Abstract: The inventive subject matter provides an adjustable midsole that can be contained within sole units for shoes generally and particularly within thin profile sole units. An adjustment of the midsole results in a change in the profile of a predetermined portion of the foot-supporting surface of a shoe to help accommodate the foot morphology of a particular wearer or to provide performance enhancements.
SOLE UNIT WITH ADJUSTABLE ARCH

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RELATED APPLICATIONS

This application claims the benefit of and priority to U.S. Provisional Application Serial No. 61/314,062, filed March 15, 2010, the content of which is hereby incorporated by reference as if recited in full herein for all purposes.

BACKGROUND

The inventive subject matter disclosed herein generally relates to a sole unit with an adjustable midsole for changing the profile of the foot supporting surface of a shoe. More particularly, the inventive subject matter relates to an adjustable arch support that is height adjustable by an adjustment mechanism positioned between a footbed and an outsole of a sole unit, for example, as used in a sandal, sports shoe or boot.

Although footwear comes in a variety of sizes to accommodate the range of foot lengths and widths, a given shoe size still may not fit a wearer well because of variability in the morphology of the foot. This variability is often expressed in differences in arch height, which can range from flat-footed to high arch. Because of variability in foot morphology, there is a need to provide adjustable shoes that can better conform to the shape of a wearer's foot within a given shoe size.

Several attempts have been made to incorporate into a shoe added comfort with arch support that is adjustable to provide support to various foot contours. For example, there have been attempts to cushion the upper and sole of a shoe with air by using
inflating mechanisms, such as described in US 2,020,240 and US 2,177,116. Other attempts use a vertically adjustable screw and spring mechanism, for example as described in US 3,667,473, or a screw and adjusting lever, for example as described in US 4,166,329. These attempts suffer from various drawbacks, including that they are overly complicated and not easy to use, inefficient, uncomfortable, or not suitable for all shoe types. For example, the prior art assemblies would not work for a sandal-type shoe because they would not be easily contained within the thin profile of a sandal sole.

Accordingly, there is a need for a sole unit that has an adjustment mechanism that addresses the aforementioned problems in the prior art and otherwise improves the state of the art.

SUMMARY

The inventive subject matter addresses the foregoing by providing an adjustable midsole that can be contained within sole units generally, and particularly within thin profile sole units. An adjustment of the midsole results in a change in the profile of a predetermined portion of the foot-supporting surface of a shoe to help accommodate the foot morphology of a particular wearer or to provide performance enhancements.

In certain embodiments, the inventive subject matter is directed to a sole unit having a support system contained therein for adjusting a foot-supporting surface shape of the sole unit, the support system having a support plate mounted within the sole unit, a base plate secured to the sole unit extending over an area generally below the support plate, an adjustment mechanism positioned between the base plate and support plate, the adjustment mechanism coupled to the support plate and comprising an elevating member
that is slideably disposed on a path under the support plate that is transverse to an axis of
the support plate. The adjustment of the adjustment mechanism causes the elevating
member to engage the support plate and change its height, which change in height results
in a change to the foot-supporting surface shape of the sole unit. In the foregoing
embodiment, the support plate may be disposed in a rearfoot, midfoot, or forefoot portion
of the sole unit and independently adjusts the portion relative to another portion, for
example, the support plate may be disposed in a midfoot portion to support the arch of a
foot. The inventive subject matter is further directed to a shoe incorporating the sole unit
described above.

In other possible embodiments, an adjustable arch support for a shoe, particularly
a sandal, may have an arch support plate extending from an outer edge on the medial side
of the shoe to a central portion of the shoe, and the arch support plate curving gradually
to form an arch fit that is generally complementary to the arch of a foot. The adjustable
arch support further has a base plate secured to the shoe extending over an area generally
below the arch support plate, and an adjustment mechanism positioned between the base
plate and arch support plate. The adjustment mechanism includes an adjustment screw, a
threaded member interacting with the adjustment screw, and an elevating member
adapted to interact freely with the threaded member and coupled to the arch support plate.
Rotation of the adjustment screw repositions the threaded member so that the elevating
member and the associated arch support plate are repositioned and the height and
curvature of the arch support plate is adjusted. In the foregoing embodiment, the support
plate may include a semi-rigid material, for example a thermoplastic material. In the
foregoing embodiment, the adjustment screw may be operatively positioned along a
transverse axis of the shoe between the arch support plate and base plate so that the
height and curvature of the arch support plate are adjusted when the screw is rotated. In
the foregoing embodiment, the adjustment mechanism may have a guide channel guiding
the screw in a path under the support plate that is transverse to the longitudinal axis of the
support plate. In the foregoing embodiment, the base plate may have a plurality of ridges
sloping down from an outer edge on the medial side of the base plate towards a central
portion of the shoe. In the foregoing embodiment, the base plate may have a guide
channel formed by ridges sloping from a medial side of the base plate to a central portion
of the shoe and adapted for guiding the threaded member and elevating member. In the
foregoing embodiment, the threaded member and the elevating member may have a
surface with complementary shapes configured to engage and adjust the height of the
arch support plate. In the foregoing embodiment, the elevating member may have a
wedge shape with a side that is sloped complementary to a sloped side of the threaded
member so that repositioning the sloped sides relative to each other adjusts the height and
curvature of the arch support plate relative to the base plate. In the foregoing
embodiment, the arch support plate may have engageable elements adapted to slideably
engage complementary engageable elements on the base plate so that the arch support is
freely moveable relative to the base plate, for example, the base plate may have a
plurality of slots freely engaging corresponding tabs on the arch support plate, and the
arch support plate configured to slide relative to the base plate.

In another possible embodiment, the inventive subject matter is directed to a
sole unit with an adjustable arch having an outsole, a footbed mounted to or otherwise
integrated with the outsole, and an adjustable arch support mounted between the outsole
and the footbed at a location corresponding to the arch of a foot, the adjustable arch support comprising a support plate mounted within the sole unit, a base plate secured to the sole unit extending over an area generally below the support plate, an adjustment mechanism positioned between the base plate and support plate, the adjustment mechanism coupled to the support plate and comprising an elevating member that is slideably disposed on a path under the support plate that is transverse to an axis of the support plate, and wherein the adjustment of the adjustment mechanism causes the elevating member to engage the support plate and change its height, which change in height results in a change to the foot-supporting surface shape of the sole unit. In the foregoing embodiment, the sole unit may further have a midsole located between the outsole and the footbed, and the midsole shaped to accommodate an adjustable arch support.

The inventive subject matter is further directed to a kit including footwear having a sole unit as described above and a key adapted to adjust the adjustment mechanism of the support system.

The inventive subject matter further contemplates a method of making a sole unit having a support system contained therein for adjusting a foot-supporting surface shape of the sole unit, the method including the steps of mounting a support plate within the sole unit, securing a base plate to the sole unit extending over an area generally below the support plate, positioning an adjustment mechanism between the base plate and support plate, the adjustment mechanism coupled to the support plate and comprising an elevating member that is slideably disposed on a path under the support plate that is transverse to an axis of the support plate, and wherein the adjustment of the adjustment
mechanism causes the elevating member to engage the support plate and change its height, which change in height results in a change to the foot-supporting surface shape of the sole unit. In the foregoing embodiment, the support plate may be disposed in a rearfoot, midfoot, or forefoot portion of the sole unit and independently adjusts the portion relative to another portion.

The inventive subject matter further contemplates a method for making an adjustable arch support for a shoe by providing an arch support plate extending from an outer edge on the medial side of the shoe to a central portion of the shoe and the arch support plate curving gradually to form an arch fit complementary to the arch of a foot, securing a base plate to the shoe extending over an area generally below the arch support plate, positioning an adjustment mechanism between the base plate and arch support plate, the adjustment mechanism having an adjustment screw, a threaded member interacting with the adjustment screw, an elevating member adapted to interact freely with the threaded member and coupled to the arch support plate, and wherein rotation of the adjustment screw repositions the threaded member so that the elevating member and the associated arch support plate are repositioned and the height of the arch support plate is adjusted.

These and other embodiments are described in more detail in the following detailed descriptions and the figures.

The foregoing is not intended to be an exhaustive list of embodiments and features of the inventive subject matter. Persons skilled in the art are capable of appreciating other embodiments and features from the following detailed description in conjunction with the drawings.
BRIEF DESCRIPTION OF THE DRAWINGS

The following figures show embodiments according to the inventive subject matter, unless noted as showing prior art.

FIG. 1 shows a side view of a sandal with an adjustable arch.

FIG. 2 shows a detail of the sandal of FIG. 1.

FIG. 3 shows the sandal of FIG. 1 and a key to adjust the arch of the sandal.

FIG. 4 shows a detail of the sandal of FIG. 1 with a portion of the footbed removed and pulled away to expose the support system.

FIG. 5 shows the inside to the adjustable arch support of FIG. 1 with the arch support plate cut open and lifted.

FIG. 6 and 7 show different views the inside of the arch support of the sandal of FIG. 1 with the arch support plate cut open along the transverse axis of the sandal.

FIG. 8A shows a top view of a midsole with an adjustable arch support system.

FIG. 8B shows a cross-section of the sole unit along the line B-B' indicated in FIG. 8A.

FIG. 8C shows a cross-section of the sole unit along the line C-C' indicated in FIG. 8A.

FIG. 8D shows cross-sections of the sole unit along the line D-D' indicated in FIG. 8A.

FIG. 8E shows cross-sections of the sole unit along the line E-E' indicated in FIG. 8A.

FIG. 9 shows a perspective view of a sole unit.

FIG. 10 shows different layers of the sole unit of FIG. 9 together with a key to
adjust the support system.

FIGS. 11-12 show perspective views of the midsole and outsole respectively of the sole unit of FIG. 9.

FIG. 13 shows a bottom perspective view along the medial side of the midsole of FIG. 9.

FIG. 14 shows a perspective view of the support system along the medial side of the midsole of FIG. 9 with the arch support plate removed from the arch support system.

FIG. 15 shows a bottom view of the arch support plate of the sole unit of FIG. 9.

FIG. 16 shows a perspective view of a detail along the medial side of the arch support system of the sole unit of FIG. 9.

FIG. 17 shows a bottom view of the base plate used in the arch support system of the sole unit of FIG. 9.

DETAILED DESCRIPTION

Representative embodiments according to the inventive subject matter are shown in Figs. 1-17, wherein the same or generally similar features share common reference numerals.

The inventive subject matter provides an adjustable sole that can be contained within sole units for shoes generally and particularly within thin profile sole units. The shoe may be any article of footwear, including sports shoes, sandals, dress shoes, casual shoes, work shoes, sports boots such as ski, snowboard, and skate boots, or any other kind of shoe or boot. An adjustment of the sole results in a change in the profile of a predetermined portion of the foot-supporting surface of a shoe to help accommodate the foot morphology of a particular wearer or to provide performance enhancements.
For convenience and unless context indicates otherwise, as used herein, "shoe" or "footwear" are all encompassing terms for any kind of shoe, sandal, boot or like durable item to shod the feet. As used herein a "sole unit" generally may comprise a full length midsole or discrete elements for energy absorption and/or return; or an outsole material for surface contact and abrasion resistance and/or traction; or a single unit providing such midsole or outsole functions across some or all the length of a foot. While a sole unit would generally extend the length of the shoe, a sole unit could also comprise a unit that extends for a lesser area, such as, just the forefoot or rearfoot portion, or some other area of lesser length or width.

The inventive subject matter is generally directed to an adjustable midsole that can be contained within sole units generally and particularly within thin profile sole units such as for sandals.

The adjustability system herein may be used at any location were adjustability might be desired. For example, not only can it be used to provide an adjustable arch, but it could also be used to increase or decrease heel lift. For example, such increase or decrease could allow the wearer to choose between positive, neutral and negative heel lift. As another example, the adjustment system may be arranged along lateral and/or medial sides of a shoe to cant a shoe or boot laterally or medially. The canting could be a desirable performance-enhancing feature for boots used in action sports, such as snowboarding or skiing. For convenience, not limitation, the following discussion relates to an adjustable arch support for a sandal. However, from the teachings herein, persons skilled in the art will appreciate how to adapt the inventive subject matter for other applications.
Accordingly, in certain embodiments, the inventive subject matter is directed to a sole unit with an adjustable arch support. The adjustable arch support may be contained in a sole unit for a sandal between an outsole and a footbed at a location corresponding to the arch of a foot. The shape of the adjustable arch support generally complements the shape of the arch of a foot and may be adjusted for a comfortable fit.

In particular, the inventive subject matter is directed to an adjustable arch support having a movable arch support plate, a base plate, and an adjustment mechanism between the arch support plate and base plate to facilitate adjustment of the support plate relative to the base plate.

Footwear, such as sandal 2 shown in FIGS. 1-14, has a sole unit 4 and a shoe upper 6 secured to sole unit 4. Shoe upper 6 includes straps 12 adapted to hold sole unit 4 to the foot of a wearer. The sole unit generally includes a footbed 8 at the foot facing side that provides cushioning to the foot, and an outsole 10 for ground surface contact and abrasion resistance and/or traction. The sole unit may also be formed as a single unit providing such footbed or outsole functions. FIGS. 9-16 show a sole unit 4 having an outsole 10, a midsole 9, and a footbed 8.

In the embodiment shown in FIGS. 1-17, the upper of footbed 8 has a raised surface 66 corresponding to the contours of arch support mechanism 14. Additionally, the upper of footbed 8 may be provided with a top layer 64, such as a layer of nubuck or other leather material. Top layer 64 may be fitted over midsole 9 and contoured around arch support mechanism 14. In other embodiments, the sole unit may be provided with a laminate assemble of various other layers of material.

Working components of the adjustable arch support system may be positioned
entirely or partially within the sole unit. In the example shown, the components are integrated in the sole unit and concealed from the outside upper of the sole unit so that the foot of a wearer is protected and so that the components are protected. By concealing the components, they do not detract from the aesthetics of the sandal.

The components may be adjusted by rotating a part of a mechanism that is exposed at the side of the sole unit, for example by using a tool, such as a hex key. FIGS. 9-16 show an adjustable arch support 14 positioned in a crescent cut-out in a molded midsole 9. The molded material of the midsole may be EVA or PU or other such foamed or foamed polymers used in modern shoes. In this case, the midsole may include a slightly raised rim along some or all its periphery. Footbed 8 fits within the rimmed portion of midsole 9 to provide cushioning and/or comfort to the foot. Outsole 10 attaches to the bottom surface of midsole 9. The outsole sole may be any kind of durable outsole material known for use in footwear, including leather, rubber, wood, cork, textile, EVA, PU and other polymers, and combinations of any of the foregoing.

FIGS. 4-8, 11-12, and 14-17 show the working components of the adjustable arch support mechanism 14. Figs. 4-7 show the sandal of FIGS. 1-3 with a cross portion of the footbed removed along a midfoot section of the sole unit and the footbed pulled away to show the support system embedded in the midsole of the sandal. Arch support 14 includes an arch support plate 16, a base plate 18, and an adjustment mechanism 20 positioned between base plate 18 and arch support plate 16. In some embodiments, arch support plate 16, base plate 18, and adjustment mechanism 20 may be permanently integrated in sole unit 4. For example, parts of adjustment mechanism 20 may be molded integrally with or cemented to plates 16 and 18 which are cemented or otherwise attached...
to or integrated with to midsole 9 and footbed 8. In other embodiments, the parts may be formed as having a complementary fit with interlocking portions that are snapped together.

Arch support plate 16 extends from an outer edge 22 on the medial side of the sole unit 4 to a central portion 23 of sole unit 4. Arch support plate 16 curves gradually upward from the central portion to the medial portion of the sole unit to form an arch fit corresponding to the arch of a foot. In the embodiment shown in FIGS. 1-17 arch support plate 16 has a crescent shape. However, the arch support plate may have any suitable shape. Arch support plate 16 is movable in height relative to base plate 18. The height of arch support plate 16 may be adjusted according to the requirement for support by a user, as described in more detail below.

Base plate 18 extends over an area generally below arch support plate 16. For example, as shown in FIGS. 8A-E, 11, 12 and 14-17, base plate 18 has a crescent shape similar to the shape of arch support plate 16 but with a circumference slightly larger than arch support plate 16 so that the medial edges of the two plates align but the curved edge of base plate 18 extends beyond arch support plate 16.

Adjustment mechanism 20 includes an elevating member 28 that is coupled to the support plate 16. Elevating member 28 is movable along a path in a direction that is transverse to the long axis of the support plate. Moving elevating member 28 along the transverse path cams support plate 16 upwardly or downwardly to adjust arch height. In the example shown, adjustment mechanism 20 further includes a screw 24 and a threaded member 26 housed in a guide channel 40 of base plate 18. Threaded member 26 interacts with adjustment screw 24 via a threaded passage or channel. Elevating member
28 has a surface that interacts with a complementary surface of threaded member 26. Rotation of adjustment screw 24 repositions threaded member 26 in guide channel 40 so that elevating member 28 is repositioned along a path that is transverse to an axis of the support plate and the height of arch support plate 16 is adjusted. For example, threaded member 26 and elevating member 28 may each have a slanted surface with generally complementary shape. For example, as shown in FIGS. 6-8, 14 and 16, threaded member 26 has a generally cuboid shape with a threaded opening for adjustment screw 24 approximately in the center of the cuboid shape and running along a transverse axis of member 26 and sole unit 4. Threaded member 26 further has a sloped portion 44 facing the medial side of the sole. Elevating member 28 has a general wedge shape coupled to arch support plate 16 with a sloped side 42 facing threaded member 26 and wherein sloped side 42 is complementary to sloped side 44 of threaded member 26 so that repositioning the sloped side of the threaded member adjusts the height and curvature of arch support plate 16 relative to base plate 18. Furthermore, elevating member 28 is located proximately to the medial edge of the arch support plate 16 and may have an allowance 56 for screw 24 to pass through freely when the elevating member is in the lowest position.

Adjustment screw 24 is operatively positioned and secured for rotation between arch support plate 16 and base plate 18 along a horizontal transverse axis of the sandal. Adjustment screw 24 has an enlarged head portion 30 which prevents the screw from moving into the interior of the arch support mechanism and which provides easy access for adjustment without removal of any portion of the sole unit construction. Head portion 30 of screw 24 extends to the outside of the shoe at the medial side and is operatively
fitted into a channel 62. Head 30 is adapted to interact with a key, for example hex key 32, as shown in FIG. 3. Rotation of hex key 32 rotates screw 24, which results in a linear repositioning of threaded member 26 along the transverse axis of the sole unit. Movement of threaded member 26 leads to a repositioning of elevating member 28 along the path under the support plate, which lowers or elevates arch support plate 16. In some embodiments, further adjustment may be provided by tensioning support plate 16 relative to base plate 18. For example, the support plate may include a semi-rigid material that allows changing of the shape or curvature of the support plate. For example the support plate may include a thermoplastic material such as polyurethane, polyvinyl chloride, or any other natural or synthetic material with suitable tensioning properties.

Base plate 18 is provided with a guide channel 40 guiding threaded element 26 and elevating member 28 along a transverse axis of sole unit 4. The sides of guide channel 40 may be formed of ridges 34 sloping down from an outer edge 36 at the medial side of base plate 18 towards a central portion 38 of base plate 18. Ridges 34, together with outer rim 60 of guide channel 40, form an elongated chamber in base plate 18 wherein adjustment mechanism 20 is mounted. As shown in FIG. 6, threaded member 26 may extend above ridges 34 of guide channel 40. The height of threaded member 26 may correspond approximately to the depth of channel 40 at the medial side of the channel. When threaded member 26 moves away from the medial edge towards central portion 26, the top surface of threaded member 26 may extend above sloped ridges 34 of channel 40.

Guide channel 40 may end at the medial side into a channel 62 at outer rim 60 to guide screw 24. Channel 62 extends to the outside of sole unit 4. A bottom portion of guide channel 40 may be formed as a rectangular recess in base plate 18 positioned.
centrally along the medial side of base plate 18, for example as shown in FIG. 17. A guide piece 58 may be positioned on the inside of outer rim 60 to guide screw 24 and provide a stop for threaded member 26 and elevated member 28. Ridges 34 of channel 40 hold arch support plate 16 at a minimum distance from base plate so that pressure on the plates does not interfere with functioning of the adjustment mechanism. Base plate 18 may have support additional ridges 35, for example four ridges as shown in FIG. 14 that radiate and slope down from an outer edge 36 of base plate 18 towards a central portion of base plate 18.

In some embodiments, arch support plate 16 may include engageable elements 46 adapted to slideably engage complementary engageable elements 48 on base plate 18 so that arch support plate 16 may be repositioned relative to base plate 18. For example, base plate 18 may have several slots 50 of a general rectangularly curved shape positioned along a curved line corresponding to the outer edge of support plate 16 and adapted to engage complementary shaped tabs 52 on arch support plate 16. Tabs 52 and slots 50 allow for a slideable repositioning of arch support plate 16 relative to base plate 18. Ridges 34, 35 slope down and end at a position medial of slots 50. Central portion 38 of base plate 18 further may have an edge formed as a raised surface 54 accommodating tabs 52 and allowing tabs 52 to slide underneath raised surface 54.

A user may adjust the height and curve of the arch support by engaging the adjustment screw head 30 with a key, for example hex key 32. Rotation of key 32 adjusts screw 24, which repositions threaded member 26 along a transverse axis of sole unit 4. Sloped side 44 of threaded member 26 interacts with sloped side 42 of elevating member 28, thereby moving elevating member either downward or upward relative to threaded
member 26. By changing the height of elevating member 28, the position of arch support plate 16 is also changed and arch support plate 16 moves upward or downward relative to base plate 18. Support plate 16 is held in the desired position by threaded member 26, which is held in place by screw 24 in guide channel 40. Additionally, when arch support plate 16 is moved upward, arch support plate 16 may be tensioned and warped into an elevated position. Interaction of engageable elements 46 and 48 allow arch support plate 16 to move relative to base plate 18 while also holding and tensioning arch support plate 16. To accomplish the tensioning and allow for warping of the support plate, the plate may be made of a semi-rigid material, for example a thermoplastic material. In other embodiments, the support plate may include a combination of rigid and flexible materials.

The inventive subject matter is further directed to a kit including footwear with an adjustable arch as described above and a key adapted to adjust the adjustment screw.

The inventive subject matter further contemplates a method for making and using the adjustable arch support and shoe having such a support as described above. The above described shoe may be made by mounting or otherwise integrating a shoe upper on a sole unit. In the embodiments described above, arch support plate 16 and base plate 18 may be made of a molded plastic that provides sufficient support while also being somewhat resilient. Adjustment screw 24 and threaded member 26 may be made of metal, for example, for strength and wear from foot pressure against the arch support components.
Footwear according to the inventive subject matter may come in different styles. Accordingly, the materials used, shapes, and structures of the sole unit and adjustable arch support may vary.

Persons skilled in the art will recognize that many modifications and variations are possible in the details, materials, and arrangements of the parts and actions which have been described and illustrated in order to explain the nature of the inventive subject matter, and that such modifications and variations do not depart from the spirit and scope of the teachings and claims contained therein.

All patent and non-patent literature cited herein is hereby incorporated by references in its entirety for all purposes.
CURRENTLY CLAIMED INVENTIONS:

1. A sole unit having a support system contained therein for adjusting a foot-supporting surface shape of the sole unit, the support system comprising:
   a support plate mounted within the sole unit;
   a base plate secured to the sole unit extending over an area generally below the support plate;
   an adjustment mechanism positioned between the base plate and support plate, the adjustment mechanism coupled to the support plate and comprising an elevating member that is slideably disposed on a path under the support plate that is transverse to an axis of the support plate; and
   wherein the adjustment of the adjustment mechanism causes the elevating member to engage the support plate and change its height, which change in height results in a change to the foot-supporting surface shape of the sole unit.

2. The sole unit of claim 1 wherein the support plate is disposed in a rearfoot, midfoot, or forefoot portion of the sole unit and independently adjusts the portion relative to another portion.

3. The sole unit of claim 1 wherein the support plate is disposed in an area of the sole unit corresponding to an arch of a foot.
4. A shoe with a sole unit according to claim 1.

5. An adjustable arch support for a shoe comprising:
   an arch support plate extending from an outer edge on the medial side of the shoe
to a central portion of the shoe and the arch support plate curving
   gradually to form an arch fit complementary to the arch of a foot;
a base plate secured to the shoe extending over an area generally below the arch
   support plate;
an adjustment mechanism positioned between the base plate and arch support
   plate, the adjustment mechanism comprising
   an adjustment screw;
a threaded member interacting with the adjustment screw;
an elevating member adapted to interact freely with the threaded
   member and coupled to the arch support plate; and
wherein rotation of the adjustment screw repositions the threaded member so that
   the elevating member and the associated arch support plate are
   repositioned and the height of the arch support plate is adjusted.

6. The adjustable arch support of claim 5 wherein the support plate comprises a
   semi-rigid material.

7. The adjustable arch support of claim 5 wherein the support plate comprises a
   thermoplastic material.
8. The adjustable arch support of claim 5 wherein the adjustment screw is operatively positioned along a transverse axis of the shoe between the arch support plate and base plate so that the height and curvature of the arch support plate are adjusted when the screw is rotated.

9. The adjustable arch support of claim 5 wherein the adjustment mechanism comprises a guide channel guiding the screw in a path under the support plate that is transverse to the longitudinal axis of the support plate.

10. The adjustable arch support of claim 5 wherein the base plate comprises a plurality of ridges sloping down from an outer edge on the medial side of the base plate towards a central portion of the shoe.

11. The adjustable arch support of claim 5 wherein the base plate comprises a guide channel formed by ridges sloping from a medial side of the base plate to a central portion of the shoe and adapted for guiding the threaded member and elevating member.

12. The adjustable arch support of claim 5 wherein the threaded member and the elevating member have a surface with complementary shapes configured to engage and adjust the height of the arch support plate.
13. The adjustable arch support of claim 5 wherein the elevating member has a wedge shape with a side that is sloped complementary to a sloped side of the threaded member so that repositioning the sloped sides relative to each other adjusts the height and curvature of the arch support plate relative to the base plate.

14. The adjustable arch support of claim 5 wherein the arch support plate comprises engageable elements adapted to slideably engage complementary engageable elements on the base plate so that the arch support is freely moveable relative to the base plate.

15. The adjustable arch support of claim 5 wherein the base plate comprises a plurality of slots freely engaging corresponding tabs on the arch support plate, and the arch support plate configured to slide relative to the base plate.

16. A sole unit with an adjustable arch, comprising:

   an outsole;

   a footbed mounted to or otherwise integrated with the outsole;

   an adjustable arch support mounted between the outsole and the footbed at a location corresponding to the arch of a foot, the adjustable arch support comprising:

   a support plate mounted within the sole unit;

   a base plate secured to the sole unit extending over an area generally below the support plate;
an adjustment mechanism positioned between the base plate and support plate, the adjustment mechanism coupled to the support plate and comprising an elevating member that is slideably disposed on a path under the support plate that is transverse to an axis of the support plate; and

wherein the adjustment of the adjustment mechanism causes the elevating member to engage the support plate and change its height, which change in height results in a change to the foot-supporting surface shape of the sole unit.

17. The sole unit of claim 16 further comprising a midsole located between the outsole and the footbed, and the midsole shaped to accommodate an adjustable arch support.

18. A kit comprising:
footwear having a sole unit as claimed in claim 1; and

a key adapted to adjust the adjustment mechanism of the support system.

19. A method for making a sole unit having a support system contained therein for adjusting a foot-supporting surface shape of the sole unit comprising:
mounting a support plate within the sole unit;
securing a base plate to the sole unit extending over an area generally below the support plate;
positioning an adjustment mechanism between the base plate and support plate,
the adjustment mechanism coupled to the support plate and comprising an
elevating member that is slideably disposed on a path under the support
plate that is transverse to an axis of the support plate; and
wherein the adjustment of the adjustment mechanism causes the elevating
member to engage the support plate and change its height, which change
in height results in a change to the foot-supporting surface shape of the
sole unit.

20. The method of claim 19 wherein the support system is disposed in a rearfoot,
midfoot, or forefoot portion of the sole unit and independently adjusts the portion
relative to another portion.

21. A method for making an adjustable arch support for a shoe comprising:
providing an arch support plate extending from an outer edge on the medial side
of the shoe to a central portion of the shoe and the arch support plate
curving gradually to form an arch fit complementary to the arch of a foot;
securing a base plate to the shoe extending over an area generally below the arch
support plate;
positioning an adjustment mechanism between the base plate and arch support
plate, the adjustment mechanism comprising
an adjustment screw;
a threaded member interacting with the adjustment screw;
an elevating member adapted to interact freely with the threaded
member and coupled to the arch support plate; and
wherein rotation of the adjustment screw repositions the threaded member
so that the elevating member and the associated arch support plate
are repositioned and the height of the arch support plate is
adjusted.
INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 1/28183

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) … 
USPC - 36/25R

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED
Minimum documentation searched (classification system followed by classification symbols)
USPC: 36/25R

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
USPC: 36/12, 15, 16, 23, 25R, 30, 97, 140
(keyword limited; terms below)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
PubWEST (PGPB, USPT, EPAB, JPAB); Google
Search terms: shoe, boot, adjust, control, change, modify, arch, height, raise, elevate, sole, support, plate, insole, etc.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
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<tbody>
<tr>
<td>X</td>
<td>US 4,909,768 A (O'Brien) 20 March 1990 (20.03.1990), col 2, ln 9 to col 3, ln 19, Fig 1-4</td>
<td>1-2 1</td>
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<td>A</td>
<td>US 5,903,985 A (DeMarchi) 18 May 1999 (18.05.1999), entire document</td>
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<td>US 20040064973 A1 (Talbot) 08 April 2004 (08.04.2004), entire document</td>
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Further documents are listed in the continuation of Box C.

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26 April 2001 (26.04.2001)

Date of mailing of the international search report
17 MAY 2011

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