lateral heel pod 1614 would tend to increase the amount and rate of pronation.

[00652] Preferably, the firmness of the material used in medial heel pod 1616 is selected based on the firmness of lateral heel pod 1614 and on the type of intended activity. For example, the firmness of lateral heel pod 1614 and medial heel pod 1616 differs by about 20-30 % for an insole to be used during light to moderate activities.

[00653] Carrying a heavy backpack or other articles significantly increases the load on the foot and the rate of pronation during and following heel strike. Accordingly, medial heel pod 1616 is made significantly firmer in an insole designed for use while backpacking. As an example, a difference in firmness of about 20-40% is more appropriate for such activities.

[00654] Lateral midfoot pod 1612 provides cushioning and control to the lateral side of the foot during the midstance portion of a step. Typically, lateral midfoot pod 1612 is formed of a material having the same properties, e.g., firmness, as lateral heel pod 1614. However, a material having different characteristics may also be used.

[00655] FIG. 16D-1 to 16D-4 shows a bottom, side, cross section and prospective view of the forefoot pad.

[00656] Figures 16E-1 to 16E-4 show a medial side, bottom, cross-section and prospective view of the forefoot pad 1608. Forefoot pad 108 is preferably made from a Thermoplastic Rubber ("TPR") or Polyurethane ("PU"). The hardness of the TPR or PU used in the forefoot pad is preferably about 30 Asker C ±3. The forefoot pad 1620, lateral midfoot pod 1621, lateral heel pod 1622, and medial heel pod 1623 are constructed with a criss-cross

[0065] The forefoot pad 108, lateral midfoot pod 112, lateral heel pod 114, and medial heel pod 116 are constructed with a criss-cross groove pattern on the bottom surface of the pod or pad. The criss-cross groove pattern introduces air gaps into the pod/pad surfaces. Such air gaps and criss-cross groove patterns positively influence the impact absorption properties of each pod and pad. It also allows for use of less material and therefore a lighter insole while still providing the desired cushioning function. Preferably, the forefoot criss-cross groove pattern 120 is approximately 0.75 mm deep. Preferably the lateral midfoot and heel criss-cross groove patterns 121 and 122 are approximately 1.00 to 3.00 mm deep. Preferably, the medial heel criss-cross groove pattern 123 is approximately 1.00 to 2.50 mm deep. Preferably the TPR pods have the deeper criss-cross groove pattern and the PU pods have the shallower criss-cross groove pattern due to the compression characteristics of the materials. The criss-cross groove patterns assists with securing the insole in the shoe cavity and keeping the insole in place such that it will not move or slide around The criss-cross groove pattern also allows for air circulation and/or provides different cushioning and spring properties.

[0066] For a men's size 11-12 insole, the width of the forefoot pad from the medial to lateral side is about 85 to 95 mm. The height is about 100 to 110 mm. The depth is about 0.95 to 1.50 mm.

[0067] It is desirable to minimize the total weight of the insoles by selection of materials working with the structural features of the insole. It is desirable that the total weight of the preferred embodiment of the insole (men's size 10/11) be about 4.0 ounces. It is desirable that the total weight of an alternate embodiment of the insole be about 5.0 to 6.0 ounces for a men's size 10/11 and about 6.5 to 7.5 ounces for a men's size 12/13. Other sizes will be proportional. Using the criss-cross groove pattern designs will help provide a lighter insole.

[0068] In a preferred embodiment, base 102 is covered with top sheet 101 from toe to heel areas of the insole, which is preferably a non-woven fabric layer with a low coefficient of friction so as to minimize the possibility of blisters. Preferably, top sheet 101 is made of a cooling fabric which contains a special low temperature jade obtained from a natural source. The form of jade in the fabric is a jadeite. In a preferred embodiment, the fabric is treated with an antibacterial agent, which in combination with a moisture barrier reduces odor causing bacteria and fungi.

[00106] The configuration, material and position of the lateral heel pod 514 provides cushioning and works in association with the medial heel pod 516 to stabilize the ankle. The hardness of the lateral heel pod is preferably essentially the same as the lateral midfoot pod, which work in concert to help reduce the incidence of lateral ankle roll-overs. It is preferably made of TPR or PU of a hardness of about Shore C 45-50. If TPR is used, a fabric is in turn secured to the base 502 in the lateral heel pod opening 511 of said base 502. The fabric component allows the TPR to properly adhere to the base 502.

[00107] Stability cradle 506 defines a medial heel pod opening 515 that extends through the heel area along the medial side of heel area on the bottom surface of base 502 just short of the heel end. Medial heel pod 516 is shaped essentially the same as medial heel pod opening 515 and is secured to the bottom surface of base 502 within the stability cradle recession area 505 in a location that correlates to the medial heel pod opening 515 and allows medial heel pod 516 to extend out through said medial heel pod opening 515. The medial heel pod 516 has essentially a pea-pod shape; it has a medial edge and a lateral edge which are connected to one another at a first distal apex and a second proximal apex. The edges widen out opposite one another to define said medial heel pod.

[00108] Medial heel pod 516 is preferably made from TPR or PU of a hardness of about 60 ASKER C ±3. If TPR is used, a fabric is in turn secured to the base 502 in the medial heel pod opening 515 of said base 502. The fabric component allows the TPR to properly adhere to the base 502.

[00109] Foot contact with the ground is generally divided into three phases: heel strike, midfoot support, and toe off. During heel strike, the heel of the foot impacts the ground with significant force. To cushion the impact, lateral heel pod 514 is positioned along the rear and lateral side of the calcaneus (heel bone) and extends outwardly below stability cradle 506. Preferably, lateral heel pod 514 is made of a material having suitable cushioning properties and are selected based on an intended type of activity.

[00110] Following the initial impact of the heel with the ground, the foot twists, or pronates, bringing the medial side of the heel into contact with the ground. The foot is sensitive to the amount of pronation as well as the rate at which the pronation occurs. Pronation is natural, and some degree of pronation is desirable because it serves to absorb the stresses and forces on the foot during walking or running. However, an excessive amount or rate of pronation results in injury.

so that energy put into compressing forefoot pad 508 is returned to help propel the foot at toe-off.

[00117] During toe off, the first metatarsal naturally flexes downward. Preventing this natural downward flex of the first metatarsal causes the arch of the foot to flatten and the foot to over pronate, increasing stress on the ankles and knees. To accommodate the downward flex, the medial portion of forefoot pad 508 extends rearward into a corresponding concave edge portion of the distal edge of stability cradle 506. The shape of the stability cradle 506 and forefoot pad 508 permit the first metatarsal to flex more naturally and thereby encourage loading of the great toe during toe off.

[00118] Base 502 is preferably made of foam or other material having suitable cushioning properties. Preferably, base 502 comprises an Ethylene vinyl acetate ("EVA") foam, which is a copolymer of ethylene and vinyl acetate, or a Thermoplastic Rubber ("TPR")/EVA mix. A preferred EVA or TPR/EVA mix has a durometer (hardness) of about Asker C 45-50.

[00119] Forefoot pad 508 is preferably made from a Thermoplastic Rubber ("TPR") or Polyurethane ("PU"). The hardness of the TPR or PU used in the forefoot pad is preferably about 30 Asker C ±3.

[00120] The forefoot pad 508, lateral midfoot pod 512, lateral heel pod 514, and medial heel pod 516 are constructed with a criss-cross groove pattern on the bottom surface of the pod or pad. The criss-cross groove pattern introduces air gaps into the pod/pad surfaces. Such air gaps and criss-cross groove patterns positively influence the impact absorption properties. It also allows for use of less material and therefore a lighter insole while still providing the desired cushioning function. Preferably, the forefoot criss-cross groove pattern 520 is approximately 0.75 mm deep. Preferably the lateral midfoot and heel criss-cross groove patterns 521 and 522 are approximately 1.00 to 3.00 mm deep. Preferably, the medial heel criss-cross groove pattern 523 is approximately 1.00 to 2.50 mm deep. Preferably the TPR pods have the deeper criss-cross groove pattern and the PU pods have the shallower criss-cross groove pattern due to the compression characteristics of the materials. The criss-cross groove pattern also assists with keeping the insole in place so it does not move or slide around within the shoe.

example, the firmness of lateral heel pod 914 and medial heel pod 916 differs by about 20-30 % for an insole to be used during light to moderate activities.

[00186] Carrying a heavy backpack or other articles significantly increases the load on the foot and the rate of pronation during and following heel strike. Accordingly, medial heel pod 916 is made significantly firmer in an insole designed for use while backpacking. As an example, a difference in firmness of about 20-40% is more appropriate for such activities.

[00187] Lateral midfoot pod 912 provides cushioning and control to the lateral side of the foot during the midstance portion of a step. Typically, lateral midfoot pod is formed of a material having the same properties, e.g., firmness, as lateral heel pod 914. However, a material having different characteristics may also be used.

[00188] The use of dual density heel pods is employed to cause a kinetic change in foot function to promote ankle stability. It is also not out of the scope of the invention to have the medial heel pod softer than the lateral heel pod and/or lateral midfoot pod or any combination thereof to address different joint moments or ankle rolls.

[00189] At the beginning of the propulsion or toe-off phase of a step, the heel begins to lift from the ground and weight shifts to the ball of the foot. Forefoot pad 908 is located under this part of the foot. Preferably, forefoot pad 908 is formed of a relatively resilient material so that energy put into compressing forefoot pad 908 is returned to help propel the foot at toe-off.

[00190] During toe off, the first metatarsal naturally flexes downward. Preventing this natural downward flex of the first metatarsal causes the arch of the foot to flatten and the foot to over pronate, increasing stress on the ankles and knees. To accommodate the downward flex, the medial portion of forefoot pad 908 extends rearward into a corresponding concave edge portion of the distal edge of stability cradle 906. The shape of the stability cradle 906 and forefoot pad 908 permit the first metatarsal to flex more naturally and thereby encourage loading of the great toe during toe off.

[00191] The forefoot pad 908, lateral midfoot pod 912, lateral heel pod 914, and medial heel pod 916 are constructed with a criss-cross groove pattern on the bottom surface of the pod or pad. The criss-cross groove pattern introduces air gaps into the pod/pad surfaces. Such air gaps and criss-cross groove patterns positively influence the impact absorption properties. It also

[00202] Transverse arch support 1038 preferably lies under the second to fourth metatarsal heads. Transverse arch support 1038 provides additional stability to the forefoot and middle of the foot.

[00203] FIG. 11 illustrates a cross section 11-11 as identified in FIGS. 4 and 5. Insole 1100 preferably comprises a top sheet 1101 and a base 1102 having a top surface secured to said top sheet 1101 and an opposite bottom surface. The bottom surface of base 1102 defines a forefoot pad recession area and a stability cradle recession area.

[00204] The stability cradle recession area 1105 is located in the midfoot and heel areas of the bottom surface of base 1102. The stability cradle recession area 1105 extends from a medial edge approximate the medial border to a lateral edge approximate the lateral border of the base and from a distal edge slightly proximal of the forefoot recession area to a proximal edge approximate the heel end of the base. A medial portion of the distal edge is shaped to accommodate downward motion of the 1st metatarsal during toe off. Stability cradle ~~116~~ 1106 is shaped essentially the same as stability cradle recession area 1105 and has a base facing surface and a shoe facing surface. The base facing surface is secured to said stability cradle recession area 1105. Stability cradle 1106 has walls that wrap up the sides and rear of base 102 to provide support for the foot.

[00205] Preferably, the shoe facing surface of stability cradle 1106 has a "faceted" surface texture. This textured faceted surface increases the ability of the insole to "stay in place" when a user's foot is being placed into or out of the shoe. Swapping shoes and running gear is a very common practice during triathlon events and practice sessions. As such, these faceted textures significantly improves the use and performance of these insoles for this particular use.

[00206] The stability cradle 1106 preferably defines one or more rib-shaped openings 1131. In a preferred embodiment, the rib-shaped openings 1131 allow said ribs 1132 of base 1102 to extend therethrough. Preferably, base 1102 is molded so that the ribs 1132 project into rib-shaped openings 1131 so that the ribs 1132 are approximately flush with the outer surface of stability cradle 1106 and mechanically lock stability cradle 106 and base 1102 together. Advantageously, the ribs 1132 are also able to bulge through rib-shaped openings 1131 when base 1102 is compressed (e.g., while walking or running) to provide additional cushioning and support to the arch of the foot. Preferably said ribs 1132 extend outwardly approximately 0.50 mm to 1.5 mm and have a width of approximately 4 mm. The rib-

[00224] Lateral heel area 1469 extends from a front edge just behind the cuboid or adjacent the front edge of heel area 1495 to the heel end. The width of lateral heel area extends from a diagonal medial edge to the lateral border where diagonal medial edge extends from about a third of the insole width medially from the lateral border along the front edge of the heel area 1495 to a point just medial of the heel end.

[00225] Medial heel area 1468 extends from the front edge of the heel area 1495 to the medial border just medial of the heel end. The width of medial heel area 1468 extends from the lateral diagonal edge of proximal medial arch area 1467 to the medial diagonal edge of lateral heel area 1469.

[00226] Forefoot pad recession area 1407 preferably extends the entire length of the metatarsal head area 1492 on the medial half and from the front diagonal edge of metatarsal head area 1492 to 3rd through 5th metatarsal heads on the lateral half. Forefoot pad 1408 is secured to the forefoot pad recession area 1467.

[00227] Stability cradle 1406 is located in the entire midfoot area 1494 and heel area 1495. A portion of stability cradle 1406 on the lateral half extends forward into metatarsal head area 1492 to just behind the 3rd through 5th metatarsal heads.

[00228] In a preferred embodiment, ribs 1432 of base 1402 extend through rib openings 1431 and are located in the majority of the distal medial arch area 1465 and proximal medial arch area 1467. In an alternate embodiment, the ribs or protrusions are defined by the stability cradle 1406 and extending outwardly from the stability cradle 1406 and are located in the majority of the distal medial arch area 1465 and proximal medial arch area 1467.

[00229] Lateral midfoot pod opening is located approximately in the middle third of the lateral midfoot area 1466. Lateral midfoot pod opening extends essentially the entire length of lateral midfoot area 1466. Lateral midfoot pod 1412 is secured to lateral midfoot pod opening.

[00230] Medial heel pod opening is located in the majority of the medial heel area 1468. Medial heel pod 1416 is secured to medial heel pod opening. Lateral heel pod opening is located in the majority of the lateral heel area 1469. Lateral heel pod 1414 is secured to lateral heel pod opening.

[00248] Stability cradle 1506 defines a lateral midfoot pod opening 1511 that extends from behind the 3rd through 5th metatarsal heads proximally to the back of the cuboid. The length of the lateral midfoot pod opening 1511 is preferably sufficient to provide cushioning to the lateral aspect of the midfoot. Lateral midfoot pod 1512 is shaped essentially the same as lateral midfoot pod opening 1511 and is secured to the bottom surface of base 1502 within the stability cradle recession area 1505 in a location that correlates to the lateral midfoot pod opening 1511 and allows lateral midfoot pod 1512 to extend out through said lateral midfoot pod opening 1511.

[00249] Lateral midfoot pod 1512 is preferably made from TPR or PU of a hardness of about 45-50 ASKER C. If TPR is used, a fabric is in turn secured to the base 1502 in the lateral midfoot pod opening 1511 of said base 1502. The fabric component allows the TPR to properly adhere to the base 1502.

[00250] Stability cradle 1506 also defines a lateral heel pod opening 1513 that extends through the lateral side of the heel area of stability cradle 1506 from approximately rearward of the lateral midfoot pod opening 1511 toward the heel end. Lateral heel pod 1514 is shaped essentially the same as lateral heel pod opening 1513 and is secured to the bottom surface of base 1502 within the stability cradle recession area 1505 in a location that correlates to the lateral heel pod opening 1513 and allows lateral heel pod 1514 to extend out through said lateral heel pod opening 1513. Lateral heel pod 1514 has a lateral edge which extends along the lateral border of insole 1500 from said heel end to a lateral heel edge spaced apart from said lateral midfoot pod. The lateral edge curves in the area of the heel to follow the outline of the insole heel end. The lateral heel pod 1514 also has a medial curvilinear edge. The overall configuration is roughly a multi-sided geometric shape with curved edges as described rather than straight lines.

[00251] The configuration, material and position of the lateral heel pod 1514 provides cushioning and works in association with the medial heel pod 1516 to stabilize the ankle. The hardness of the lateral heel pod is preferably essentially the same as the lateral midfoot pod, which work in concert to help reduce the incidence of lateral ankle roll-overs. It is preferably made of TPR or PU of a hardness of about Shore C 45-50. If TPR is used, a fabric is in turn secured to the base 1502 in the lateral heel pod opening 1511 of said base 1502. The fabric component allows the TPR to properly adhere to the base 1502.

of the stability cradle 1506 and forefoot pad 1508 permit the first metatarsal to flex more naturally and thereby encourage loading of the great toe during toe off.

[00263] Base 1502 is preferably made of foam or other material having suitable cushioning properties. Preferably, base 1502 comprises an Ethylene vinyl acetate ("EVA") foam, which is a copolymer of ethylene and vinyl acetate, or a Thermoplastic Rubber ("TPR")/EVA mix. A preferred EVA or TPR/EVA mix has a durometer (hardness) of about Asker C 45-50.

[00264] Forefoot pad 1508 is preferably made from a Thermoplastic Rubber ("TPR") or Polyurethane ("PU"). The hardness of the TPR or PU used in the forefoot pad is preferably about 30 Asker C ±3.

[00265] The forefoot pad 1508, lateral midfoot pod 1512, lateral heel pod 1514, and medial heel pod 1516 are constructed with a criss-cross groove pattern on the bottom surface of the pod or pad. The criss-cross groove pattern introduces air gaps into the pod/pad surfaces. Such air gaps and criss-cross groove patterns positively influence the impact absorption properties. It also allows for use of less material and therefore a lighter insole while still providing the desired cushioning function. Preferably, the forefoot criss-cross groove pattern 1520 is approximately 0.75 mm deep. Preferably the lateral midfoot and heel criss-cross groove patterns 1521 and 1522 are approximately 1.00 to 3.00 mm deep. Preferably, the medial heel criss-cross groove pattern 1523 is approximately 1.00 to 2.50 mm deep. Preferably the TPR pods have the deeper criss-cross groove pattern and the PU pods have the shallower criss-cross groove pattern due to the compression characteristics of the materials. The criss-cross groove pattern also assists with keeping the insole in place so it does not move or slide around within the shoe.

[00266] For a men's size 11-12 insole, the width of the forefoot pad from the medial to lateral side is about 85 to 95 mm. The height is about 100 to 110 mm. The depth is about 0.95 to 1.50 mm.

[00267] It is desirable to minimize the total weight of the insoles by selection of materials working with the structural features of the insole. It is desirable that the total weight of the preferred embodiment of the insole (men's size 10/11) be about 4.0 ounces. It is desirable that the total weight of an alternate embodiment of the insole be about 5.0 to 6.0 ounces for

midfoot pod opening 1511 and allows lateral midfoot pod 1512 to extend out through said lateral midfoot pod opening 1511.

[00302] Lateral midfoot pod 1512 is preferably made from TPR or PU of a hardness of about 45-50 ASKER C. If TPR is used, a fabric is in turn secured to the base 1502 in the lateral midfoot pod opening 1511 of said base 1502. The fabric component allows the TPR to properly adhere to the base 1502.

[00303] Stability cradle 1506 also defines a lateral heel pod opening 1513 that extends through the lateral side of the heel area of stability cradle 1506 from approximately rearward of the lateral midfoot pod opening 1511 toward the heel end. Lateral heel pod 1514 is shaped essentially the same as lateral heel pod opening 1513 and is secured to the bottom surface of base 1502 within the stability cradle recession area 1505 in a location that correlates to the lateral heel pod opening 1513 and allows lateral heel pod 1514 to extend out through said lateral heel pod opening 1513. Lateral heel pod 1514 has a lateral edge which extends along the lateral border of insole 1500 from said heel end to a lateral heel edge spaced apart from said lateral midfoot pod. The lateral edge curves in the area of the heel to follow the outline of the insole heel end. The lateral heel pod 1514 also has a medial curvilinear edge. The overall configuration is roughly a multi-sided geometric shape with curved edges as described rather than straight lines.

[00304] The configuration, material and position of the lateral heel pod 1514 provides cushioning and works in association with the medial heel pod1516 to stabilize the ankle. The hardness of the lateral heel pod is preferably essentially the same as the lateral midfoot pod, which work in concert to help reduce the incidence of lateral ankle roll-overs. It is preferably made of TPR or PU of a hardness of about Shore C 45-50. If TPR is used, a fabric is in turn secured to the base 1502 in the lateral heel pod opening 1511 of said base 1502. The fabric component allows the TPR to properly adhere to the base 1502.

[00305] Stability cradle 1506 defines a medial heel pod opening 1515 that extends through the heel area along the medial side of heel area on the bottom surface of base 1502 just short of the heel end. Medial heel pod 1516 is shaped essentially the same as medial heel pod opening 1515 and is secured to the bottom surface of base 1502 within the stability cradle recession area 1505 in a location that correlates to the medial heel pod opening 1515 and allows medial heel pod 1516 to extend out through said medial heel pod opening 1515. The medial heel pod 1516 has essentially a pea-pod shape; it has a medial edge and a lateral

rather than straight lines. Lateral heel pod opening 1513 is designed to allow a lateral heel pod to extend there through.

[00409] Medial heel pod opening 1515 extends through the heel area along the medial side of heel area on the bottom surface of base 1502 just short of the heel end. The medial heel pod opening 1515 has essentially a pea-pod shape; it has a medial edge and a lateral edge which are connected to one another at a first distal apex and a second proximal apex. The edges widen out opposite one another to define said medial heel pod opening. Medial heel pod opening 1515 is designed to allow a medial heel pod to extend there through.

[00410] Stability cradle 1506 provides firm support along the medial portion of the foot to help control the amount of pronation.

[00411] FIGS. 15D-1 to 15D-5 show a medial side, bottom, lateral side, prospective and a cross-section of the insole pods 1512, 1514 and 1516.

[00412] Stability cradle 1506 also defines a lateral heel pod opening 1513 that extends through the lateral side of the heel area of stability cradle 1506 from approximately rearward of the lateral midfoot pod opening 1511 toward the heel end. Lateral heel pod 1514 is shaped essentially the same as lateral heel pod opening 1513 and is secured to the bottom surface of base 1502 within the stability cradle recession area 1505 in a location that correlates to the lateral heel pod opening 1513 and allows lateral heel pod 1514 to extend out through said lateral heel pod opening 1513. Lateral heel pod 1514 has a lateral edge which extends along the lateral border of insole 1500 from said heel end to a lateral heel edge spaced apart from said lateral midfoot pod. The lateral edge curves in the area of the heel to follow the outline of the insole heel end. The lateral heel pod 1514 also has a medial curvilinear edge. The overall configuration is roughly a multi-sided geometric shape with curved edges as described rather than straight lines.

[00413] The configuration, material and position of the lateral heel pod 1514 provides cushioning and works in association with the medial heel pod 1516 to stabilize the ankle. The hardness of the lateral heel pod is preferably essentially the same as the lateral midfoot pod, which work in concert to help reduce the incidence of lateral ankle roll-overs. It is preferably made of TPR or PU of a hardness of about Shore C 45-50. If TPR is used, a fabric is in turn secured to the base 102 in the lateral heel pod opening 1513 of said base 1502. The fabric component allows the TPR to properly adhere to the base 1502.

1514 made of a softer material. As a result, medial heel pod 1516 tends to resist or counteract pronation and thereby help to reduce the degree and rate of pronation. Conversely, making medial heel pod 1516 from a softer material than lateral heel pod 1514 would tend to increase the amount and rate of pronation.

[00419] Preferably, the firmness of the material used in medial heel pod 1516 is selected based on the firmness of lateral heel pod 1514 and on the type of intended activity. For example, the firmness of lateral heel pod 1514 and medial heel pod 1516 differs by about 20-30 % for an insole to be used during light to moderate activities.

[00420] Carrying a heavy backpack or other articles significantly increases the load on the foot and the rate of pronation during and following heel strike. Accordingly, medial heel pod 1516 is made significantly firmer in an insole designed for use while backpacking. As an example, a difference in firmness of about 20-40% is more appropriate for such activities.

[00421] Lateral midfoot pod 1512 provides cushioning and control to the lateral side of the foot during the midstance portion of a step. Typically, lateral midfoot pod 1512 is formed of a material having the same properties, e.g., firmness, as lateral heel pod 1514. However, a material having different characteristics may also be used.

[00422] .

[00423] FIGS. 15E-1 to 15E-4 show a medial side, bottom, cross-section and prospective view of the forefoot pad 1508. Forefoot pad 108 is preferably made from a Thermoplastic Rubber ("TPR") or Polyurethane ("PU"). The hardness of the TPR or PU used in the forefoot pad is preferably about 30 Asker C ±3. The forefoot pad 1508, lateral midfoot pod 1512, lateral heel pod 1514, and medial heel pod 1516 are constructed with a criss-cross groove pattern on the bottom surface of the pod or pad. The criss-cross groove pattern introduces air gaps into the pod/pad surfaces. Such air gaps and criss-cross groove patterns positively influence the impact absorption properties of each pod and pad. It also allows for use of less material and therefore a lighter insole while still providing the desired

opening 1613 has a lateral edge which extends along the lateral border of insole from said heel end to a lateral heel edge spaced apart from said lateral midfoot pod opening 1611. The lateral edge curves in the area of the heel to follow the outline of the insole heel end. The lateral heel pod opening 1613 also has a medial curvilinear edge. The overall configuration is roughly a multi-sided geometric shape with curved edges as described rather than straight lines. Lateral heel pod opening 1613 is designed to allow a lateral heel pod to extend there through.

[00642] Medial heel pod opening 1615 extends through the heel area along the medial side of heel area on the bottom surface of base 1602 just short of the heel end. The medial heel pod opening 1615 has essentially a pea-pod shape; it has a medial edge and a lateral edge which are connected to one another at a first distal apex and a second proximal apex. The edges widen out opposite one another to define said medial heel pod opening. Medial heel pod opening 1615 is designed to allow a medial heel pod to extend there through.

[00643] Stability cradle 1606 provides firm support along the medial portion of the foot to help control the amount of pronation.

[00644] FIG. 16C-1 to 16C-5 shows a bottom and side views of the lateral midfoot pod, medial heel pod, and lateral heel pod, and a section view of the medial heel pod and lateral heel pod.

[00645] Figure 16D-1 to 16D-5 show a medial side, bottom, lateral side, prospective and one cross-section view of the insole pods 1612, 1614 and 1616. Stability cradle 1606 also defines a lateral heel pod opening 1613 that extends through the lateral side of the heel area of stability cradle 1606 from approximately rearward of the lateral midfoot pod opening 1611 toward the heel end. Lateral heel pod 1614 is shaped essentially the same as lateral heel pod opening 1613 and is secured to the bottom surface of base 1602 within the stability cradle recession area 1605 in a location that correlates to the lateral heel pod opening 1613 and allows lateral heel pod 1614 to extend out through said lateral heel pod opening 1613. Lateral heel pod 1614 has a lateral edge which extends along the lateral border of insole 1600 from said heel end to a lateral heel edge spaced apart from said lateral midfoot pod. The lateral edge curves in the area of the heel to follow the outline of the insole heel end. The lateral heel pod 1614 also has a medial curvilinear edge. The overall configuration is roughly a multi-sided geometric shape with curved edges as described rather than straight lines.

[0065l] Stability cradle 1606 provides firm support along the medial portion of the foot to help control the amount of pronation. Medial heel pod 1616 helps to control the rate of pronation by forming medial heel pod 1616 out of a material having different characteristics than lateral heel pod 1614. For example, to reduce a pronation rate, medial heel pod 1616 is made from a firmer material than lateral heel pod 1614. A firmer or stiffer material does not compress as much or as fast as a softer material under the same load. Thus, a medial heel pod 1616 made from a firmer material would compress less than a lateral heel pod 1614 made of a softer material. As a result, medial heel pod 1616 tends to resist or counteract pronation and thereby help to reduce the degree and rate of pronation. Conversely, making medial heel pod 1616 from a softer material than lateral heel pod 1614 would tend to increase the amount and rate of pronation.

[0065 2] Preferably, the firmness of the material used in medial heel pod 1616 is selected based on the firmness of lateral heel pod 1614 and on the type of intended activity. For example, the firmness of lateral heel pod 1614 and medial heel pod 1616 differs by about 20-30 % for an insole to be used during light to moderate activities.

[0065 3] Carrying a heavy backpack or other articles significantly increases the load on the foot and the rate of pronation during and following heel strike. Accordingly, medial heel pod 1616 is made significantly firmer in an insole designed for use while backpacking. As an example, a difference in firmness of about 20-40% is more appropriate for such activities.

[0065 4] Lateral midfoot pod 1612 provides cushioning and control to the lateral side of the foot during the midstance portion of a step. Typically, lateral midfoot pod 1612 is formed of a material having the same properties, e.g., firmness, as lateral heel pod 1614. However, a material having different characteristics may also be used.

[0065 5] FIG. 16D-1 to 16D-4 shows a bottom, side, cross section and prospective view of the forefoot pad.

[0065 6] Figures 16E-1 to 16E-4 show a medial side, bottom, cross-section and prospective view of the forefoot pad 1608. Forefoot pad 108 is preferably made from a Thermoplastic Rubber ("TPR") or Polyurethane ("PU"). The hardness of the TPR or PU used in the forefoot pad is preferably about 30 Asker C ±3. The forefoot pad 1608, lateral midfoot pod 1612, lateral heel pod 1614, and medial heel pod 1616 are constructed with a criss-cross groove pattern on the