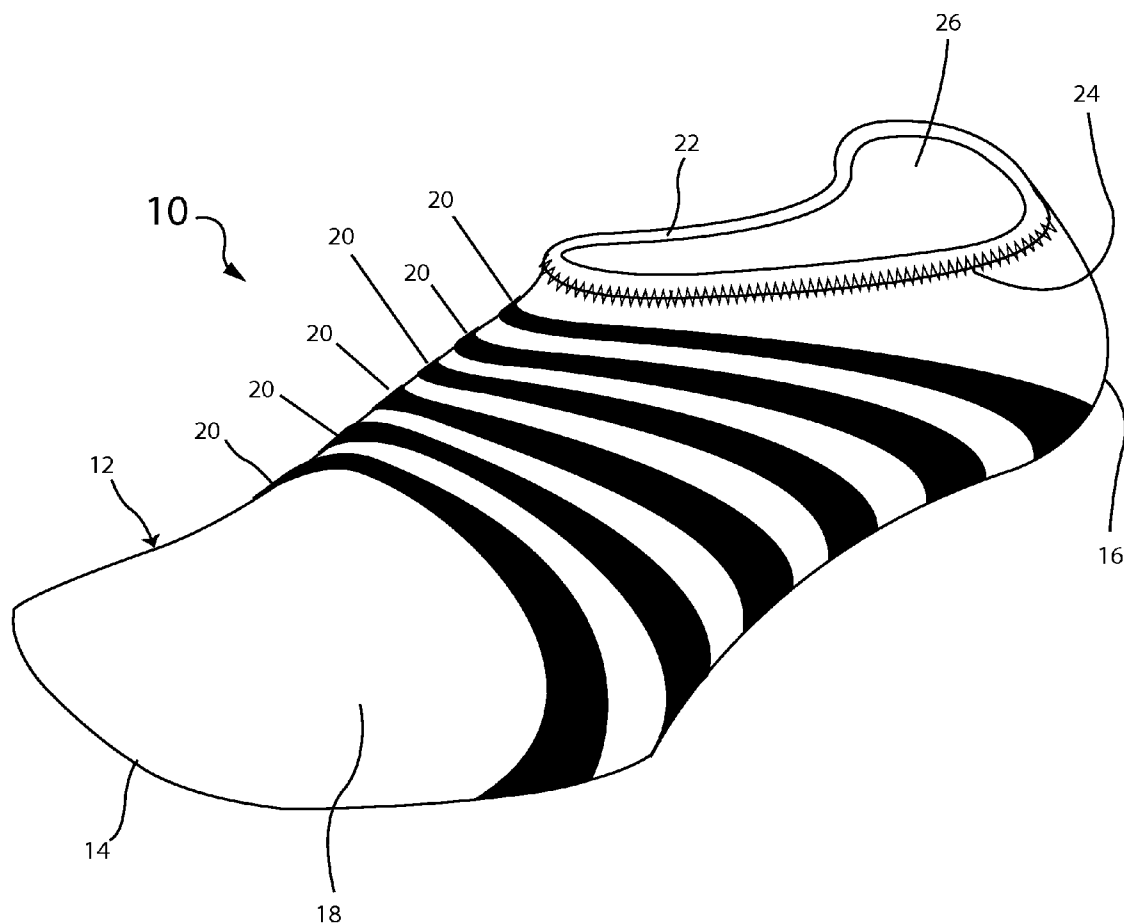


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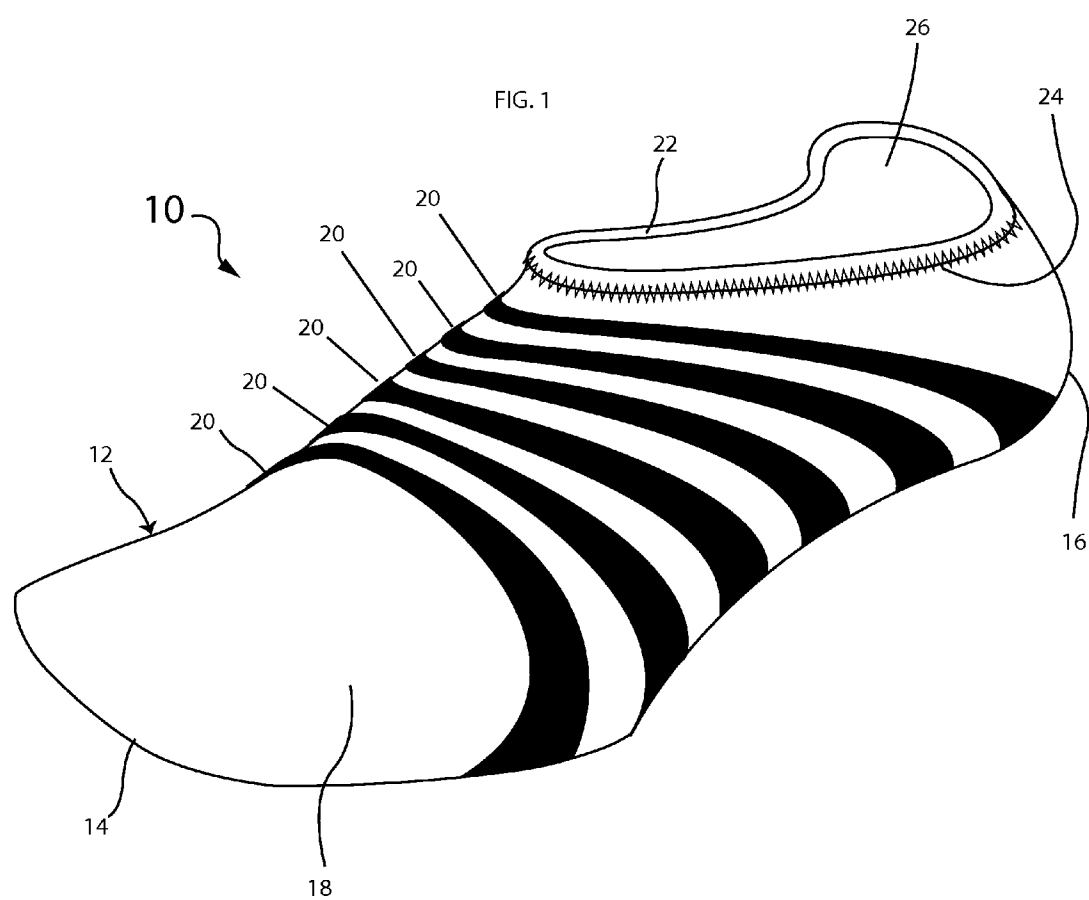


FIG. 2

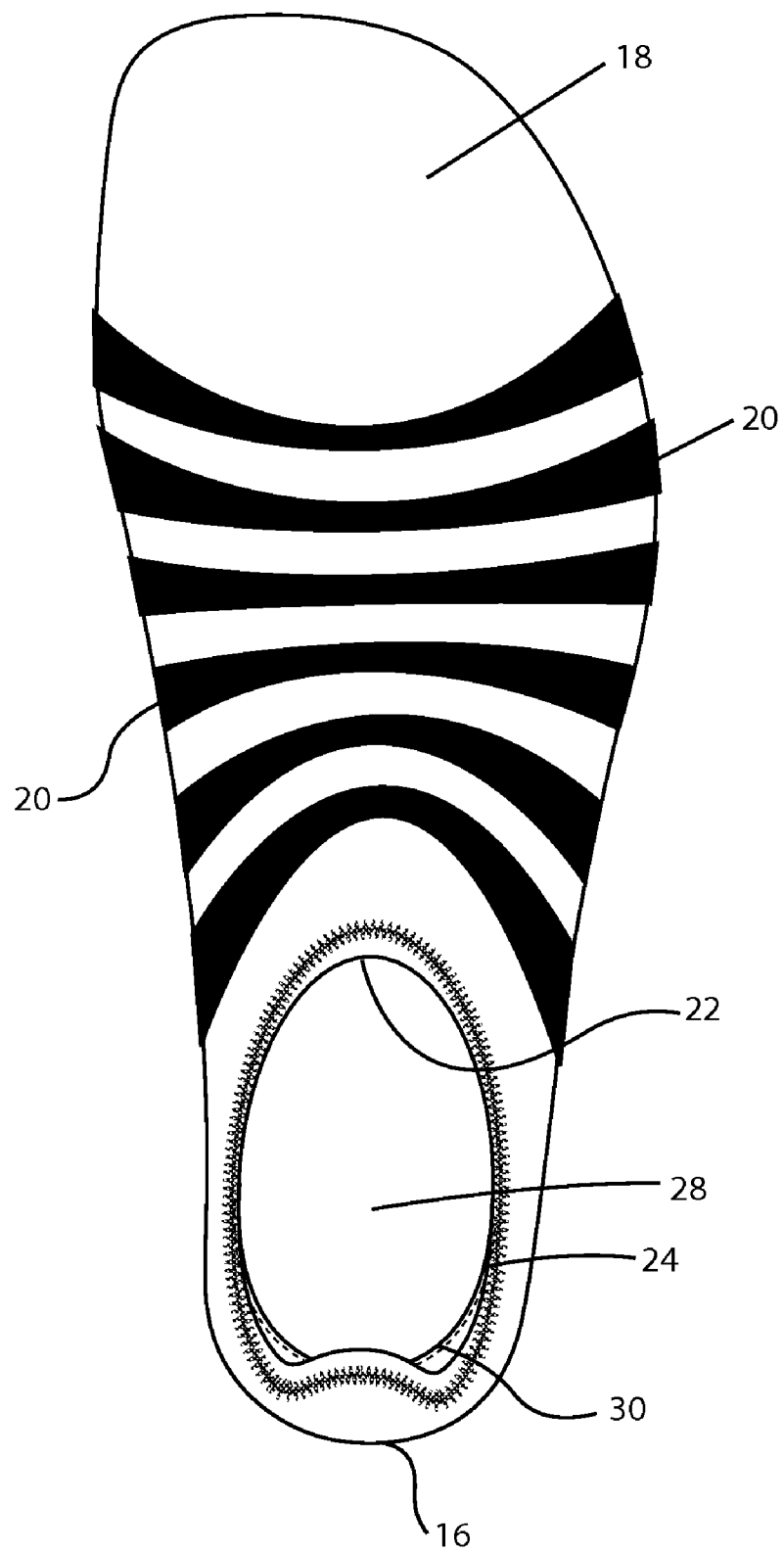


FIG. 3

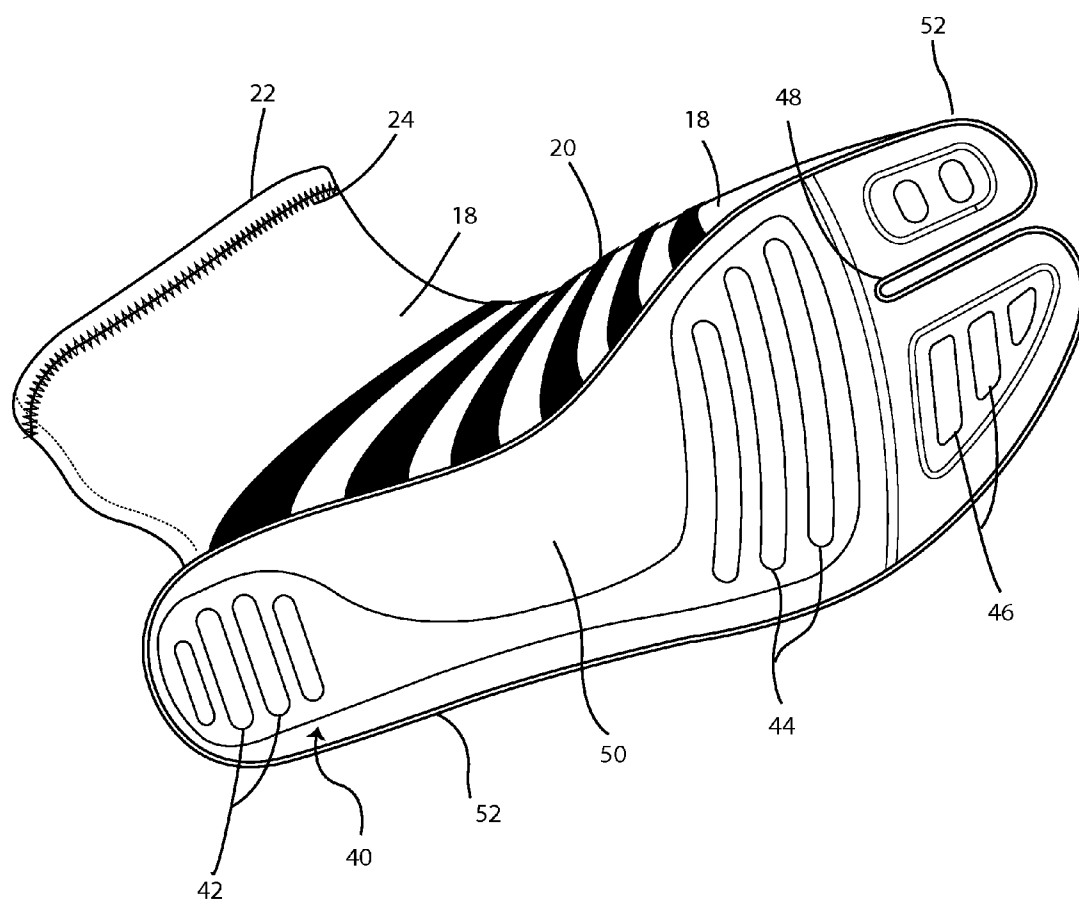
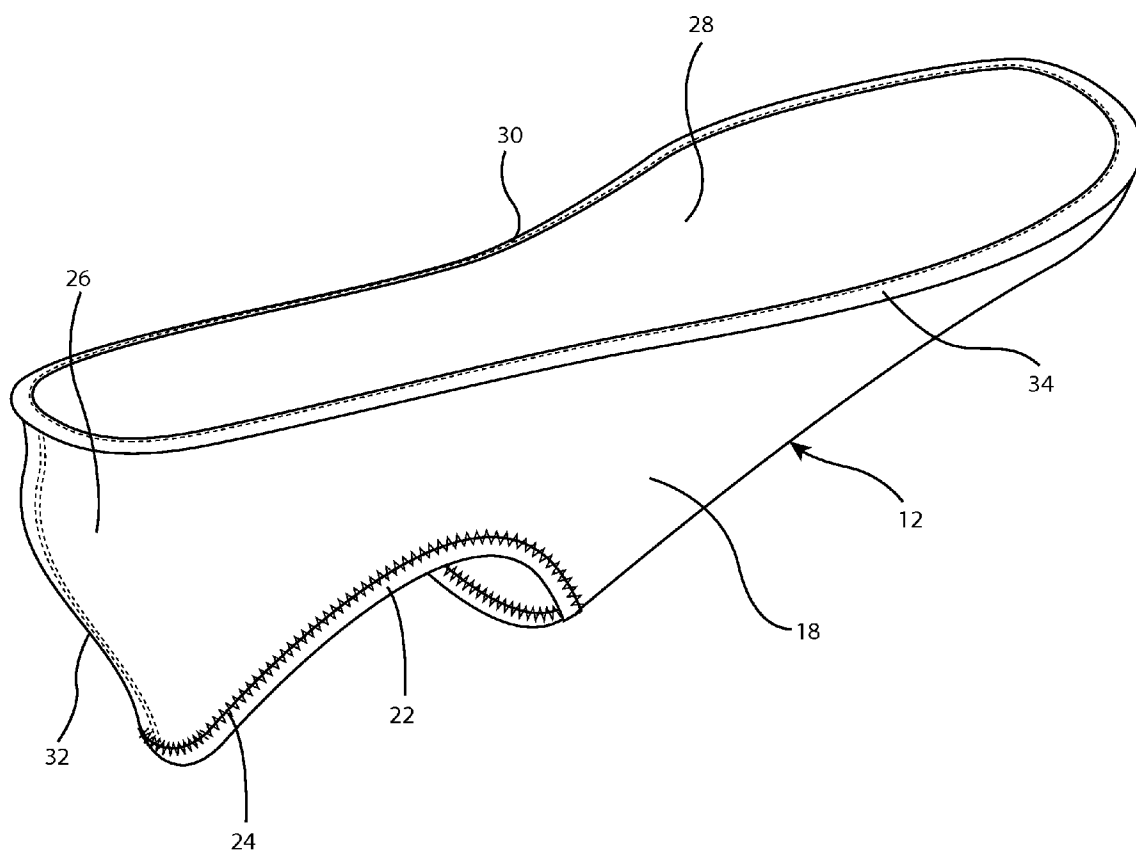


FIG. 4



MINIMAL FOOTWEAR

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The present invention relates to footwear, and more particularly, to minimal structure, high-performance footwear.

[0003] 2. Description of the Related Art

[0004] Several designs for performance footwear have been designed in the past. None of them, however, includes, among other distinguishing features, a minimal sole for better ground sensation and having a flexible upper with transverse substantially parallel support bands to keep the foot stabilized and centered over the sole thereby creating lateral stability that cradles the foot automatically by adjusting in response to individual foot shapes and body temperature.

[0005] Applicant believes that the closest reference corresponds to U.S. Pat. No. 7,337,558 issued to Terlizzi. However, it differs from the present invention because the present invention includes, among other important features, a unitary, minimalist sole without arch support, a flexible and breathable upper including a multiplicity of lesser flexible lateral support band spanning the upper from the medial edge of the sole to the lateral edge of the sole.

[0006] Other patents describing the closest subject matter provide for a number of more or less complicated features that fail to solve the problem in an efficient and economical way. None of these patents suggest the novel features of the present invention.

SUMMARY OF THE INVENTION

[0007] It is one of the main objects of the present invention to provide a minimalist shoe that allows maximum ground tactile sensation yet provides sufficient abrasion resistance.

[0008] Another object of the invention is to provide natural freedom of movement and therefore improved foot agility and increasing the foot's ability to grip the ground.

[0009] It is another object of this invention to provide a natural and automatically self-adjusting form fitting minimalist shoe that keeps the foot of the user centered over the sole by preventing unwanted lateral shifting of the foot relative to the sole.

[0010] Another object of the invention is to provide an upper assembly and structural bands that adjust with body temperature to precisely mold to the shape of the wearer's foot.

[0011] It is still another object of the present invention to provide footwear that is breathable and drainable yet inhibits soils or other foreign objects and the elements from entering the shoe that would otherwise cause discomfort or injury to the wearer while preserving the natural foot feel.

[0012] Additionally, the non-traditional assembly process of stitch and turn construction reduces labor costs and eliminates the use of harmful solvents, chemicals and adhesives and the need for a traditional shoe assembly line.

[0013] It is yet another object of this invention to provide such a device that is inexpensive to manufacture and maintain while retaining its effectiveness.

[0014] Further objects of the invention will be brought out in the following part of the specification, wherein detailed

description is for the purpose of fully disclosing the invention without placing limitations thereon.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] With the above and other related objects in view, the invention consists in the details of construction and combination of parts as will be more fully understood from the following description, when read in conjunction with the accompanying drawings in which:

[0016] FIG. 1 represents a perspective view of a full-toe variant of the footwear.

[0017] FIG. 2 shows a top side plan view of a similar version of the footwear as shown in FIG. 1.

[0018] FIG. 3 illustrates a perspective view of an alternate variation including a split-toe and "high top" upper.

[0019] FIG. 4 is a perspective view of a variation of the footwear turned inside out emphasizing the internal configuration.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0020] Referring now to the drawings, where the present invention is generally referred to in FIG. 1 with numeral 10, it can be observed that it basically includes an interior 26 compartment and an upper assembly 12 that further includes, inter alia, a toe 14, a heel 16, upper 18, bands 20, a collar 22, stitching 24, insole 28 and seam 30.

[0021] Some footwear, such as bedroom slippers and some moccasins, are constructed with a stitch and turn method. Generally, the stitch and turn fabrication method is applied to shoes when the upper is affixed to the sole. The upper is turned inside out and the sole is positioned so that the outsole is temporarily exposed to the interior of the shoe. The perimeter of the sole is then affixed to the lower edge perimeter of the upper. The shoe is then returned to right side out so that the stitching between the sole and upper is again on the interior of the shoe and thus not visible on the exterior side of the footwear.

[0022] All known prior art then adds a separate insole to the interior of the sole of the shoe to prevent the foot from contacting the sole, seam and stitching between the sole and the upper. This prevents unwanted chaffing and other related discomfort to the wearer of the shoe. The separate insole in prior art adds cushioning over the sole and often includes mid-foot arch support.

[0023] In stark contrast, the present invention allows a wearer of the footwear to experience maximum sensation of the ground and increased toe and foot flexibility during regular use by avoiding a traditional insole and having a minimal sole constructed of a flexible, yet highly durable material.

[0024] Many runners, dancers, climbers and other athletes find advantage in maximizing the tactile sensation of the ground under their feet. Often shoes are foregone for barefoot activities. In addition to sensation is the ability to flex ones foot for improving traction and grasping the ground, particularly over uneven surfaces or climbing. The sole is preferably flexible enough to permit high resolution sensation yet remains durable enough to prevent abrasion or laceration of the sole of the foot.

[0025] Conversely, almost all traditional footwear in the prior art attempts to prevent the wearer from feeling the intricacies of the ground by providing a thick rubber sole complemented by padding and cushioning on the insole. This

almost universally results in the numbing of all but the most course and severe ground contact sensations.

[0026] The human body is designed to naturally absorb shock from movements like walking, running or jumping. Our feet have an instant feedback system and send messages to the body to minimize shock. When we constrain our feet by wearing traditional shoes or sneakers this feedback system becomes distorted and muffled. It becomes more challenging for our body to react instinctively to mitigate shock. True stability and balance stems from the body's natural ability to react and move freely.

[0027] Proprioception, or perception of movement and spatial orientation arising from stimuli within the body, is a key to improved performance. Transmission of sensory feedback between the nerve endings in the foot and the brain are maximized with minimal footwear or barefoot. When engaging in barefoot activities you allow your brain to receive data faster. It's not muffled and diluted by the cushion effect of shoes. Feeling the ground more directly enables the brain to receive better pure data, faster. Studies clearly substantiate that improved proprioception helps prevent fall injuries and increases balance and core strength.

[0028] An arch is a natural support structure of the foot. Like in a bridge arch it is constructed specifically to stand up without external help. When we support a support structure we in fact weaken its natural strength over time. A constantly supported foot arch has no chance to train and form muscles and tendons designed to naturally hold it in place. By supporting this natural support structure we compromise the original, well functioning design and rob ourselves of our original foot strength and foot health our bodies afford us with. Therefore, the absence of significant arch support can increase the foot's natural performance capabilities without injuring the foot.

[0029] Referring now to the embodiment and elements exemplified in the Figures that the present footwear shares some common anatomy of some other types of footwear including an upper assembly **12** having a toe **14** end which encloses the toe end of the wearer's foot opposite a heel **16** end that cradles the wearer's heel.

[0030] The interior **26** of the shoe is accessed through an aperture rimmed by a collar **22**. The collar **22**, in a preferred variation of the invention, reinforces the aperture. Generally, the collar **22** is constructed of a strip of material, folded over the rim of the aperture and affixed to the upper **18** by a line of stitching **24**. The collar **22** acts to improve the seal between the upper **18** and the user's foot to prevent entry of foreign objects such as sand or other debris while remaining comfortable. This also allows a downward curl or grasping action of the toes that is impossible in other traditional prior art footwear.

[0031] In a valuable version of the invention the upper **18** is constructed of a flexible and resilient material. Experience and discovery have shown that spandex or elastane fabrics that are breathable, durable and flexible are preferred. These materials also permit drainage of excess water, perspiration and other moisture while having a fine enough weave or knit pattern to prevent inclusion of soil or other unwanted materials to pass to the interior of the shoe.

[0032] In other valuable variations, the upper **18** may be constructed of a variety of natural or synthetic materials, such as, leather, meshes, plastics, woven or knitted fabrics or other materials that have a requisite amount of flexibility and dura-

bility. The specific upper **18** material may be selected for aesthetics and/or performance for a specific sport activity or application.

[0033] In a preferred variation of the footwear, a series of bands **20** span over the upper **18** from the medial edge of the intersection of the sole **50** and the upper **18** to the lateral edge on the opposite side. The bands **20** are generally parallel as they traverse the upper **18**. In some variations the edge of the bands **20** nearer the sole **50** tend to deviate from parallel to each other that spreads the forces experienced along the edge of the sole **50**.

[0034] In a principal variation, the bands **20** are permanently bonded to the upper **18**. Various means to bond the bands **20** to the upper **18** have been successfully utilized including chemical bonding with adhesives, heat or high frequency welding or other means as may be known in the industry that may evolve from time to time.

[0035] In an alternate embodiment, the bands **20** are not permanently affixed to the upper but instead traverse substantially parallel to each other from the seam between the upper **18** and the sole **50** on the medial edge to the seam between the upper **18** and the sole **50** on the lateral edge. The bands **20** perform a similar function to those in the principal variation that are affixed to the upper **18**.

[0036] As a result of experience and discovery the preferred material of the bands **20** is flexible and durable. Ideally, the bands **20** are also significantly less stretchable than the balance of the upper **18** but remain flexible. Gaps between the bands **20** expose a preselected distance of the more flexible upper **18**. It is this variation in flexibility between the bands **20** and the balance of the upper **18** that directs the flex and stretch of the upper **18** as a whole.

[0037] The contrasting and complimentary stretch and flex characteristics of the bands **20** and the upper **18** are carefully matched to provide the perfect balance between the range of foot flexibility and the need to closely hold the foot in the shoe. Because of the limited stretchability of the bands **20** the foot is held centered over the sole **50** while not immovably binding lateral movement of the foot within the shoe. The stretchability of the upper **18**, particularly between the bands **20** permit the bands **20** to be stretched apart to a predetermined degree lengthening the distance between the toe **14** and the collar **22** allowing the foot to flex naturally.

[0038] While ambulating, the human foot materially flexes between heel and toe while having limited lateral flex motion. It is important in minimal shoe design to keep the foot centered over the sole while permitting the foot to flex naturally. Thus, during this gait cycle, the foot naturally has varying curve lengthwise along the foot between toe and heel and less change in deformation laterally, from one side of the foot to the other. This is a key to avoiding lateral instability.

[0039] The pattern and number of bands **20**, along with the stretchability of the upper **18** material, contribute to the flexibility characteristics of the footwear. Because the bands **20** are significantly less stretchable than the balance of the upper **18** the overall flex behavior of the shoe is controllable. The bands **20** act to keep the wearer's foot centered over the sole **50** by forming essentially a series of straps that wrap around the wearer's foot. Importantly, the upper **18** material between the bands **20** is stretchable so that the distance between the bands **20** can fluctuate when the user's foot moves within the shoe throughout the gait cycle.

[0040] Preferably the materials that comprise the structural bands **20** tend to conform more precisely to the shape of the

wearer's foot when warmed by body heat. The bands **20** mold to the unique shape of the foot almost immediately after donning the shoe. This results in a more precisely fitting shoe and therefore can increase tactile sensation, stability and comfort level experienced by the wearer.

[0041] The effective number of bands **20** can range from about two to ten. The most effective balance between flexibility, control, breathability and performance is about six. Other variations may work equally well or better for particular sport applications. For example, a general purpose shoe variation of the present invention may have about six bands **20** where a versions more tailored to rock climbing may have about eight to ten bands **20** for additional support.

[0042] Typically, the most forward band **20**, near the toe **14** end of the upper **18** is the shortest from end to end as it spans over the forward metatarsals of the foot. The substantially parallel bands **20** become successively longer as they conform to the anatomy of the foot. The longest band **20** is the most dorsal and may arch from the medial heel **16** edge of the intersection between the upper **18** and the sole assembly **40**, over the superior edge of the upper, ventral to the collar **22** and terminating in the outside lateral edge of the intersection between the upper **18** and sole assembly **40**.

[0043] Without the presence of the bands **20**, the shoe is permitted to flex in all directions in an uncontrolled manner. Other problems, such as the tendency of the foot to deviate from a centered position over the sole assembly **50**, have also been found to occur. The bands **20** perform as a cage to restrain the foot over the sole assembly while retaining the foot's ability to naturally flex throughout the gait cycle in a barefoot specific motion.

[0044] In a preferred variation, the bands **20** are fabricated from a flexible and durable material that has less stretchability than the balance of the upper **18**. Urethane or polyurethane polymers have been found to be effective. However, it should be understood that many other materials that are flexible and have limited stretch characteristics could be effective material for the bands **20**. Other examples may include, by way of example only, leather, plastics, rubber, meshes or fabrics.

[0045] As demonstrated more clearly in FIG. 3, the sole assembly **40** is also an important component of the invention as a whole and is shown to include, inter alia, a tread **42**, a tread **44**, a tread **46**, optionally a split **48**, a sole **50** and a roll **52**. The sole assembly **40** is the foot's barrier from the ground and prevents or reduces unwanted abrasion and laceration to the bottom of the foot.

[0046] The preferred material for the sole **50** is durable and flexible. It has been determined that ethylene vinyl acetate (EVA) is a suitable material. Alternatives, such as, in combination or individually, EVA, leather, some plastics, rubber or vinyl may also be suitable for some applications of the footwear. Other suitable materials, used alone or in conjunction with other materials include, for example, phylons or fabrics coated with particles of any of ground rubber, polytetrafluoroethylene (sometimes marketed under the trade name Teflon), stone, glass or plastic.

[0047] Texture may optionally be integrated into the sole **50**. In the example shown in FIG. 3 treads **42** are present in the heel area on the exterior of the sole. Treads **44** may also be present mid-foot. Treads **46** may also be present on the toe end of the sole assembly **40**. Various designs for the treads **42**, treads **44** and treads **46** that may be suited to a particular activity or application may be equally employed.

[0048] An optional split **48** is also shown on FIG. 3 that separates the big toe from the other toes. This design feature increases toe dexterity for improved grip, natural foot agility and grasp of the foot. For example, a split **48** toe may be preferred for rock climbing applications where the toes are more important for gripping a rock face. FIG. 3 also shows a high-top variation of the upper **18** that expands the upper assembly **12** to cover more of the lower leg of the wearer than the other low-top designs as shown in the example in FIG. 1.

[0049] FIG. 4 shows a version of the footwear in a view as might be seen during the manufacturing process when the footwear is inside out. This fabrication method is commonly referred to as stitch and turn. In other words, the shoe is sewn while inside out and then turned right side out placing the seams on the interior of the shoe. This practice is common for most clothing, such as shirts and pants, where the seams are preferably hidden on the inside. This often creates a problem with footwear because footwear closely holds the foot where seams and stitching can cause uneven surface which can irritate the skin of the wearer.

[0050] The present invention, contrary to the prior art, capitalizes on the problems encountered with typical stitch and turn methods. When the sole assembly **50** is affixed to the upper **18** at seam **30**, a rim **34** results from the small margin of material of the upper **18** and sole **28** outboard of the seam **30**. When the shoe is turned right side out the rim **34** is raised slightly above the plane of the sole **28** about the periphery of the sole **28**. This rim **34** effectively creates a small but significant raised edge that acts to help cup the foot and prevent the foot of the wearer from sliding off the sole **28** during active use of the shoe.

[0051] The collar **22** about the foot aperture is optionally present and provides a cushioned pad about the wearer's ankles. The collar **22** is generally formed of a strip of material, similar in composition to that of the upper **18** that is affixed to the upper **18** by stitching **24**.

[0052] The invention and its several variations can be accurately described as footwear comprised of an upper assembly and a sole assembly where said sole assembly formed of a durable, impermeable and flexible material. The sole assembly has a first sole surface, a second sole surface and a periphery edge further comprised of a lateral edge, a toe edge, a heel edge and a medial edge. Said first sole surface has an integral molded tread pattern to grip the ground. The upper assembly further has an upper and a plurality of structural bands. The upper further has an inside surface, an outside surface and a periphery further comprised of a lateral edge, a toe edge, a heel edge and a medial edge. Importantly the upper is formed of a durable, semi-permeable and stretchable material. Between two and ten structural bands are provided and are formed of a durable, flexible material that is significantly less stretchable than the material forming said upper. The structural bands are permanently affixed to the outside surface of the upper, spanning from the medial edge of said upper to said lateral edge of said upper and each of said structural bands being substantially parallel to each other but allowing for some deviation from parallel. The upper assembly is affixed to the sole assembly by stitch and turn method and therefore has a seam uniting the toe edge of the upper with the toe edge of the sole, the lateral edge of the upper with the lateral edge of the sole, the heel edge of the upper with the heel edge of the sole and the medial edge of the upper with the medial edge of the sole thereby resulting in a margin of material formed of

the upper and sole about said periphery of said sole which forms a raised edge about the periphery of the second sole surface.

[0053] A variation of the above is further characterized in that a split toe is provided between said toe edge of said upper and said toe edge of said sole resulting in a pocket that separates a wearer's big toe from the other toes. This feature can provide improved dexterity.

[0054] The performance characteristics of the shoe can be controlled by constructing the upper with defined stretch characteristics including an upper material that stretches omni-directionally or bi-directionally.

[0055] A high top version is also described that could be further characterized in that said upper assembly is extended about a collar thereby allowing the upper assembly to cover the wearer's ankle.

[0056] The sole can be constructed of any combination of, or individually, ethylene vinyl acetate (EVA), rubber, phylons or fabrics coated with any of ground rubber, Teflon, stone, glass or plastics particles.

[0057] The structural bands can be constructed of any combination of, or individually, urethane, EVA, fabric adhesive paints, elastic fabrics, rubber, plastics or ethelanes.

[0058] The upper can be constructed of any combination of, or individually, elastane, mesh, stretch mesh, leather, neoprene, woven fabric, knit fabric or felt.

[0059] The foregoing description conveys the best understanding of the objectives and advantages of the present invention. Different embodiments may be made of the inventive concept of this invention. It is to be understood that all matter disclosed herein is to be interpreted merely as illustrative, and not in a limiting sense.

What is claimed is:

1. Footwear comprised of an upper assembly and a sole assembly;

Said sole assembly formed of a durable, impermeable and flexible material;

Said sole assembly having a first sole surface, a second sole surface and a periphery edge further comprised of a lateral edge, a toe edge, a heel edge and a medial edge;

Said first sole surface having an integral molded tread pattern;

Said upper assembly further comprising an upper and a plurality of structural bands;

Said upper further having an inside surface, an outside surface and a periphery further comprised of a lateral edge, a toe edge, a heel edge and a medial edge;

Said upper formed of a durable, semi-permeable and stretchable material;

Said structural bands formed of a durable, flexible material that is significantly less stretchable than the material forming said upper;

Said structural bands are permanently affixed to said outside surface of said upper spanning from the medial edge of said upper to said lateral edge of said upper and each of said structural bands being substantially parallel to each other;

Said upper assembly affixed to said sole assembly by stitch and turn method having a seam uniting the toe edge of the upper with the toe edge of the sole, the lateral edge of the upper with the lateral edge of the sole, the heel edge of the upper with the heel edge of the sole and the medial edge of the upper with the medial edge of the sole thereby resulting in a margin of upper and sole about said periphery of said sole which forms a raised edge about the periphery of the second sole surface.

2. Footwear as disclosed in claim 1, further characterized in that a split toe is provided between said toe edge of said upper and said toe edge of said sole resulting in a pocket that separates a wearer's big toe from the other toes.

3. Footwear as disclosed in claim 1, further characterized in that there are between two and ten structural bands.

4. Footwear as disclosed in claim 1, further characterized in that said upper material stretches omni-directionally.

5. Footwear as disclosed in claim 1, further characterized in that said upper material stretches bi-directionally.

6. Footwear as disclosed in claim 1, further characterized in that said upper assembly is extended about a collar thereby allowing the upper assembly to cover the wearer's ankle.

7. Footwear as disclosed in claim 1, further characterized in that said sole is constructed of ethylene vinyl acetate, said structural bands are constructed of a urethane and said upper is constructed of elastane.

8. Footwear as disclosed in claim 1, further characterized in that said sole assembly is constructed from any individual or combination of the group including: rubber, EVA, phylons or fabrics coated with any of ground rubber, Teflon, stone, glass or plastics particles.

9. Footwear as disclosed in claim 1, further characterized in that said upper assembly is constructed from any individual or combination of the group including: mesh, stretch mesh, leather, neoprene, woven fabric, knit fabric or felt.

10. Footwear as disclosed in claim 1, further characterized in that said structural bands are constructed from any individual or combination of the group including: fabric adhesive paints, elastic fabrics, rubber, plastics or ethelanes.

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