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(54) **FOOTWEAR SOLE CONSTRUCTION**

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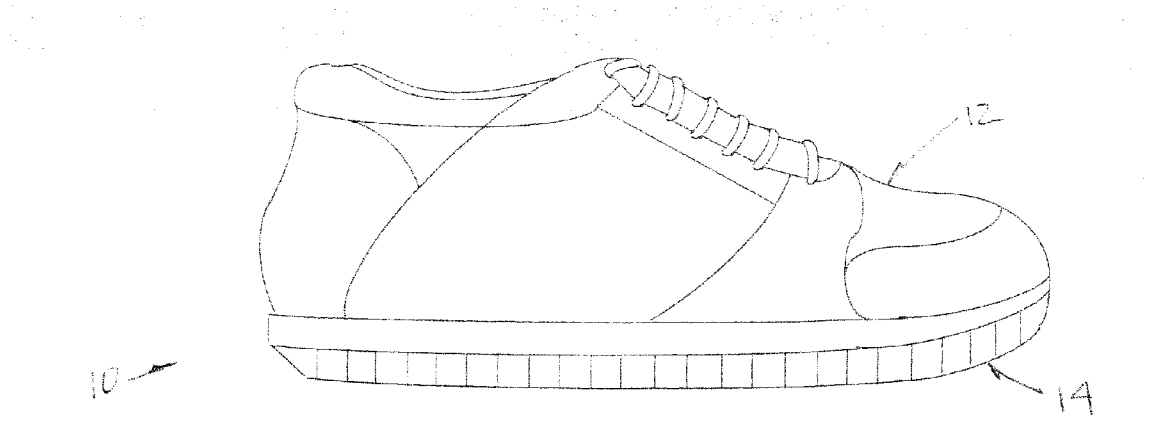
(57) **ABSTRACT**

A sole for shoes includes a planar sole base, with at least one pair of adjacent first and second traction elements extending downwardly from the sole base. Each of the traction elements includes a contact surface spaced from and generally parallel to the sole base. A straight connecting surface is disposed between the contact surface and the planar base. The straight connecting surface is generally orthogonal to the contact surface and the base. An angled connecting surface is between the contact surface and the planar base. The angled connecting surface is disposed at an acute angle to the contact surface. The straight connecting surface of the at least one additional traction element is located adjacent to, but spaced from, the angled connecting surface of the first traction element.



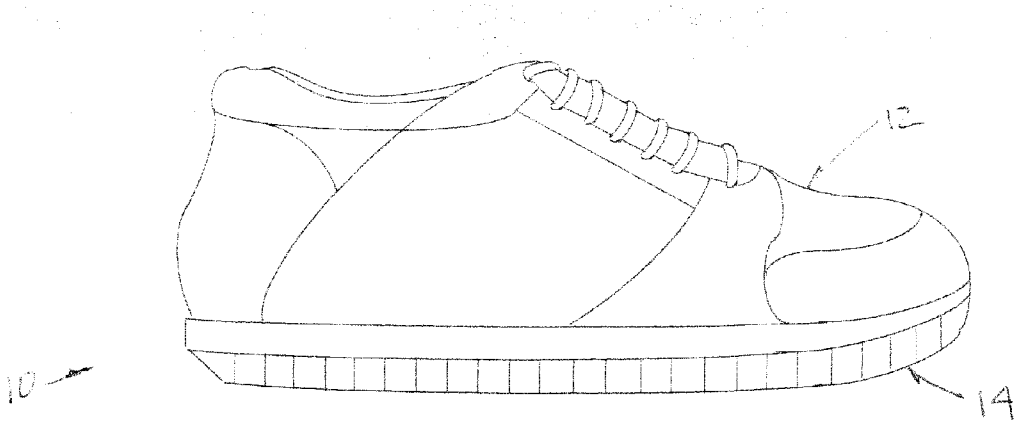


FIG. 1

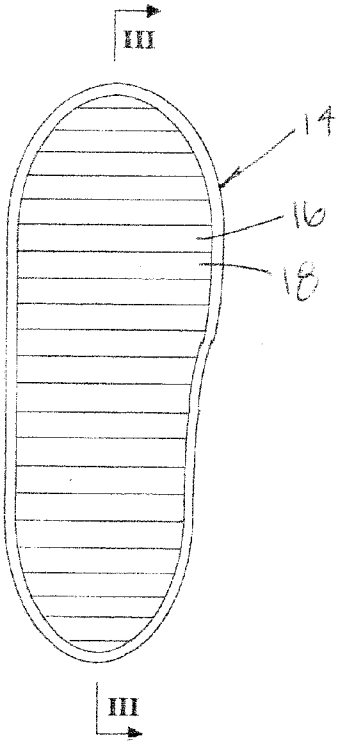


FIG. 2

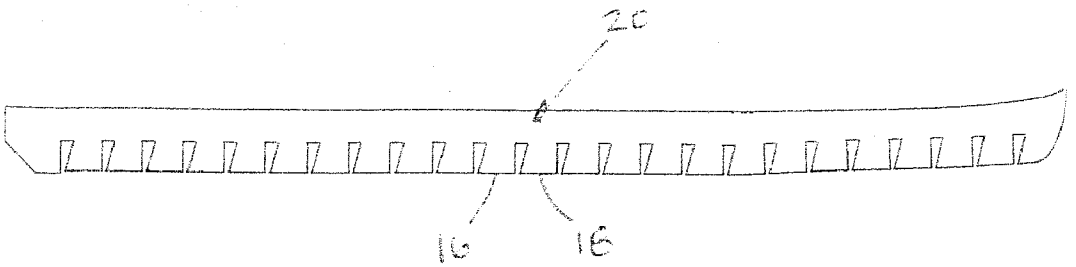


FIG. 3

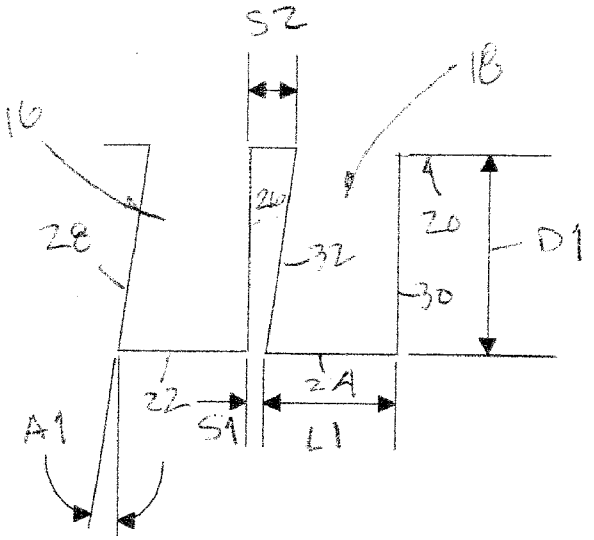


FIG. 4

FOOTWEAR SOLE CONSTRUCTION

FIELD OF THE INVENTION

[0001] The present invention relates generally to footwear, and particularly to sole structure for enhancing the performance and comfort of footwear.

BACKGROUND OF THE INVENTION

[0002] The development of specialized shoes for various athletic endeavors is a relatively recent. In "2002: A Sneaker Odyssey", Stephen M. Pribut, DPM and Douglas H. Richie, DPM outline a brief history of athletic shoes. Before the late 1970's, running shoes were not high-tech items. With rare exceptions, until the middle of the 19th century, shoes were made on a single straight last and there was no differentiation between left and right shoes. During those years, not many international competitions were held, and the modern Olympics did not appear until 1896. The early 20^{th} century saw the marketing of the first sneakers, so-called because their rubber soles permitted a wearer to "sneak" up on others. Keds, and later P.F. Flyers and Converse, captured much of the early sneaker market in the U.S.

[0003] Within the context of modern athletic-shoe development, podiatric biomechanical thought and terminology have sunk deeply into the psyche of the athletic-shoe industry and the buying public. Words such as pronation, stability, and motion control are now widely used in the description and ranking of running shoes. The significance of types of feet and lasts, the use of motion-control devices, new shock-absorbing materials, and many other ideas have become common as a result of both podiatric sports medical influence and the realization that foot and lower extremity biomechanics plays a vital role in the performance of the casual athlete as well as the world-class athlete.

[0004] Today's athletic shoes are designed with an eye toward accommodating various types and shapes of feet. Shoes are made that allow for the differences between men and women, light- and heavyweight runners, pronated and supinated feet, and narrow and wide feet. Sport-specific shoes also attempt to meet the diverse needs of differing sports.

[0005] Not surprisingly, sole structure for athletic and other shoes has found its way into the patent literature. For example, U.S. Pat. No. 6,574,889 to Cagner is directed to a shoe having a flexible outersole, an insole and an upper, the upper being formed from a flat Thermo Plastic Rubber blank, a toe cap first being fabricated in the blank by means of a teacup crease special-use sewing machine, the blank or preform subsequently affixed to a last and joined by a second special purpose sewing machine, or disc feed overseaming machine, to a non-woven fabric midsole or insole, substantially completing the upper. Thermal processing on the resulting preform completes processing of the upper without use of an insole board. A third element of the shoe, the outersole, is unitary in construction, and equipped with a unique pattern of intersecting grooves, as well as an external bridge or instep support in lieu of an inner steel shank. Following bonding of the upper and the outersole, a shoe of unique flexibility is produced, while still providing adequate protection to an active user's foot.

[0006] U.S. Pat. No. 6,115,945 to Ellis sets forth a construction for a shoe, particularly an athletic shoe, which includes a sole that conforms to the natural shape of the foot shoe, including the bottom and the sides, when that foot sole deforms naturally by flattening under load while walking or running in order to provide a stable support base for the foot and ankle. Deformation sipes such as slits or channels are introduced in the shoe sole along its long axis, and other axes, to provide it with flexibility roughly equivalent to that of the foot. The result is a shoe sole that accurately parallels the frontal plane deformation of the foot sole, which creates a stable base that is wide and flat even when tilted sideways in extreme pronation or supination motion. In marked contrast, conventional shoe soles are rigid and become highly unstable when tilted sideways because they are supported only by a thin bottom edge.

[0007] U.S. Pat. No. 5,768,806 to Parisotto deals with a shoe sole presenting a rear portion in turn presenting at the top a number of inclined, flexible transverse ribs defining a deformable heel support.

[0008] In U.S. Pat. No. 4,741,114 to Stubblefield, a shoe sole includes an outer sole of substantially uniform thickness and a midsole. The midsole has peripheral portions that are relatively thick compared to its central portion which is relatively thin. The lower surface of the midsole is preferably configured as a concavity. The outer sole has a top surface which is connected to the concave lower surface of the midsole to define, along with the midsole, a general lateral concavity for the shoe. The lower surface of the outer sole includes tread members. The outermost tread members, outer sole and midsole cooperate to support the relatively thin central portion of the midsole in a cantilever fashion. Upon ground impact, the lower extremities of the tread members are urged resiliently upwardly and outwardly, and the relatively thin central portion flexes downwardly to provide cushioning for the foot of the wearer.

[0009] U.S. Pat. No. 4,309,832 to Hall is directed to a flexible shoe, preferably of the sport shoe variety, includes a resilient sole which incorporates one or two transverse hinge joints. The principal hinge joint extends across the ball of the foot and preferably passes under the first metatarso-phalangeal joint. An optional second hinge joint extends across the anterior heel region of the foot. Both hinge joints function to keep the effective sole levers short and thereby permit the foot to function in a natural and comfortable manner. The shank of the sole may be longitudinally stiffened for additional stability.

[0010] U.S. Pat. No. 4,241,524 to Sink deals with an athletic shoe for running and having a bar tread configuration providing improved traction with the running surface while cushioning the foot and providing improved flexibility so as not to limit the bending of the foot.

[0011] It can thus be seen from the foregoing that several attempts have been made to configure shoe soles to enhance comfort and performance. However, many existing sole structures are complex and difficult to manufacture, and offer only incremental improvements. Clearly, the need exists for a shoe sole configuration that provides enhanced comfort and performance while overcoming the drawbacks of existing structures.

SUMMARY OF THE INVENTION

[0012] A sole for shoes includes a planar sole base, with at least one pair of adjacent first and second traction elements extending downwardly from the sole base. Each of the traction elements includes a contact surface spaced from and generally parallel to the sole base. A straight connecting surface is disposed between the contact surface and the planar

base. The straight connecting surface is generally orthogonal to the contact surface and the base. An angled connecting surface is between the contact surface and the planar base. The angled connecting surface is disposed at an acute angle to the contact surface. The straight connecting surface of the at least one additional traction element is located adjacent to, but spaced from, the angled connecting surface of the first traction element.

DESCRIPTION OF THE DRAWINGS

[0013] FIG. **1** illustrates a perspective view of a shoe having sole structure in accordance with the principles of the present invention.

[0014] FIG. **2** illustrates a bottom plan view of the FIG. **1** shoe.

[0015] FIG. **3** illustrates a sectional view taken generally along lines of FIG. **2**.

[0016] FIG. **4** illustrates an enlarged detail view of the FIG. **3** section.

DETAILED DESCRIPTION OF THE INVENTION

[0017] FIG. **1** illustrates a shoe **10** in accordance with the principles of the present invention. The shoe **10** includes an upper **12** secured to a sole **14** in a conventional fashion. The shoe **10** can be an athletic shoe, walking shoe, or the like. As seen in FIG. **2**, the sole **14** includes a plurality of traction elements **16**, **18**. The traction elements are disposed substantially along the entire length of the sole **12**.

[0018] FIG. **3** shows the sole **14** including a planar sole base **20**, with the traction elements **16**, **18** extending downwardly from the sole base **20**. The traction elements and sole base can be fabricated from any suitable material using any suitable manufacturing method. It is contemplated that the sole base and traction elements can be molded in a single piece of thermoplastic material or other flexible, durable substance.

[0019] The detailed section of FIG. **4** shows an embodiment of specific sole construction in accordance with the principles of the present invention. Each of the traction elements **16**, **18** include contact surfaces **22**, **24**, having lengths L**1** and spaced from the sole base **20** a distance D**1**. The contact surfaces **22**, **24** are generally parallel to the sole base **20**. A straight connecting surface **26** is disposed between the contact surface **22** and the planar base **20**. The straight connecting surface **26** is generally orthogonal to the contact surface **22** and the base **20**. An angled connecting surface **28** extends between the contact surface **22** and the planar base **20**. The angled connecting surface **28** is disposed at an acute angle A**1** to the contact surface **20**. A straight connecting surface **30** is disposed between the contact surface **24** and the planar base **20**. The straight connecting surface **30** is generally orthogonal to the contact surface **22** and the base **20**. An angled connecting surface **32** extends between the contact surface **24** and the planar base **20**. The angled connecting surface **28** is disposed at an acute angle to the contact surface **20**.

[0020] The traction elements **16**, **18**, and all of the traction elements, are spaced apart such that the contact surfaces **22**, **24** are spaced apart a distance S**1**, and the straight connecting surface **26** of the traction element **16** element is located adjacent to the angled connecting surface **32** of the traction element **18** by a distance S**2**. It is contemplated that the distances and angles will be selected in accordance with the materials and sizes of the particular sole **12**. In the illustrated embodiment, the distance D**1** and length L**1** can be approximately 3/16", the space S**1** approximately 1/16", and the space S**2** approximately 1/4". The angle A**1** can be in a range from approximately 10° to 20°.

[0021] By this construction, the traction elements are stable, yet yield during walking or running, imparting a "rolling" feel to the wearer of the shoe **10**. This effect is believed to reduce fatigue and increase the comfort of the wearer, while providing excellent stability and traction.

[0022] Although the present invention has been described with reference to specific embodiments, those of skill in the art will recognize that changes may be made thereto without departing from the scope and spirit of the invention as defined by the appended claims.

What is claimed is:

1. A sole for shoes comprising the following:

a planar sole base;

at least one pair of adjacent traction elements including a first traction element and a second traction element extending downwardly from the sole base,

wherein each of the traction elements includes the following:

a contact surface spaced from and generally parallel to the sole base;

a straight connecting surface between the contact surface and the planar base, the straight connecting surface being generally orthogonal to the contact surface and the base;

an angled connecting surface between the contact surface and the planar base, the angled connecting surface being disposed at an acute angle to the contact surface;

whereby the straight connecting surface of the at least one additional traction element is located adjacent to, but spaced from, the angled connecting surface of the first traction element.

2. A sole in accordance with claim **1**, wherein the at least one pair of adjacent traction elements comprises a plurality of pairs of adjacent traction elements.

3. A sole in accordance with claim **2**, wherein the angled connecting surfaces of the traction elements each form an angle of approximately 10° with respect to the contact surface.

4. A sole in accordance with claim **3**, wherein the traction elements are spaced approximately 1/16" apart from one another.

5. A sole in accordance with claim **4**, wherein the contact surfaces of the traction elements are approximately 3/16" in width.

6. A sole in accordance with claim **5**, wherein the straight connecting surfaces of the traction elements are approximately 3/16" in height.

7. A sole in accordance with claim **6**, wherein the planar sole base and the traction elements are fabricated from thermoplastic material.

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