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Gossman

(54) **FLEXIBLE MIDFOOT ORTHOTIC SHOE INSERT**

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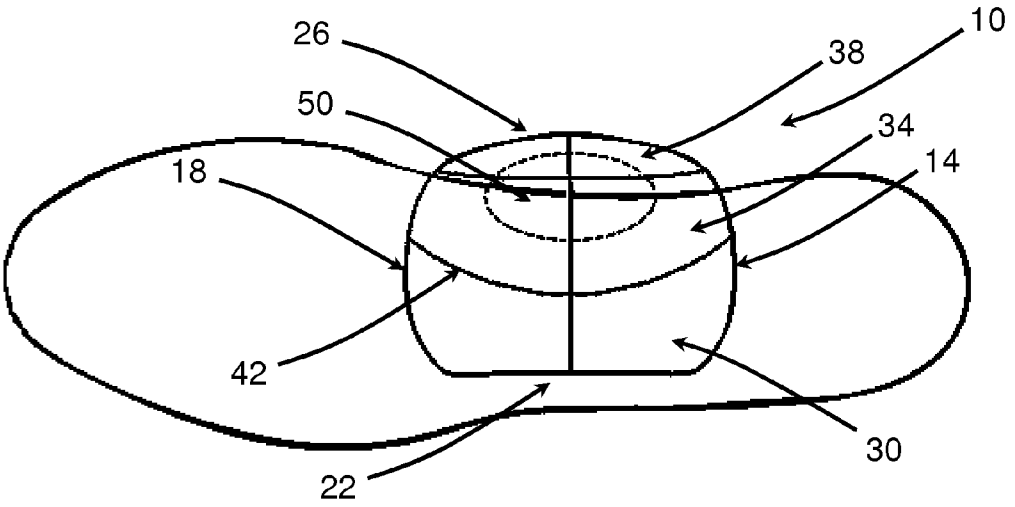
(57) **ABSTRACT**

A preformed orthotic is provided. The orthotic may include a lateral contour zone disposed on the lateral side of the orthotic which slopes upwardly in a medial direction at an angle of about one to fifteen degrees, a medial contour zone adjacent the lateral contour zone which slopes upwardly in a medial direction at an angle of about fifteen to forty degrees, and a medial wing disposed adjacent the medial contour zone which extends upwardly from the medial contour zone at an angle of about twenty-five to seventy-five degrees. An orthotic contoured support area may primarily cover the mid-foot and may only extend slightly into the heel and forefoot. The orthotic may be constructed from a flexible material which allows the orthotic to form to the shape of the shoe it is placed in. The medial wing may utilize the medial wall of the shoe to increase arch support.



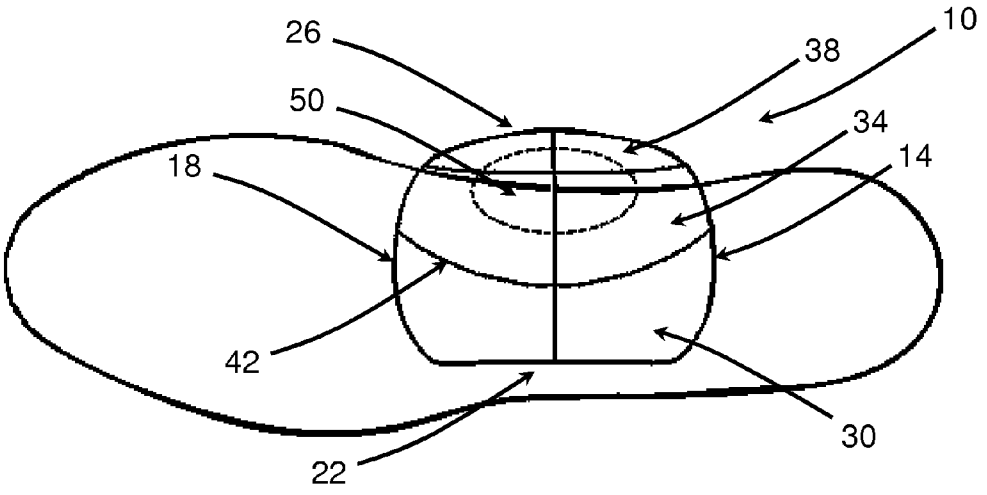


FIG. 1

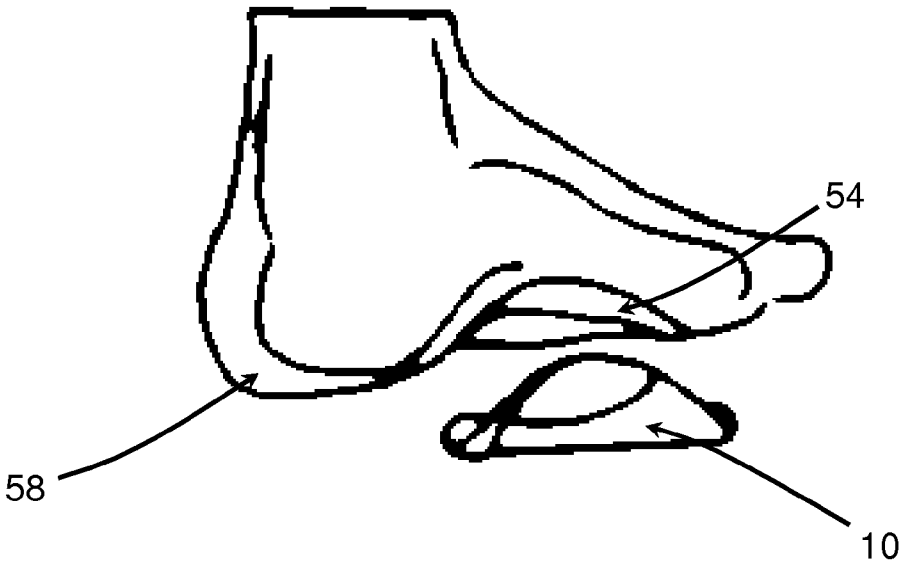


FIG. 2

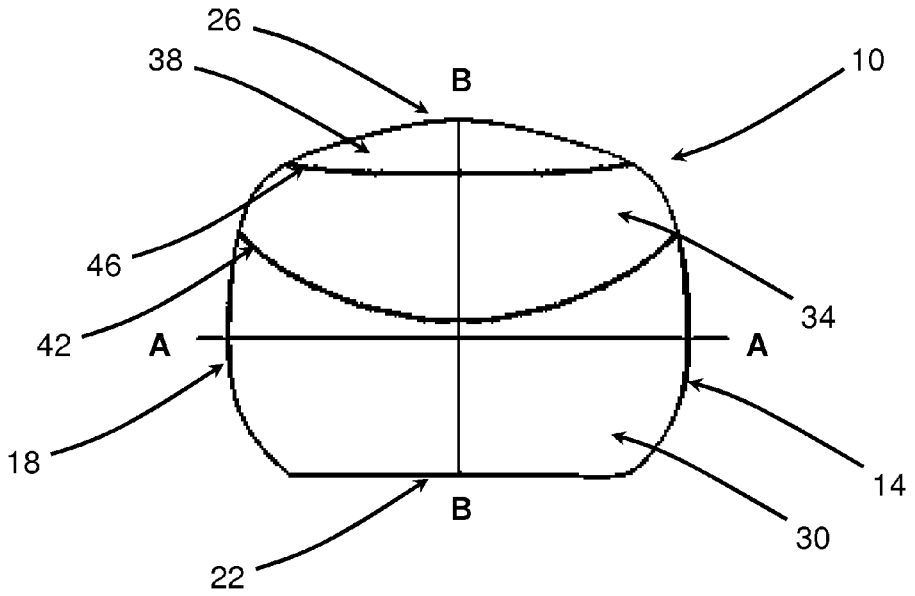


FIG. 3

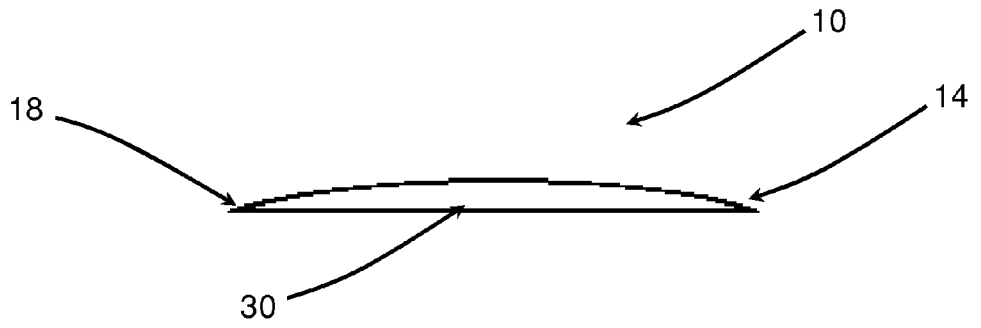


FIG. 4

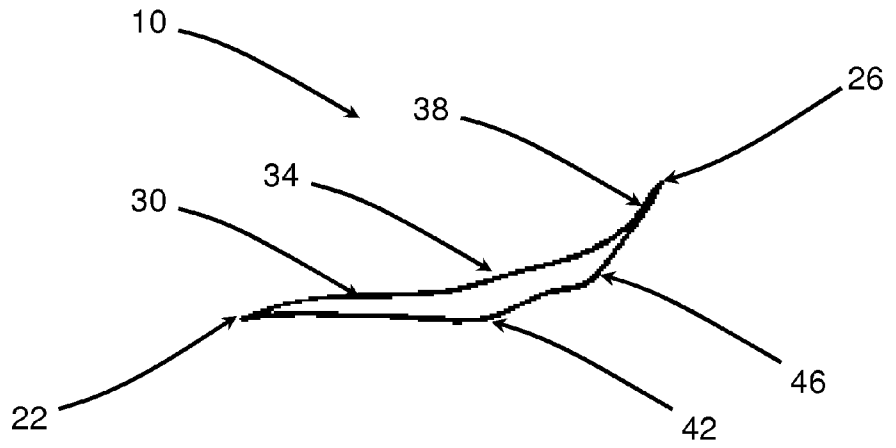


FIG. 5

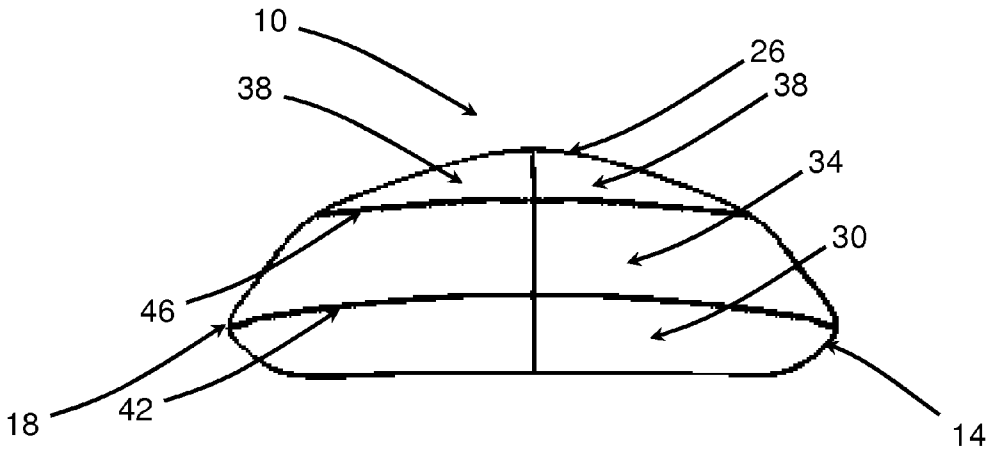


FIG. 6

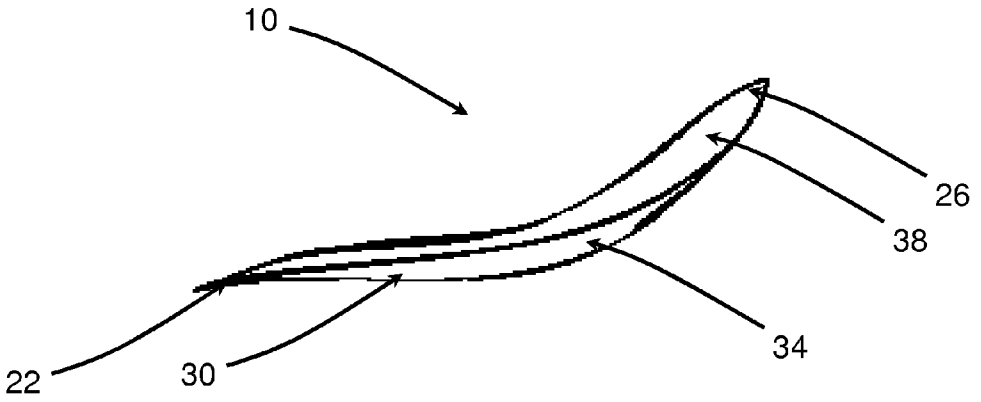


FIG. 7

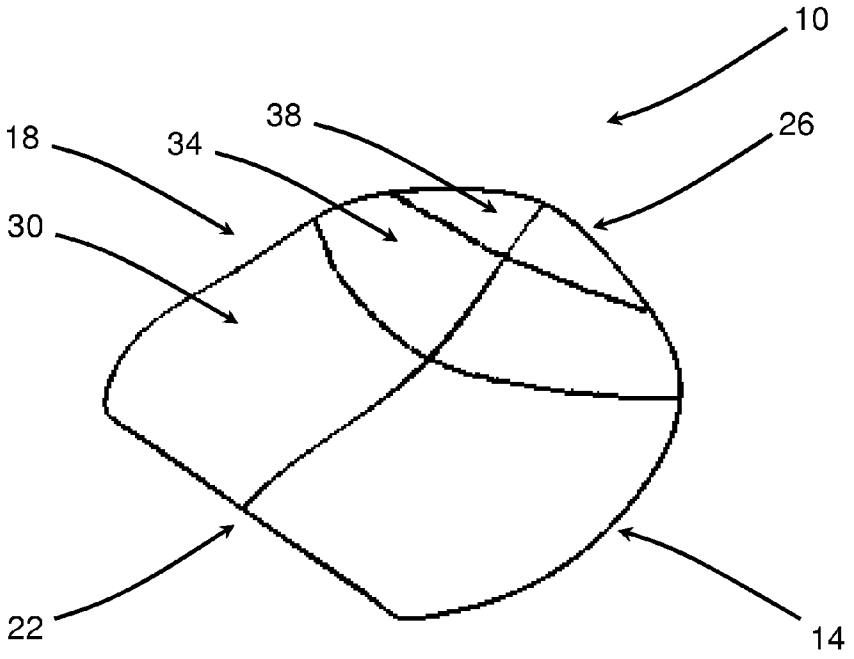


FIG. 8

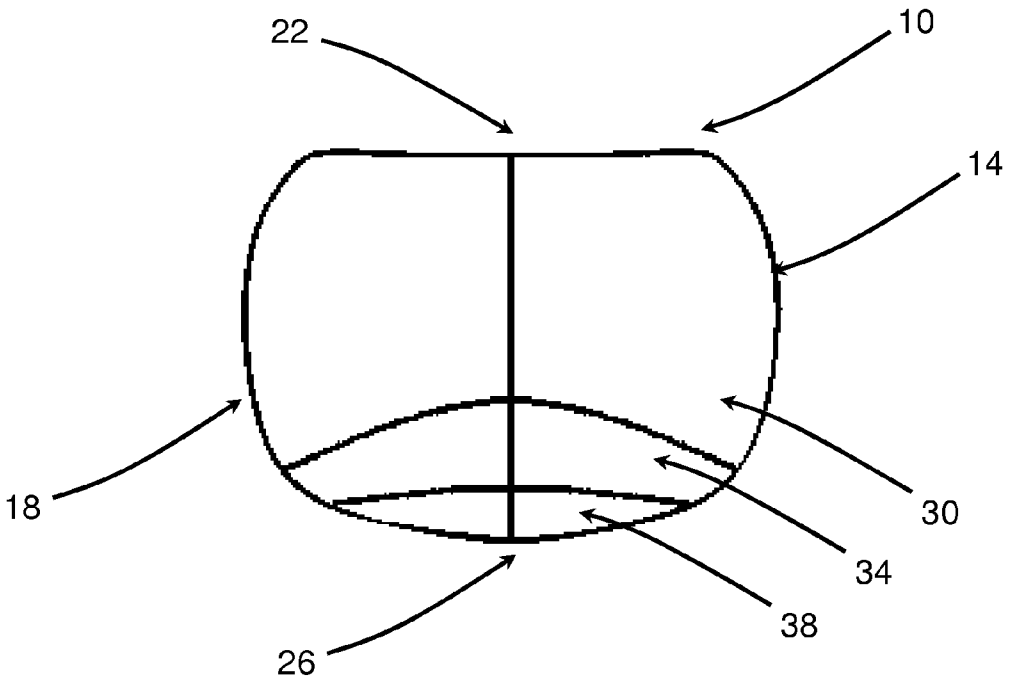


FIG. 9

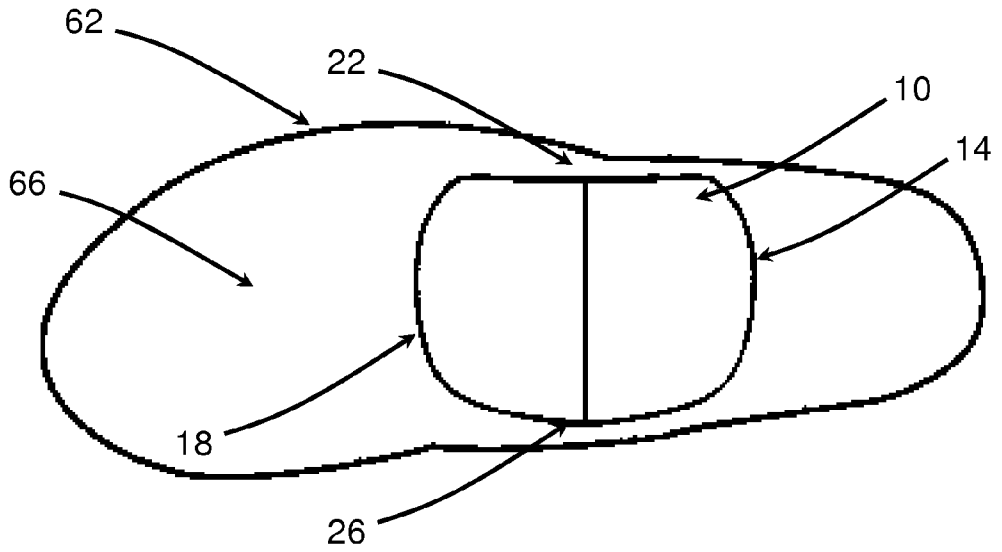


FIG. 10

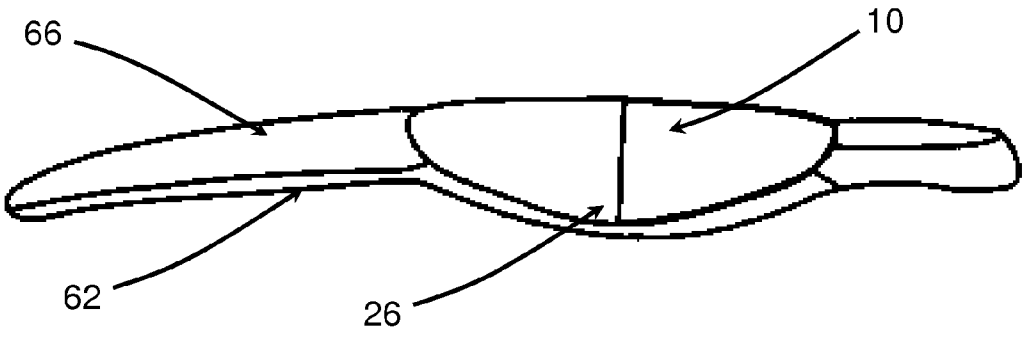


FIG. 11

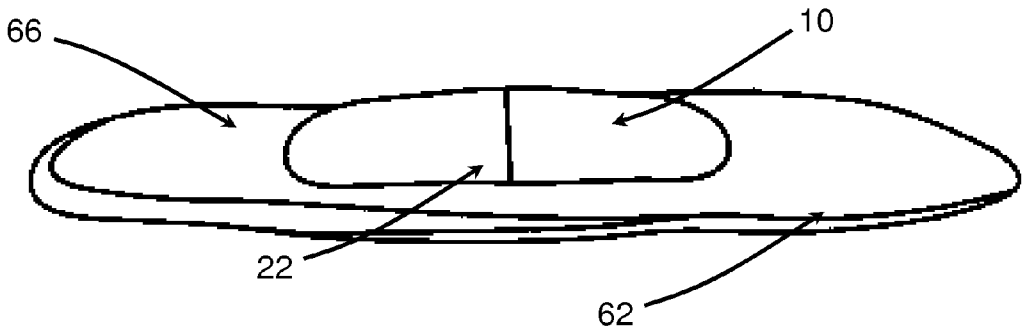


FIG. 12

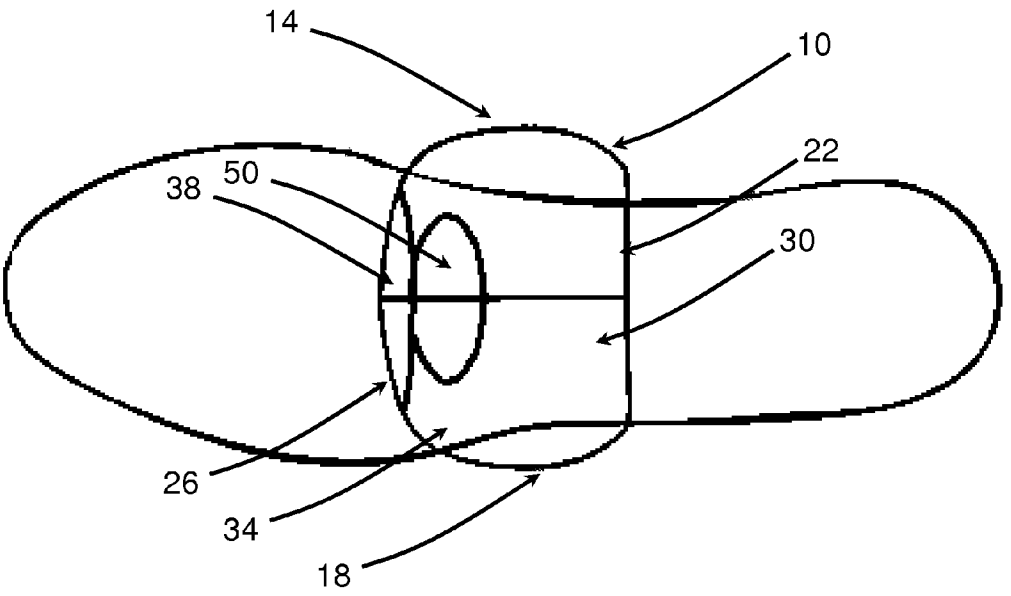


FIG. 13

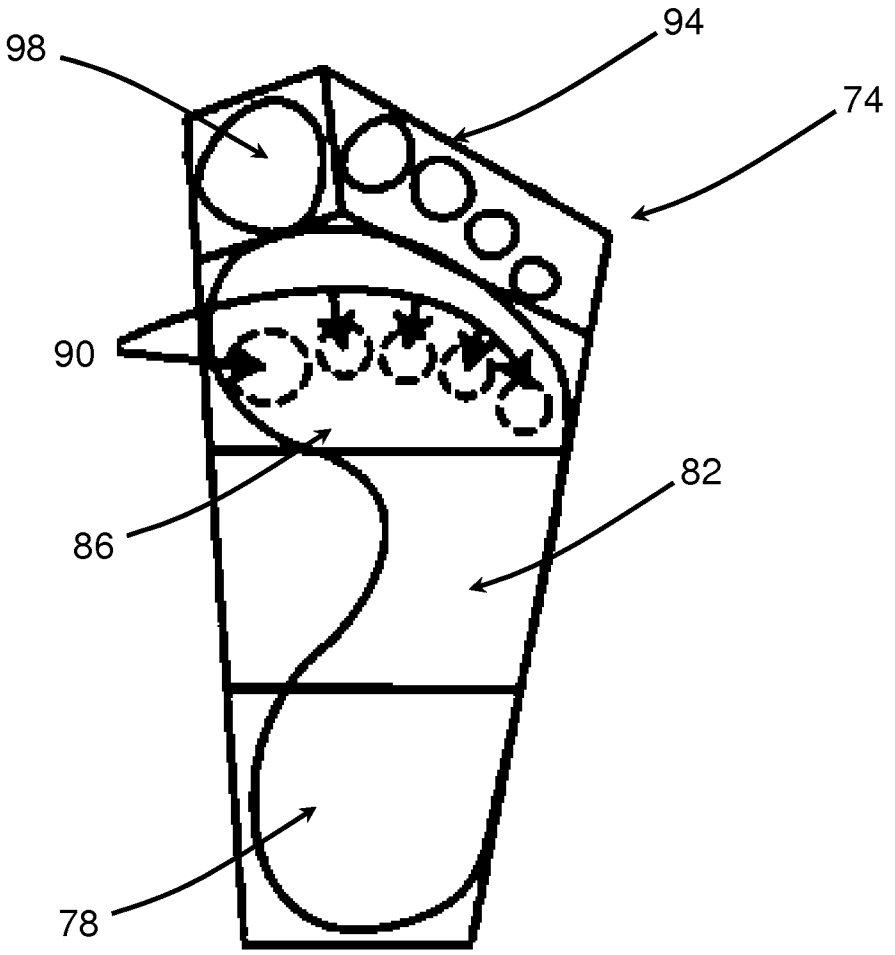


FIG. 14

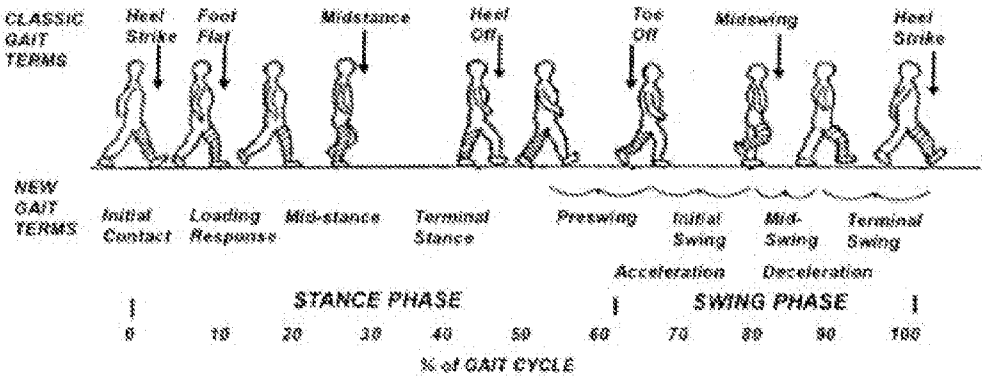

CLASSIC GAIT TERMS
Heel Strike
Foot Flat
Midstance
Heel Off
Toe Off
Midswing
Heel Strike
NEW GAIT TERMS
Initial Contact
Loading Response
Mid-stance
Terminal Stance
Preswing
Initial Swing
Mid-Swing
Terminal Swing
Acceleration
Deceleration
STANCE PHASE
SWING PHASE
0
10
20
30
40
50
60
70
80
90
100
% of GAIT CYCLE

FIG. 15

FLEXIBLE MIDFOOT ORTHOTIC SHOE INSERT

RELATED APPLICATIONS

[0001] The present application claims the benefit of U.S. Provisional Application Ser. No. 61/663,340, filed Jun. 22, 2012, which is expressly incorporated herein by reference in its entirety. The present application also claims the benefit of U.S. Provisional Application Ser. No. 61/755,821, filed Jan. 23, 2013, which is expressly incorporated herein in its entirety.

BACKGROUND INFORMATION

[0002] 1. Field of the Disclosure

[0003] The present invention relates generally to a device for supporting the foot and more particularly to a device for relaxing and shortening the musculatures of the foot by raising the arch to prevent and treat plantar fasciitis as well as other lower extremity ailments.

[0004] 2. Background

[0005] Feet are the foundation of the body. Without proper alignment of the joints of the feet, excessive stress and strain can occur in the feet as well as elsewhere in the body. Many types of footwear, however, may not properly support the feet and may not promote proper alignment of the feet. Fashion footwear in particular is often designed without regard to properly supporting the feet. Such footwear may cause or exacerbate problems with the feet. There is a need for improved support of the foot while wearing footwear generally and fashion footwear in particular.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] Non-limiting and non-exhaustive embodiments of the present invention are described with reference to the following figures, wherein like reference numerals refer to like parts throughout the various views unless otherwise specified.

[0007] FIG. **1** shows a top view of an orthotic insert according to the present disclosure as it may be placed on the inside of an article of footwear.

[0008] FIG. **2** shows a perspective view of the placement of the orthotic of FIG. **1** under the left foot.

[0009] FIG. **3** shows a top view of the orthotic of FIG. **1**.

[0010] FIG. **4** shows a lateral, cross-sectional view of the orthotic of FIG. **1** taken along line A-A of FIG. **3**.

[0011] FIG. **5** shows a frontal, cross-sectional view of the orthotic of FIG. **1** taken on the line B-B of FIG. **3**.

[0012] FIG. **6** shows a lateral side view of the orthotic of FIG. **1**.

[0013] FIG. **7** shows a frontal view of the orthotic of FIG. **1**.

[0014] FIG. **8** shows a perspective view from the frontal/lateral corner of the orthotic of FIG. **1**.

[0015] FIG. **9** shows a bottom view of the orthotic of FIG. **1**.

[0016] FIG. **10** shows a bottom view of the orthotic of FIG. **1** attached to the underside of a full length insole.

[0017] FIG. **11** shows a medial side view of the orthotic of FIG. **1** attached to the underside of a full length insole.

[0018] FIG. **12** shows a lateral side view of the orthotic of FIG. **1** attached to the underside of a full length insole.

[0019] FIG. **13** shows a top view of the orthotic of FIG. **1** as placed on the inside of an article of footwear in an alternate orientation to provide relief from extreme forefoot pain or neuroma.

[0020] FIG. **14** is a drawing illustrating the five plantar surface regions.

[0021] FIG. **15** is a diagram of the different phases within a human gait cycle.

[0022] Corresponding reference characters indicate corresponding components throughout the several views of the drawings. Skilled artisans will appreciate that elements in the figures are illustrated for simplicity and clarity and have not necessarily been drawn to scale. For example, the dimensions of some of the elements in the figures may be exaggerated relative to other elements to help to improve understanding of various embodiments of the present invention. Also, common but well-understood elements that are useful or necessary in a commercially feasible embodiment are often not depicted in order to facilitate a less obstructed view of these various embodiments of the present invention.

DETAILED DESCRIPTION

[0023] In the following description, numerous specific details are set forth in order to provide a thorough understanding of the present invention. It will be apparent, however, to one having ordinary skill in the art that the specific detail need not be employed to practice the present invention. In other instances, well-known materials or methods have not been described in detail in order to avoid obscuring the present invention.

[0024] Reference throughout this specification to "one embodiment", "an embodiment", "one example" or "an example" means that a particular feature, structure or characteristic described in connection with the embodiment or example is included in at least one embodiment of the present invention. Thus, appearances of the phrases "in one embodiment", "in an embodiment", "one example" or "an example" in various places throughout this specification are not necessarily all referring to the same embodiment or example. Furthermore, the particular features, structures or characteristics may be combined in any suitable combinations and/or subcombinations in one or more embodiments or examples. In addition, it is appreciated that the figures provided herewith are for explanation purposes to persons ordinarily skilled in the art and that the drawings are not necessarily drawn to scale.

[0025] Feet are the foundation of the body. Without proper alignment of the joints of the feet, excessive stress and strain can occur in the feet as well as elsewhere in the body. The human foot may be subject to a variety of abnormalities that cause pain. Abnormalities and injuries of the foot may be caused by or made worse by footwear which does not properly support the foot. The present disclosure provides an orthotic device which is useful to properly support a foot and to correct abnormalities or problems which adversely affect the foot. The orthotic device may be used to correct abnormalities in the foot as well as to prevent foot problems or injury occurring while wearing shoes.

[0026] The orthotic device may be used to realign the joints of the feet to their neutral, mid-range positions while wearing shoes. The device may be used to maintain the structure and stability of the feet to help prevent subluxation of joints and strains of muscles, tendons, and ligaments of the feet and all joints up the kinetic chain of a person. The present orthotic

may be used for reducing injury or increasing comfort of shoes without removable insoles. As such, the device will work for shoes with and without removable insoles.

[0027] A high-heeled dress shoe is one example of a shoe that this orthotic will help make more comfortable. A standard high-heeled dress shoe is designed so that the heel of the foot wearing the shoe is set higher than its toes. The height difference between the heel and the toes can vary significantly depending on the style of the shoe. It is not uncommon for heel heights to range from 1 and ½ inches to 3 inches or more above the toes in certain styles of high heeled shoes. A number of painful foot problems result from this design. For example, the downward slant of the shoe forces the wearer's foot to slide forward. This often jams the foot into the toe portion of the shoe. This can be very painful, and some research has shown that at least 85% of all high-heeled shoe wearers experience such pain.

[0028] Additionally, the downward slant of the shoe places stress on the foot, causing the heel bone or calcaneus to tilt downward, or plantarflex. This downward tilting of the heel bone may lock the first metatarsal phalangeal joint and prevent hallux extension, which may be referred to as "toe lock". This toe lock causes the foot to pronate which is uncomfortable for the foot and which also adversely affects the wearer's posture and ambulation. Therefore, wearers of high-heeled shoes often complain of problems associated with toe pain, arch pain, as well as general lower back pain and problems. Orthotic devices according to the present disclosure are designed to combat this issue. These devices will not take up any space in the toe box area and will often help prevent the foot from sliding forward in the shoe while providing arch support.

[0029] Fashion shoes are a second example of shoes that an orthotic according to the present disclosure will help to make more comfortable. Many women's and men's fashion shoes have pointed toes for greater fashion appeal. While the design of these pointed toes may vary, it is generally common for these fashion shoes to maintain pointed toes regardless of the shape of the wearer's foot. While these fashion shoes leave no space for prior art orthotics, an orthotic according to the present disclosure will fit into these kinds of shoes.

[0030] The present disclosure provides a new approach to orthotic shoe inserts. The present disclosure provides novel structures and methods to improve comfort and beneficially support a user's foot structure. One example includes support structures are made of flexible material with a shape that extends from after the heel to before the forefoot and up the medial side of the foot. Various examples of such orthotics include novel structures which provide benefits such as: transverse and medial arch support, impact absorption, redistribution of force and pressure, gait control, prevention and healing of lower extremity injuries, and improved wearer comfort.

[0031] Orthotics according to the present disclosure are further advantageous as they may occupy minimal space in the shoe. Because they occupy minimal space in a shoe, orthotics according to the present disclosure may be worn in fashion shoes and high heeled shoes without detracting from the appearance of the shoes. These orthotic designs enhance the comfort of a wide variety of footwear including fashion footwear.

[0032] Referring to FIGS. **1** to **13**, an orthotic insert **10** is depicted. In one example, the orthotic insert **10** may be inserted into an article of footwear such that in use the orthotic insert lies between the footwear and the underside of the person's foot so as to provide a degree of biomechanical support and control for the foot. The orthotic insert **10** depicted in the accompanying drawings is a partial length insert, but it should be noted that corresponding structures and benefits may be realized in other lengths of orthotic inserts, such as full length inserts. Such may be accomplished, for example, by forming the orthotic with a thin peripheral flange or layer which extends beyond the shaped portion of the orthotic **10** as discussed and extends across a shoe. This may be accomplished without significant change to the functional shape of the orthotic **10**. The orthotic **10** offers arch control resulting in comfort and control in the gait cycle from initial contact, midstance to initial swing, while also maintaining medial foot control throughout the gait cycle.

[0033] Referring now to FIGS. **1** through **9**, an exemplary orthotic insert **10** is shown. FIG. **1** shows a top view of the orthotic insert placed on the inside of an article of footwear to illustrate placement of the orthotic. FIG. **2** shows a perspective view of the placement of the orthotic **10** under the left foot. FIG. **3** shows a top view of the orthotic **10**. FIG. **4** shows a cross-sectional view of the orthotic **10** taken along line A-A of FIG. **3**. FIG. **5** shows a cross-sectional view of the orthotic **10** taken on the line B-B of FIG. **3**. FIG. **6** shows a lateral side view of the orthotic **10**. FIG. **7** shows a frontal view of the orthotic **10**. FIG. **8** shows a perspective view of the orthotic **10** from the frontal/lateral corner. FIG. **9** shows a bottom view of the orthotic **10**.

[0034] As can be seen in FIGS. **1** and **2**, the functional support surface of the orthotic **10** extends from after the heel to before the metatarsal head area in the forefoot. That is to say that the contoured support surface of the orthotic **10** which provides support and control to the foot begins forwards of the heel and ends backwards of the metatarsal head area of the foot. The orthotic insert **10** includes a proximal edge **14** which is disposed adjacent the heel of a user and a distal edge **18** which is disposed adjacent the metatarsal head area of a user. The orthotic insert includes a lateral edge **22** disposed adjacent the lateral side of the foot and a medial edge **26** disposed adjacent the medial side of the foot.

[0035] The orthotic device **10** defines a plurality of different contour zones which provide support to the foot when the orthotic device **10** is used. The orthotic device **10** may include a lateral contour zone **30**, a medial contour zone **34**, and a medial wing **38**.

[0036] Along a medial-lateral midpoint line B-B, the lateral contour zone **30** extends from the lateral edge **22** to a point between approximately one fourth and one half of the width of the insert **10**, and in one example may extend across approximately 40 percent of the width of the insert adjacent the medial-lateral center line B-B. The lateral contour zone **30** may be somewhat wider at the proximal edge **14** or the distal edge **18** of the insert **10**, and may occupy between one fourth and two thirds of the width of the insert **10** at the proximal edge and the distal edge of the insert.

[0037] FIG. **4** shows a cross-sectional view of the lateral contour zone **30** taken along line A-A of FIG. **3**. As illustrated in FIG. **4**, the lateral contour zone **30** may taper to a reduced thickness and reduced height at the proximal edge **14** and the distal edge **18**. The lateral contour zone **30** may taper to a zero, minimal, or near zero thickness and height at the proximal edge **14** and the distal edge **18**. The lateral contour zone **30** may have a thickness near the proximal-distal center which is

between approximately one eighth and three quarters of an inch or between approximately one eight and one half of an inch. The thickness of the lateral contour zone **30** may be between about 3 and about 16 percent or between about 3 and about 20 percent of the proximal-distal length of the insert **10**. According to one example, the thickness of the lateral contour zone **30** may be about 10 percent of the proximal-distal length of the insert **10**. The lateral contour zone **30** may be between about one eighth of an inch and about three quarters of an inch in thickness, and may more frequently be between about one eighth of an inch and one half on an inch in thickness. In one example, the lateral contour zone **30** may be about one fourth of an inch thick.

[0038] The lateral contour zone **30** may define a maximum thickness near the center of the orthotic insert **10** (adjacent the medial contour zone **34**). The lateral contour zone may taper to a reduced, near zero, or zero thickness at the lateral edge **22** of the orthotic insert **10**. Thus, the upper surface of the lateral contour zone **30** may, on average, be sloped upwardly approximately 10 degrees from the lateral edge **22** towards the center of the orthotic insert **10**. The lateral contour zone **30** may be formed such that when the insert **10** is placed in a shoe the bottom of the lateral contour zone rests on the sole of the shoe. According to one example, the bottom of the lateral contour zone **30** may be generally flat or may include a small amount of curvature according to manufacturing processes. According to another example, the bottom of the lateral contour zone **30** may be formed of a flexible material and may, when the orthotic insert **10** is placed into a shoe, conform to the sole of the shoe.

[0039] The medial contour zone **34** may be disposed adjacent the lateral contour zone **30**. The orthotic insert **10** may define a curved boundary **42** between the lateral contour zone **30** and the medial contour zone **34**. The medial contour zone **34** may be wider near the proximal-distal center of the orthotic insert **10** and may be narrower near the proximal edge **14** and the distal edge **18** of the orthotic insert **10**. The medial contour zone **34** may have a width of between one fourth and two thirds of the width of the orthotic device **10** adjacent the proximal-distal center of the device. According to one example, the medial contour zone may have a width of approximately 50 percent of the width of the orthotic device **10** adjacent the proximal-distal center of the orthotic device.

[0040] The medial contour zone **34** may have a width which is between approximately half and one third of the length of the orthotic insert **10** at the proximal edge **14** and the distal edge **18** of the orthotic device **10**. The medial contour zone **34** may have a maximum thickness near the proximal-distal center of the medial edge **26** of the orthotic insert **10**. At this location, the medial contour zone **34** may have a thickness which is between one and one half times and 3 times the maximum thickness of the lateral contour zone **30**. The medial contour zone **34** may have a maximum thickness which is between one eighth of an inch and one inch, and more frequently between about one fourth of an inch and three fourths of an inch in thickness. The medial contour zone **34** may taper to a near zero thickness adjacent the proximal edge **14** and the distal edge **18**, and may taper to a reduced thickness and reduced height adjacent the medial-lateral centers of the proximal edge **14** and lateral edge **18**. The medial contour zone **34** may have an increased thickness and increased height near area **50**. The medial contour zone **34** may taper to a near zero thickness adjacent the medial edge **26** of the orthotic insert **10**.

[0041] The upper surface of the medial contour zone **34** may slope upwardly from the lateral contour zone **30** towards the medial edge **26** at an angle which is between about 15 and 40 degrees. According to one example, the upper surface of the medial contour zone **34** may slope upwardly at an angle of about 30 degrees. The bottom surface of the medial contour zone **34** may also slope upwardly. According to one example, the bottom surface of the medial contour zone **34** may slope upwardly at an angle which is similar to the angle of the upper surface of the medial contour zone. The material forming the medial contour zone **34** may thus have a thickness which is less than the total thickness of the medial contour zone **34** and the orthotic insert **10** may present a hollow area or a space beneath this area of the orthotic insert **10** (the medial contour zone **34**) when the insert **10** is placed on a flat surface or in a shoe. The material forming the medial contour zone **34** may have a thickness of between about one eighth of an inch and one half of an inch, or about one fourth of an inch. The medial contour zone **34** may have a thickness which is between about 4 and 33 percent of the width of the orthotic insert **10**, and which may be about 8 percent of the width of the orthotic insert **10**.

[0042] The medial wing **38** may extend upwardly and outwardly from the medial contour zone **34**. The medial wing **38** may extend along much of the medial edge **26** of the orthotic insert **10**. The medial wing **38** may taper in thickness towards the medial edge **26** and may be approximately the thickness of the medial contour zone **34** at the boundary **46** between the medial contour zone **34** and the medial wing to a reduced, near zero, or zero thickness at the medial edge **26**. As such, the medial wing **38** may present a space beneath the medial wing when the orthotic insert **10** is placed on a flat surface. The orthotic insert **10** may provide maximum support in an area **50** which may cover part of the medial contour zone **34** and may cover part of the medial wing **38**.

[0043] The medial wing **38** may slope upwardly from the medial contour zone **34** at a greater angle than the medial contour zone **34**. The upper surface of the medial wing **38** may slope upwardly at an angle which is between about 25 and 75 degrees, and in one example may slope upwardly at an angle of about 40 to 60 degrees from horizontal.

[0044] As is seen in FIG. **6**, the medial edge **26** is higher near the proximal-distal center of the orthotic insert **10** and is lower near the proximal edge **14** and the distal edge **18** of the orthotic insert **10**.

[0045] The orthotic **10** (the medial wing **38** in particular) extends up the medial side of the foot in a way that it rests on the medial wall of the shoe. In this manner, the shoe aids in the support that the orthotic **10** provides to a user. This means that in a shoe with a more rigid medial wall, the wearer will experience increased support as compared to a shoe that has a soft or non-existent medial wall. The orthotic design is meant to increase arch support in any article of footwear that it is used with. Since the support of the orthotic insert **10** varies according to the shoe, a shoe that has higher medial or arch support will give the wearer a larger amount of support from the orthotic **10** than in a shoe that has little to no support.

[0046] The orthotic **10** is typically constructed from a flexible material. The flexibility of an orthotic **10** according to the present disclosure allows the device **10** to form to the shape of the shoe it is placed in. The medial wing **38** of the device can utilize the medial wall of the shoe to increase arch support. The medial wing **38** of the orthotic device presses on the medial wall of the shoe, which, in turn, softly raises the arch

of the wearer's foot. Different shoes have varied midfoot width and varied medial wall strength. This provides for a varied amount of arch support dependent on the shoe that the orthotic device is placed into. Placing the orthotic device into a shoe with a more rigid medial wall and narrower midfoot width will have increased support as compared to a shoe with a weaker medial wall and wider midfoot width. In this manner, the orthotic device **10** will augment and enhance the relative amount of structure and support provided by a shoe according to the shoe itself rather than simply increasing the structure or support to a particular level. That is to say that the orthotic insert **10** will tend to increase the structure and support of a shoe by a percentage rather than simply increasing the support of the shoe to fixed level.

[0047] While the example depicted in FIGS. **1** through **9** illustrates an orthotic **10** having a substantially symmetrical shaped configuration along the line B-B, it is to be noted that the shape of the front and back edges may be configured in differing shapes according to the orthotic requirements of the intended wearer. The symmetrical shape allows for the same orthotic to be used for either the left or the right foot.

[0048] One example provides a prefabricated orthotic insert **10** that allows the wearer's foot to rest in a correct biomechanical position while the wearer is standing in a weight bearing position. The orthotic **10** displays a shape whose contoured support area primarily covers the midfoot section of the foot and may only extend slightly into the heel and forefoot (metatarsal head) sections of the foot. This allows the orthotic insert **10** to offload pressure from the heel and forefoot and to distribute the weight more evenly across the entire foot.

[0049] The orthotic **10** can improve support in shoes that already have some support across the midfoot. The orthotic **10** will make a significant difference in the comfort of the vast majority of shoes that have little to no arch support. When there is little to no arch support, there is a gap in the arch region **54** (FIG. **2**) between the insole of the shoe and the wearer's foot **58**. This orthotic **10** may fill that gap and to raise the arch of the wearer's foot up through the use of a mid-foot arch support. It has a slight rocker shape from curved end the proximal edge **14** to the distal edge **18**. This means that it is thicker along line B-B and tapers to the proximal and distal edges **14**, **18**. This rocker shape helps to relieve pressure from the heel and forefoot as it redistributes the pressure more evenly across the entire sole of the foot. This support also helps to reduce arch aches and pains. Arch support is important for preventing and healing many lower extremity ailments. It helps to reduce stress to the ankles, knees, hips and spine.

[0050] One example of a common foot ailment that these orthotic designs can help prevent and heal is Plantar Fasciitis. Plantar fasciitis is a foot issue that occurs when the Plantar Fascia Ligament is overstretched from a collapsing arch. When the ligament is pushed to stretch further than its range, it can tear in different places along the ligament or near the attachment points at a person's heal. Plantar fasciitis is painful and a chronic ailment that can heal by resting the feet, strengthening the muscles around the ligament and preventing the ligament from overstretching. Arch support helps prevent and heal plantar fasciitis by holding the arch up and stopping the arch from collapsing.

[0051] Arch support also helps to prevent pronation; helping to keep the ankles, knees, hips and back in proper alignment. The orthotic insert **10** also creates a proprioceptive response; training the foot to maintain proper, biomechanically correct alignment and gait. The orthotic **10** can also be used to relieve symptoms of extreme forefoot pain and Neuromas. Neuromas are benign tumors made up mostly of nerves cells. In the foot, neuromas are associated with extreme pain in the forefoot area/ball of the foot **86** (FIG. **14**). The orthotic **10** may be placed in a show with the medial edge **26** closest to the ball of the foot as shown in FIG. **13**. This placement will offload pressure from the ball of the foot. The shape of the orthotic **10** creates a ramp that drops off before the metatarsal bones **90**. The material forming the orthotic **10** closest to the medial edge **26** may be very thin and the orthotic may gradually thicken as it gets closer to area **50** (FIG. **1**). The center of area **50** is the tallest and thickest part of the orthotic **10**, which then tapers towards the medial edge **26**.

[0052] The orthotic **10** may be constructed of a material which offers substantial support, energy return, impact absorption and which maintains its shape over time. By way of example, the orthotic **10** may be made from a rubber or silicone material, a closed cell polymer foam, etc. Materials such as urethane, polyurethane, ethylene vinyl acetate (EVA), polyethylene, newsponge, sofsponge, and neoprene may be used to form the orthotic insert **10**. Additionally, the insert may be sealed by spraying or coating a sealant on the orthotic, vacuum sealing a sealant material around the orthotic, heating the orthotic, molding the orthotic, using adhesive to attach a cover to the orthotic, or sewing a material to or around the orthotic. Such a sealant or covering may be a dri-lex, ultra suede, leather, plastic, polyester, nylon, cotton, suede, canvas, rubber, sofsponge, vinyl, fabric, coronet, gel, neoprene, X-static, Kevlar, cork, bamboo fiber, silk, silicon, synthetic fabric, Urethane, P-cell, Tri-Lam, EVA, polyurethane, polyethylene, or synthetic rubber. The orthotic insert may have a layer of rougher material on plantar surface to create traction and prevent slipping. This traction material can be made of silicon, rubber, synthetic rubber, EVA, urethane, polyurethane, polyethylene, plastic, suede, leather, vinyl, gel, neoprene, cork, or synthetic fabric.

[0053] Turning now to FIGS. **10** through **12**, the orthotic insert **10** is shown attached to or formed as part of a shoe insole. FIG. **10** shows a bottom view of the orthotic **10** attached to the underside of a full length insole **62**. FIG. **11** shows a medial side view of the orthotic **10** and insole **62**. FIG. **12** shows a lateral side view of the orthotic **10** and insole **62**.

[0054] The orthotic insert **10** may be attached to or formed integrally with a relatively thin insole layer. This may make it easier to place the orthotic insert **10** into a shoe, but may reduce the ability of a user to adjust the position of the orthotic insert **10** within the shoe. A combined orthotic insert and insole may provide the shape and contour of the orthotic insert **10** with a relatively flat and thin insole layer **62** which may provide little or no contour on its own and may primarily be used to position the orthotic **10**. The orthotic insert **10** may be attached to the top or the bottom surface **66** (as shown) or between layers of the insole **62**.

[0055] If the orthotic is formed integrally with the insole **62**, the insole **62** may simply extend from the edges of the orthotic **10**. The orthotic **10** may be increased in thickness to compensate for the thickness of the insole **62** and maintain the level of support provided by the orthotic **10**.

[0056] Turning now to FIG. **13**, a top view of the orthotic **10** as placed on the inside of an article of footwear in an alternate orientation is shown. The orthotic insert **10** may be placed in

a transverse orientation in an article of footwear **70** to provide relief from extreme forefoot pain or neuroma. As illustrated, the orthotic insert **10** may be placed in an article of footwear **70** such that the medial wing **38** and medial contour zone **34** are disposed distally in the footwear **70** and adjacent the metatarsal head area of a person's foot. This places the area of maximum support **50** adjacent to and proximal of the metatarsal head area of the foot.

[0057] The lateral edge **22** and lateral contour zone **30** are disposed proximally in the footwear **70** and adjacent the person's heel. The proximal edge **14** and distal edge **18** of the insert **10** may be disposed on the medial side and lateral side respectively of the footwear and the person's foot. If the orthotic insert **10** is symmetrical or relatively symmetrical between the proximal edge **14** and distal edge **18**, the orientation of the insert **10** shown in FIG. **13** will primarily increase the pressure on the foot in the midfoot adjacent the metatarsal head of the foot and heel of the foot and will correspondingly reduce the pressure on the metatarsal head area of the foot. The orthotic insert **10** may also increase the curvature or arch of the midfoot. These effects may reduce pressure and stress in certain areas of the foot and provide relief from forefoot pain or neuroma.

[0058] Turning now to FIG. **14**, an illustration of a foot is shown which highlights various areas of the foot discussed herein. As referred to, a human foot **74** may conveniently be divided into areas including the heel **78**, the midfoot **82**, and the forefoot **86**. Individual areas of the forefoot **86** may further be referred to as the metatarsal heads **90**, toes **94**, and the hallux **98**. Collectively, the metatarsal heads **90** may be referred to as the metatarsal head area.

[0059] The orthotic insert **10** (referring to the contoured support providing orthotic referred to in FIGS. **1** through **9**) generally covers the midfoot section **82** of the foot, and extends between the heel **78** and the metatarsal head area **90**. The orthotic insert **10** does not extend significantly into the heel area **78** and also does not extend significantly into the metatarsal head area **90** of the foot.

[0060] Referring now to FIG. **15**, the human gait cycle is shown. There are generally 2 phases to the human gait; the stance phase and the swing phase. The stance phase can be divided into 5 general sub-phases/events:

[0061] 1. Initial contact—referring to the instant the foot contacts the ground;

[0062] 2. Loading response—referring to the time period from immediately following initial contact to the lift of the contralateral extremity from the ground, during which weight shift between feet occurs;

[0063] 3. Midstance—referring to the time interval from the lift of the contralateral extremity from the ground to the point where the ankles of both extremities are aligned in the frontal (or coronal) plane;

[0064] 4. Terminal stance—referring to the period from ankle alignment in the frontal plane to just prior to initial contact of the contralateral (swinging) extremity; and

[0065] 5. Preswing—referring to the time interval from initial contact of the contralateral extremity to just prior to lift of the ipsilateral extremity from the ground (unloading weight)

[0066] The swing phase can be divided into 3 general sub-phases/events:

[0067] 1. Initial swing—referring to the lift of the extremity from the ground to position of maximum knee flexion;

[0068] 2. Mid swing—referring to the time immediately following knee flexion until vertical tibia position; and

[0069] 3. Terminal swing—referring to the time following vertical tibia position until just prior to initial contact.

[0070] The description of the foot structure and the human gait within its various different events is believed to assist in the understanding of the various structures, shapes, and physiological effects of the orthotic insert **10**.

[0071] The orthotic insert **10** may be provided as a prefabricated orthotic that will increase arch support for any foot type, in any article of footwear. Also, advantageously, the flexible universal orthotic **10** permits many variations without departing from the invention. For example, the thickness and thickness distribution of the support may be adapted as necessary dependent on materials used and wearer's arch height. Thus, it is to be understood that various modifications could be made to the invention without departing from the basic teachings thereof.

[0072] Included herein are examples of devices for foot comfort. In some examples, the shape of the orthotic is unique. In other examples, the shape is further enhanced by the use of flexible rather than a stiff material, though those skilled in the art will understand that the shapes may be configured in a more or less flexible material or a composite of different materials to accomplish the same comfort result without departing from the invention.

[0073] For example, with flexible materials like foam, there is more energy return and this orthotic will help to prevent fatigue. Also, flexible materials will allow the orthotic to fit into a wider variety of shoes as they will conform to the shoe that it is worn inside of. For aesthetic and functional purposes, the use of a flexible material in the orthotic design will allow for a dancer to point his/her toes and maintain that desirable curve in the arch area. The orthotic is lightweight enough to not change the perceived weight of shoes. It will also increase balance and posture.

[0074] The orthotic **10** will help keep the body in alignment while standing and walking. It will help prevent and heal injuries in the feet, ankles, knees, hips, and back. It is designed to increase performance of shoes for a variety of specialized activities. Athletes as well as people young and old alike can protect their feet without being impeded by a bulky orthotic. The orthotic **10** stops before the heel so as not to cause heel slip. This orthotic is designed to be slim enough for use in any shoe without changing the fit. Dress shoes, high heels, flats, ballet shoes, soccer shoes, ski boots, snowboard boots, casual shoes, athletic shoes, biking shoes, golf shoes, dance shoes, skates, rock climbing shoes, weightlifting shoes, natural motion shoes, military boots and more will be made more comfortable by using this orthotic design.

[0075] The above description of illustrated examples of the present invention, including what is described in the Abstract, are not intended to be exhaustive or to be limitation to the precise forms disclosed. While specific embodiments of, and examples for, the invention are described herein for illustrative purposes, various equivalent modifications are possible without departing from the broader spirit and scope of the present invention. Indeed, it is appreciated that the specific dimensions, materials, etc., are provided for explanation purposes and that other values may also be employed in other embodiments and examples in accordance with the teachings of the present invention.

What is claimed is:

1. A preformed orthotic for disposition between a shoe and a foot of a user, the orthotic comprising:

a proximal edge disposed adjacent a heel of a foot of a user;

a distal edge disposed adjacent a metatarsal head area of the foot;

a lateral edge disposed adjacent a lateral side of the foot;

a medial edge disposed adjacent a medial side of the foot;

wherein the orthotic insert defines a functional support surface which extends between the heel and the metatarsal head area and which does not substantially extend beneath the heel or beneath the metatarsal head area;

a lateral contour zone disposed on a lateral side of the orthotic insert;

wherein the lateral contour zone has a thickness adjacent a medial-lateral center line of the orthotic insert which is between about three and thirty percent of a proximal-distal length of the orthotic insert;

wherein the lateral contour zone tapers towards the proximal edge and the distal edge to a reduced thickness; and

wherein an upper surface of the lateral contour zone slopes upwardly in a medial direction from the lateral edge at an angle of between about one and fifteen degrees; and

a medial contour zone disposed adjacent the lateral contour zone and extending towards a medial side of the orthotic insert;

wherein the medial contour zone has a thickness which is between about three and thirty percent of the proximal-distal length of the orthotic insert; and

wherein an upper surface of the medial contour zone slopes upwardly in a medial direction at an angle of between about fifteen and forty degrees.

2. The orthotic of claim **1**, further comprising a medial wing disposed adjacent the medial contour zone and extending towards the medial side, and wherein an upper surface of the medial wing extends upwardly from the medial contour zone at an angle of between twenty five and seventy five degrees.

3. The orthotic of claim **2**, wherein the orthotic insert is generally hollow beneath the medial contour zone and the medial wing.

4. The orthotic of claim **1**, wherein the lateral contour zone has a width which is between about one third and one half of a width of the orthotic insert and wherein the medial contour zone has a width which is between one fourth and two thirds of the width of the orthotic insert.

5. The orthotic of claim **1**, wherein a bottom surface of the lateral contour zone is essentially flat, and wherein the bottom surface of the medial contour zone is concave such that when the orthotic insert is placed on a flat surface, a bottom surface of the medial contour zone is spaced above the flat surface.

6. The orthotic of claim **5**, wherein the medial contour zone has a thickness which is between about three and twenty-eight percent of the proximal-distal length of the insert.

7. The orthotic of claim **1**, wherein the lateral contour zone and the medial contour zone extend between the proximal edge and the distal edge.

8. A preformed orthotic for disposition between a shoe and a foot of a user, the orthotic comprising:

a proximal edge disposed adjacent a heel of a foot of a user;

a distal edge disposed adjacent a metatarsal head area of the foot;

a lateral edge disposed adjacent a lateral side of the foot;

a medial edge disposed adjacent a medial side of the foot;

a lateral contour zone disposed on a lateral side of the orthotic insert;

wherein an upper surface of the lateral contour zone slopes upwardly in a medial direction from the lateral edge at an angle of between about one and about fifteen degrees;

a medial contour zone disposed adjacent the lateral contour zone and extending towards the medial side; and

wherein an upper surface of the medial contour zone slopes upwardly in a medial direction at an angle of between about fifteen and about forty degrees.

9. The orthotic of claim **8**, wherein the orthotic insert defines a functional support surface which extends generally between the heel and the metatarsal head area.

10. The orthotic of claim **9**, wherein the orthotic does not substantially extend beneath the heel or beneath the metatarsal head area.

11. The orthotic of claim **8**, further comprising a medial wing disposed adjacent the medial contour zone and extending towards the medial side, and wherein an upper surface of the medial wing extends upwardly from the medial contour zone at an angle of between twenty five and seventy five degrees.

12. The orthotic of claim **11**, wherein the orthotic insert is generally hollow beneath the medial contour zone and the medial wing.

13. The orthotic of claim **8**, wherein the lateral contour zone has a width which is between about one fourth and one half of a width of the orthotic insert.

14. The orthotic of claim **13**, wherein the medial contour zone has a width which is between one fourth and two thirds of the width of the orthotic insert.

15. The orthotic of claim **8**, wherein the lateral contour zone has a thickness which is between one eighth and one half of an inch and wherein the medial contour zone has a maximum thickness which is between about one eighth and one inch.

16. The orthotic of claim **8**, wherein the lateral contour zone has a thickness which is between one eighth and one half of an inch and wherein the medial contour zone has a maximum thickness which is between about one and a half times and three times the thickness of the lateral contour zone.

17. The orthotic of claim **8**, wherein the lateral contour zone tapers towards the proximal edge and towards the distal edge to a reduced thickness.

18. The orthotic of claim **8**, wherein a bottom surface of the lateral contour zone is essentially flat, and wherein, when the orthotic insert is placed on a flat surface, a bottom surface of the medial contour zone is spaced above the flat surface.

19. The orthotic of claim **18**, wherein the bottom surface of the medial contour zone is concave.

20. The orthotic of claim **18**, wherein the medial contour zone has a thickness which is between about three and about twenty-eight percent of a proximal-distal length of the orthotic insert.

21. The orthotic of claim **8**, wherein the insert is attached to a shoe insole with adhesive.

22. The orthotic of claim **8**, wherein the orthotic is formed from a flexible material selected from the group consisting of silicone, silicon, silica, foam, memory foam, urethane, EVA, polyurethane, polyethylene, synthetic rubber, neoprene, neosponge, sofsponge, and ethyl vinyl acetate.

23. The orthotic of claim **8**, wherein the orthotic further comprises a layer of rougher material on a plantar surface thereof.

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