(54) Title: ANTI-ROLL ARCH SUPPORT INSOLE

(57) Abstract: A shoe insole having an axis 22 and an arch area 24 with an upper surface and a bottom. The insole has three or more supporting ridges 28, positioned under the upper surface in the arch area 24, to provide support to a wearer's arch while allowing the insole to remain flexible as the wearer walks.
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ANTI-ROLL ARCH SUPPORT INSOLE

TECHNICAL FIELD

The present invention relates to an insole, in particular, an insole having an arch support and an anti-roll peripheral edge portion.

BACKGROUND OF THE INVENTION

The present invention relates to shoe insoles, and more particularly, to improved insoles, particularly adapted for people with fallen arches. The insoles of the present invention provide comfort and support to individuals having fallen arches and also provide resistance to the tendency for the foot of such individuals to roll.

Previously, insoles of various designs have been utilized. Some insoles are simply flat sheets cut in the shape of the foot, and other insoles were thermoformed to the general shape of the foot. Additionally, it was known to place shock-absorbing material in the heel area. Many insoles are designed to be loosely inserted into athletic and other shoes. Such insoles may be used as original equipment manufacture items to be placed in the shoe at the time it is manufactured, or as replacement or substitute insoles for those supplied with a pair of shoes.

In the past, insole design has frequently been tailored to various athletic or occupational requirements. Few insoles have been designed to specifically address the problems of individuals with fallen arches. Pes Planus or flatfoot (fallen arches) is the most common foot condition in patients of all ages. It is characterized by hindfoot valgus, forefoot abduction, and decrease in the height of the medial arch. In the past, rigid orthotics have been provided but they have the disadvantage of hindering the natural movement of the foot. Such hard rigid supports limit performance and promote foot fatigue.

The present invention is addressed to the needs of individuals with fallen arches and provides several advantages. The present invention allows the insole to stay flexible and bend with the foot while continuously supporting the arch and not impeding the foot's movement.

The arch design of the present invention minimizes the compression of the arch area and prevents the foot from rolling inward. The invention can also provide a small support column on the edge opposite the arch to counteract rolling to the outside. The preferred design provides a centering action to reduce ankle strain and foot roll. The present invention offers
many advantages which can include firm support for the arch, resistance to the rolling of the foot in the shoe and shock absorption in the heel area.

**BRIEF DESCRIPTION OF THE DRAWINGS**

The present invention will be better understood with reference to the accompanying drawings in conjunction with the detailed description. The drawings of the detailed description are of preferred embodiments of the invention and thus, are not to be considered limiting.

FIG. 1 is a top view of one embodiment of an insole of the present invention;

FIG. 2 is a bottom view of FIG. 1;

FIG. 3 is a bottom view of another embodiment of the present invention being a three-quarter length insole;

FIG. 4a is a cross-sectional view of FIG. 2 at line 4a-4a;

FIG. 4b is a cross-sectional view of FIG. 3 at line 4b-4b;

FIG. 5 is a side view of the embodiment of FIGS. 1 and 2;

FIG. 6 is a side view of another embodiment of the invention;

FIG. 7 is a partial side view of an arch of another embodiment of the present invention; and

FIG. 8 is a partial cross-sectional view of FIG. 7 along line 8-8.

**SUMMARY OF THE INVENTION**

The present invention is an insole which has a body defining the shape of an insole, having an axis and an arch area. The body has an upper surface for contact with the foot and a bottom. The insole has three or more supporting ridges positioned under the upper surface in the arch area. In a preferred embodiment, the insole includes a shock-absorbing structure in the heel area. This shock-absorbing structure may be in the form of a plurality of individual spaced apart pods, or a section of shock-absorbing material located in the heel area. Also, in a preferred embodiment of the invention, the periphery of the insole extending along
the edge opposite the arch and preferably the heel section, is scalloped and is substantially vertical.

**DETAILED DESCRIPTION**

FIG. 1 is a top view of insole body 20. Like reference numbers and like drawings refer to corresponding elements. The insole defines an axis 22 which passes through the center of the heel and through a point between where the third or fourth toe would lie. The insole body 20 has an arch area 24 (shown in dashed lines) corresponding to the natural arch of a normal foot. Insole body 20 has an upper surface 26 and has supporting ridges 28, (shown on phantom) underneath the upper surface 26 in the arch area 24. Preferably, there are at least three supporting ridges 28. The supporting ridges 28 preferably are positioned such that the ridge axis of each supporting ridge 28 is positioned at an angle 30, which is between about 80° to about 100° from the axis 22. Most preferably, the supporting ridges 28 are substantially perpendicular to the axis 22.

FIG. 2 is a bottom view of the insole of FIG. 1. FIG. 2 illustrates a plurality of shock-absorbing pods 32 which are contained in a recessed area 34. Recessed area 34 can be located in the heel area or located in the heel and extend along the insole opposite the arch area 24. In the illustrated embodiment, the rear approximately three-quarters of the insole body 20 is a molded foam 36, and the front portion of the insole body 20 is formed by an extending portion 38 of a neoprene sheet. In a preferred embodiment, the periphery around the heel has a substantially vertical edge defining a plurality of projections 40. This scalloped edge can extend along the side of the insole body 20 opposite the arch area 24 as well.

FIG. 3 is an alternate embodiment of a present invention. FIG. 3 illustrates insole body 42. Insole body 42 varies from insole body 20 in that insole body 42 is a three-quarter insole having the shape of the rear approximately three-quarters of the foot. This insole body 42 has an axis, which as in the other embodiment is through the center of the heel and through a point between where the third and fourth toe would be if it were extended to a full length insole. This embodiment has supporting ridges 28 and can also have projections 40. Insole body 42 illustrates an alternate design to provide shock absorption in the heel area. Insole body 42 is provided with shock-absorbing insert 44. Shock-absorbing insert 44 may be of a sheet material, such as neoprene, around which the bottom of the insole is molded.
Alternatively, shock-absorbing insert 44 may be molded in place utilizing a suitable material as is known in the art.

FIG. 4a is a cross-sectional view of FIG.2 along line 4a-4a, and FIG. 4b is a cross-sectional view of FIG. 3 along line 4b-4b (it will be noted that both views are taken from a bottom view so that the top and bottom are reversed in the illustrations). Referring to FIGS. 4a and 4b, the cross-section shows a top sheet 50. Top sheet 50 can be of any desired fabric. Generally, the function of the fabric top sheet 50 is to provide a wear surface and to increase aesthetic appeal of the insole. Any fabric known in the art may be used. Top sheet 50 is adhered, in the preferred embodiment, to the top layer 52 which is a sheet of neoprene.

Adhered to the lower side of top layer 52 is molded bottom layer 54. Molded bottom layer 54 is preferably polyurethane, but may be made of any moldable foam as is known in the art. Shock-absorbing pods 32 are molded into the bottom layer 54. Pods 32 can be of any desired shape. They may be circular or other shapes. Spaces 56 in between the pods 32 provide areas into which the pods can deflect and provide shock absorption. In a preferred embodiment, the shock-absorbing pods 32 are generally circular with a diameter of approximately 0.952 cm and a height of about 0.432 cm in the heel section. The spaces 56 between the pods 32 can be from about 0.317 cm to about 0.482 cm. The height of the pods 32 decreases as the thickness of the molded bottom layer 54 decreases as it approaches the front portion of the insole. In FIG. 4b, top sheet 50, top layer 52 and molded bottom layer 54 are present. In addition, molded bottom layer 54 contains shock-absorbing insert 44. Shock-absorbing insert 44 can be a sheet material molded in place, or formed in situ by molding a material having desired characteristics when the bottom layer 54 is molded.

The insoles of the present invention may be made by known methods. Suitable methods are disclosed in United States Patents No. 4,627,178, 4,674,204, 4,910,886, and 4,694,589.

The insole body 20 has supporting ridges 28. The purpose of the supporting ridges 28 is to provide support to the arch of the wearer. When the molded bottom layer 54 is made of foamed polyurethane, the polyurethane develops a skin on the surface adjacent to the mold. This skin is much denser than the foam polyurethane contained within the molded bottom layer 54. It has been found that this skin helps maintain the supporting ridges 28 in their uncompressed dimension. Also, the skin and dimension of the supporting ridges 28 have
been found important in minimizing or preventing deflection of the supporting ridges 28 when pressure is applied. It has been found that when the molded bottom layer 54 is molded polyurethane and the supporting ridges 28 are a molded integral part of the molded bottom layer 54, that the width 58 (as illustrated in FIG. 5) of supporting ridges 28 should be from about 0.46 cm to about 0.90 cm when molded polyurethane is used. The space between the supporting ridges 28 can be from about 0.95 cm to about 1.28 cm. The number of supporting ridges 28 can vary with the size of the insole. In a preferred embodiment, the supporting ridges 28 are molded and form a portion of the molded bottom layer 54. The supporting ridges 28 should have a width which is sufficient to resist deflection of the supporting ridges 28 front to back as the wearer walks. The supporting ridges 28 may be slightly compressible, so long as they maintain the arch shape and support the arch in the proper position. The supporting ridges 28 will be of varying height and length depending upon their location in the arch area 24 and the size of the insole. The height of each supporting ridge 28 varies from the outside edge of the insole to the inside of the arch section. In the preferred embodiment, the supporting ridges 28 have a generally triangular shape with one side being the bottom, one side the outside edge, and the third side along what would be the bottom of the foot’s arch. It has been found that for a man’s size ten insole, made with a top layer 52 of about 0.48 cm neoprene and a molded bottom layer 54 of polyurethane, that the largest ridge in the arch area 24 has a height of about 1.09 cm on the outside edge of the insole, and a length of about 1.90 cm along the bottom.

FIGS. 5 and 6 show side views of embodiments of the invention. This width 58 of the supporting ridges 28 is preferably from about 0.46 cm to about 0.90 cm to provide adequate support. The height of the supporting ridges 28 is variable and preferably follows the shape of the arch. There should be at least three supporting ridges 28. Preferably, there are 3 to about 6 supporting ridges 28.

FIG. 5 shows the preferred embodiment of insole body 20, having a top sheet 50 of fabric, top layer 52 of neoprene and a molded bottom layer 54 of polyurethane. FIG. 6 shows an alternate embodiment in which a molded urethane bottom layer 54 extends the full length of the insole. It is not necessary to employ a neoprene top layer 52, nor is it required to have a fabric top sheet 50. Alternate embodiments of the invention would include an insole made entirely of molded urethane, and an insole of molded urethane with a fabric top sheet.
The supporting ridges 28 are utilized to minimize or prevent the arch area 24 of the insole body 20 from deflecting as weight is applied. These supporting ridges 28 form a bridge between the shoe's sole and the arch area of the foot. The supporting ridge design of the present invention allows the insole body 20 to stay flexible and bend with the foot, while continuously supporting the arch and not impeding the foot's movement. Thus, the natural movement of the foot is not impeded. It was found that the use of the supporting ridges 28 in the arch area 24 make it desirable to increase the support on the opposing edge of the insoles. Thus, in the preferred embodiment of the present invention as illustrated in FIG. 2, the peripheral outside edge opposite the arch and the edge in the heel section were designed with a scalloped edge which is substantially vertical to provide an anti-roll feature. The outside perimeter edge opposite the arch and preferrably extending around the perimeter of the heel area has the scalloped or corrugated shape with small projections 40. This design produces a corrugated edge that is much stronger than a straight or radius edge. The projections 40 have substantially vertical walls. This is in contrast to insoles marketed today which have radiused outside edges which will roll inward or outward as weight is applied near the edge. The scalloped edge with the plurality of projections 40 is preferred. This design facilitates the use of the insole as a replacement insole which can be inserted into shoes made by different manufacturers by providing an area that the projections 40 can compress into. This permits the insole body 20 to fit in shoes made by different manufactures but yet provide the anti-roll feature. For original equipment manufacturing, the edges of the insole can be custom shaped to fit tightly in the shoe so that the insole does not roll.

FIG. 7 is a partial side view of the arch area 24 of yet another embodiment of the present invention. In FIG. 7, the insole has a molded bottom layer 60. Separate supporting ridges 62 are embedded in the molded bottom layer 60 between extensions 64 in the molded bottom layer 62. FIG. 8 is a partial cross-section view along line 8-8 of FIG. 7. In this embodiment, molded bottom layer 60 can be of a highly compressible material, and supporting ridges 62 can be of a fairly rigid material. Thus, as the user walks, supporting ridges 62 provide support to the wearer's arch, and extensions 64 of molded bottom layer 60 can compress to allow the insole to flex as the wearer walks. Supporting ridges 62 can be of a material placed in the mold and bottom layer 60 molded around them, or can be formed in situ.
by molding a material of desired characteristics. This embodiment is less desirable because of the increased cost of manufacture.

Other features of the insole which can be desirable are to mold the bottom surface so that it has a rough surface similar to fine sandpaper. This helps to prevent slipping of the insoles from front to rear in the shoe.

While the present invention has been described in relation to its preferred embodiment, the description is not intended to be limiting of the invention but rather to describe certain preferred embodiments. Thus, modifications to the preferred embodiments will be appreciated by those skilled in the art without departing from the invention.
IT IS CLAIMED:

1. An insole comprising:
   a) a body defining the shape of an insole having an axis and an arch area, said
      body having an upper surface for contact with the foot and a bottom; and
   b) three or more supporting ridges positioned under said upper surface in said
      arch area.

2. An insole of claim 1 having a substantially vertical edge along the periphery of
   the heel.

3. An insole of claim 1 wherein the bottom has a plurality of pods formed in the
   area of the heel.

4. An insole of claim 1 wherein said supporting ridges have a width of from
   about 0.46 cm to about 0.90 cm.

5. An insole of claim 1 wherein said supporting ridges have ridge axes which are
   positioned at an angle of from 80 to 100 degrees from said axis.

6. An insole comprising:
   a) a top layer in the shape of an insole defining an axis and having a upper
      surface and a lower surface;
   b) a lower member attached to said lower surface of said top layer, having
      an arch area and having a bottom; and
   c) said three or more supporting ridges positioned under said lower
      surface in said arch area.

7. An insole of claim 6 wherein said top layer is fabric.

8. An insole of claim 6 wherein said lower member is of molded polyurethane.
9. An insole of claim 6 wherein said supporting ridges have a width of from about 0.46 cm to about 0.90 cm.

10. An insole of claim 8 wherein said supporting ridges have a thickness of from about 0.46 cm to about 0.90 cm.

11. An insole of claim 6 wherein said supporting ridges have ridge axes which are positioned at an angle of from 80 to 100 degrees from said axis.

12. An insole comprising:
   a) a top sheet which is the shape of an insole having a top and a bottom;
   b) a top layer attached to said bottom of said top sheet;
   c) a bottom layer attached to the lower surface of said top layer, having an arch area and having a bottom; and
   d) three or more supporting ridges located under said top layer in said arch area.

13. An insole of claim 12 wherein said top layer is of neoprene.

14. An insole of claim 12 wherein said bottom layer is of molded polyurethane.

15. An insole of claim 13 wherein said bottom layer is of molded polyurethane.

16. An insole of claim 14 wherein said supporting ridges have a width of from about 0.46 cm to about 0.90 cm.

17. An insole of claim 15 wherein said supporting ridges have a thickness of from about 0.46 cm to about 0.90 cm.

18. An insole of claim 12 wherein said supporting ridges have ridge axes which are positioned at an angle of from 80 to 100 degrees from said axis.
AMENDED CLAIMS

[Received by the International Bureau on 02 May 2003 (02.05.03); original claims 1-18 replaced by new claims 1-25]

1. An insole for use in a shoe or boot of a wearer, comprising:
   a) a toe area, an arch area and a heel area together defining an insole body having an axis, said body having an upper surface for contact with the foot of the wearer during use and a bottom surface for contact with the interior of a shoe or boot of the wearer during use;
   b) three or more supporting ridges positioned contiguous to said bottom surface in said arch area, said supporting ridges extending transversely across said arch area, wherein said toe area is substantially free of said supporting ridges, whereby said toe area remains flexible and can bend with the foot during use of said insole by the wearer; and
   c) a peripheral outside edge opposite the arch contiguous to said bottom surface comprising small projections defining a substantially vertical edge which provides an anti-roll function.

2. The insole of Claim 1, wherein said insole body comprises a top layer having a top layer upper surface and a top layer lower surface, and a lower member having a lower member bottom surface which forms said bottom surface for contact with the interior of a shoe or boot of the wearer during use and an attachment surface, said attachment surface secured to said top layer lower surface, wherein said supporting ridges are contiguous to said lower member bottom surface.

3. The insole of Claim 1 wherein said substantially vertical edge defines a corrugated or scalloped edge.

4. The insole of Claim 2 wherein said substantially vertical edge defines a corrugated or scalloped edge.
5. The insole of Claim 1, wherein said projections forming said outside perimeter edge opposite the arch further extend around the perimeter of the heel.

6. The insole of Claim 2, wherein said projections forming said outside perimeter edge opposite the arch further extend around the perimeter of the heel.

7. The insole of Claim 3, wherein said projections forming said outside perimeter edge opposite the arch further extend around the perimeter of the heel.

8. The insole of Claim 4, wherein said projections forming said outside perimeter edge opposite the arch further extend around the perimeter of the heel.

9. The insole of Claim 1 wherein said insole has a plurality of shock-absorbing pods integrally formed and located in the area of the heel contiguous to said bottom surface.

10. The insole of Claim 2 wherein said insole has a plurality of shock-absorbing pods integrally formed and located in the area of the heel contiguous to said bottom surface.

11. The insole of Claim 3 wherein said insole has a plurality of shock-absorbing pods integrally formed and located in the area of the heel contiguous to said bottom surface.

12. The insole of Claim 4 wherein said insole has a plurality of shock-absorbing pods integrally formed and located in the area of the heel contiguous to said bottom surface.

13. The insole of Claim 5 wherein said insole has a plurality of shock-absorbing pods integrally formed and located in the area of the heel contiguous to said bottom surface.
14. The insole of Claim 6 wherein said insole has a plurality of shock-absorbing pods integrally formed and located in the area of the heel contiguous to said bottom surface.

15. The insole of Claim 7 wherein said insole has a plurality of shock-absorbing pods integrally formed and located in the area of the heel contiguous to said bottom surface.

16. The insole of Claim 8 wherein said insole has a plurality of shock-absorbing pods integrally formed and located in the area of the heel contiguous to said bottom surface.

17. The insole of Claims 1-15 or 16 wherein said supporting ridges have a width of from about 0.46 cm to about 0.90 cm.

18. The insole of Claims 1-15 or 16 wherein said supporting ridges have ridge axes which are positioned at an angle of from 80 to 100 degrees from said axis of said insole.

19. The insole of Claim 17 wherein said supporting ridges have ridge axes which are positioned at an angle of from 80 to 100 degrees from said axis of said insole.

20. The insole of Claim 2, 4, 6, 8, 10, 12, 14 or 16 wherein said top layer is fabric.

21. The insole of Claim 2, 4, 6, 8, 10, 12, 14 or 16 wherein said top layer comprises a top sheet made of fabric having a fabric top side for contact with the foot of the wearer and a fabric bottom side, and a neoprene layer attached to said fabric bottom side.
22. The insole of Claim 2, 4, 6, 8, 10, 12, 14, or 16 wherein said supporting ridges have a width of from about 0.46 cm to about 0.90 cm, and wherein said top layer is fabric.

23. The insole of Claim 22 wherein said supporting ridges have ridge axes which are positioned at an angle of from 80 to 100 degrees from said axis of said insole.

24. The insole of Claim 2, 4, 6, 8, 10, 12, 14, or 16 wherein said supporting ridges have a width of from about 0.46 cm to about 0.90 cm, and wherein said top layer comprises a top sheet made of fabric having a fabric top side for contact with the foot of the wearer and a fabric bottom side, and a neoprene layer attached to said fabric bottom side.

25. The insole of Claim 24, wherein said supporting ridges have ridge axes which are positioned at an angle of from 80 to 100 degrees from said axis of said insole.
### A. CLASSIFICATION OF SUBJECT MATTER

**IPC** 7  A43B7/22  A43B17/02  A43B13/18

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

### B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

**IPC** 7  A43B

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

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

EPO-Internal, WPI Data, PAJ

### C. DOCUMENTS CONSIDERED TO BE RELEVANT

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Date of the actual completion of the international search

17 February 2003

Date of mailing of the international search report

03/03/2003
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