MOVEMENT ENHANCING FOOTWEAR

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ABSTRACT

Embodyments of the invention relate to footwear for enhanced movement, comprising a footwear component and one or more reflex layers, in contact with a portion of the footwear component. The one or more reflex layers enhance the movement of the user during normal or athletic use of the footwear.
MOVEMENT ENHANCING FOOTWEAR

TECHNICAL FIELD

[0001] Embodiments of the present invention relate to movement enhancing footwear. More specifically, embodiments relate to one or more reflex layers integrated into footwear that enhance the movement of the user.

BACKGROUND

[0002] Footwear that attempt to enhance the movement of the wearer traditionally have a number of difficulties to overcome. Recreational or medical shoes that have springs or mechanical apparatuses can be bulky and look less aesthetically pleasing than normal shoes. Further, such springs or apparatuses are commonly found towards the heel of the shoes or in a position that is awkward for the user to utilize with natural movements.

BRIEF DESCRIPTION OF THE DRAWINGS

[0003] In the drawings, which are not necessarily drawn to scale, like numerals describe substantially similar components throughout the several views. Like numerals having different letter suffixes represent different instances of substantially similar components. The drawings illustrate generally, by way of example, but not by way of limitation, various embodiments discussed in the present document. For example, a shoe is generally illustrated, but the embodiments describe various footwear applications.

[0004] FIG. 1 illustrates a perspective view of movement enhancing footwear with one or more reflex layers positioned as part of the sole, according to some embodiments.

[0005] FIG. 2 illustrates a perspective view of movement enhancing footwear with one or more reflex layers positioned above the sole, according to some embodiments.

[0006] FIG. 3 illustrates a perspective view of movement enhancing footwear one or more reflex layers as part of a removable attachment, according to some embodiments.

[0007] FIG. 4 illustrates a perspective view of movement enhancing footwear with one or more reflex layers substantially spanning the sole, according to some embodiments.

[0008] FIG. 5 illustrates a perspective view of movement enhancing footwear with one or more reflex layers as part of a removable insole, according to some embodiments.

[0009] FIG. 6 illustrates a cross-sectional view of movement enhancing footwear with one or more reflex layers spanning a portion of the footwear, according to some embodiments.

[0010] FIG. 7 illustrates a cross-sectional view of movement enhancing footwear with one or more reflex layers substantially spanning the footwear, according to some embodiments.

[0011] FIG. 8 illustrates a cross-sectional view of movement enhancing footwear with one or more wide reflex layers and support layer, according to some embodiments.

[0012] FIG. 9 illustrates a cross-sectional view of movement enhancing footwear with one or more narrow reflex layers and support layer, according to some embodiments.

[0013] FIG. 10 illustrates a cross-sectional view of movement enhancing footwear with one or more reflex layers spanning the footwear, according to some embodiments.

SUMMARY

[0014] FIG. 11 illustrates a block flow diagram of a method of making movement enhancing footwear, according to some embodiments.

[0015] Embodiments of the invention relate to footwear for enhanced movement, comprising a footwear component and one or more reflex layers, in contact with a portion of the footwear component. The one or more reflex layers enhance the movement of the user during normal or athletic use of the footwear.

DETAILED DESCRIPTION

[0016] The following detailed description includes references to the accompanying drawings, which form a part of the detailed description. The drawings show, by way of illustration, specific embodiments in which the invention may be practiced. These embodiments, which are also referred to herein as “examples,” are described in enough detail to enable those skilled in the art to practice the invention. The embodiments may be combined, other embodiments may be utilized, or structural, and logical changes may be made without departing from the scope of the present invention. The following detailed description is, therefore, not to be taken in a limiting sense, and the scope of the present invention is defined by the appended claims and their equivalents.

[0017] In this document, the terms “a” or “an” are used to include one or more than one and the term “or” is used to refer to a nonexclusive “or” unless otherwise indicated. In addition, it is to be understood that the phraseology or terminology employed herein, and not otherwise defined, is for the purpose of description only and not of limitation. Furthermore, all publications, patents, and patent documents referred to in this document are incorporated by reference herein in their entirety, as though individually incorporated by reference. In the event of inconsistent usages between this document and those documents so incorporated by reference, the usage in the incorporated reference should be considered supplementary to that of this document; for irreconcilable inconsistencies, the usage in this document controls.

[0018] Embodiments of the invention relate to movement enhancing footwear and or stabilizing the foot and body of the footwear user when stationary (static). One or more reflex layers may be incorporated into the footwear or footwear components or as an attachment or insert into the footwear. Footwear or footwear components may include shoes, sandals, slippers, sneakers, soles or insoles, for example. The one or more reflex layers may be at least partially manufactured of a material or combination of materials that allow the movement of the user to be enhanced while utilizing the footwear, such as by walking, jumping or running. The reflex layer bends as a person uses the footwear and then substantially returns to a starting position with enough force to propel or catapult the person forward, laterally (sideways), vertically or all. The reflex layer may be utilized with the natural biomechanics of a human stride or any body, leg or foot motion to allow for easier use and enhanced performance. The synergistic incorporation of one or more reflex layers positioned at least partially towards the front of the foot allows for the enhanced movement. The reflex layer may be thin and hidden from sight, such that the aesthetics of the footwear are not affected.
[0019] The reflex layer may also be utilized for medical purposes, such as for structural stability of the body and/or foot or for simulating lost digits on the foot or to assist those with trouble in walking or stability for standing up, for example. The reflex layer can be positioned or formed in various ways to provide an enhanced movement to those who may not be able to initiate movement, walk, jump or run as well otherwise.

[0020] Referring to FIG. 1, a perspective view of movement enhancing footwear with one or more reflex layers positioned as part of the sole 100 is shown, according to some embodiments. One or more reflex layers 104 may be integrated into the sole of a footwear component 102. The one or more reflex layers 104 may be integrated into the front portion of the sole of the footwear component 102, for example. The footwear component 102 may include a shoe, sandal, slipper, sneaker, sole, insole or insert, for example.

[0021] The one or more reflex layers 104 may be any material or combination of materials that has sufficient tension and reflex to bend and then return to position with sufficient force to propel a user forward, vertically or both. As a user walks or otherwise utilizes the footwear, the natural movements or biomechanics of the motion may bend the reflex layer 104 without expending much or any extra energy of the user. The natural weight and height of the user combined with a natural or exaggerated leaning and/or bending of the body, legs or feet may utilize the catapult action of the one or more reflex layers 104 to enhance the user's ability to move in a forward direction, lateral direction (sideways), vertical direction or all or to initiate movement, even without the user's intention of lifting their foot. The energy may then be substantially returned by the reflex layer 104 returning to an original position, such as snapping back into place, and propelling or catapulting the user.

[0022] The one or more reflex layers 104 may be manufactured of metal, plastic, rubber, fiber, cloth, composites or laminates, for example. The reflex layer 104 may be manufactured of a metal, such as steel, tempered steel, super tensile steel, carbon steel, alloy steel, sheet steels, metal laminates and titanium, for example. The layer 104 may be made of rigid plastic, carbon fiber, graphite, fiberglass or Kevlar, for example. The reflex layer 104 may be made of a combination of materials, such as a composite or laminate. The reflex layers 104 may be manufactured of thermosetting plastics or thermoplastics, for example.

[0023] Examples of a thermosetting plastic may include alkyd thermoset, disilyl phthalate (DAP, DAIP) thermoset, epoxy thermoset, melamine (MF, MF) thermoset, urea (U) thermoset, phenolic (phenol-formaldehyde) thermoset, polybutadiene (PDS, PBAN) thermoset, polyester (unsaturated, UP) thermoset, silicone (both flexible and rigid) thermoset, combinations thereof and laminates thereof.

[0024] Examples of a thermoplastic may include acrylonitrile-butadiene-styrene (ABS) amorphous thermoplastic, acetal (polyoxymethylene) (POM) semicrystalline thermoplastic, acrylic (polymethylmethacrylate) (PMMA) amorphous thermoplastic, cellulose acetate (CA) semicrystalline thermoplastic, cellulose acetate butyrate (CAB) semicrystalline thermoplastic, cellulose acetate propionate (CAP) semicrystalline thermoplastic, ethyl cellulose (EC) thermoplastic, polyaryly sulfone (PASU) amorphous thermoplastic, polyethylene terephthalate (PET) semicrystalline thermoplastic, polyethylene oxide (PPO) amorphous thermoplastic, polypropylene sulfide (PPS) semicrystalline thermoplastic, polyurethane (PU) amorphous thermoplastic, polyviny acetate (PVAc) semicrystalline thermoplastic, polyvinyl alcohol (PVOH) semicrystalline thermoplastic, polyvinyl carboxale (PVK) semicrystalline thermoplastic, polyvinyl chloride (PVC) semicrystalline thermoplastic, polyvinyl chloride-acetate (PVAc) semicrystalline thermoplastic, polyvinylidene chloride (PVDC) semicrystalline thermoplastic, combinations thereof and laminates thereof.

[0025] The reflex layers 104 may also include plastics, such as fluorocarbons. Fluorocarbons may include tetrafluoroethylene (TFE), fluorinated ethylene propylene (FEP), ethylene-tetrafluoroethylene (ETFE) copolymer, perfluoralkoxy (PFA) resin, chlorotrifluoroethylene (CTFE), ethylene-chlorotrifluoroethylene (E-CTFE) copolymer, vinylidene fluoride (PVDF), polyvinyl fluoride (PVF), combinations thereof and laminates thereof. The layer 104 may be manufactured of a plastic ionomer, such as Nylon (polyamide) (PA) semicrystalline thermoplastic, for example.

[0026] One example may be a reflex layer 104 manufactured of a composite foam including at least one of rubber and a resin, a blowing agent, a polymeric adhesion modifier, a decomposition accelerating agent, and a cross-linking agent. The composite foam may also be made up of at least one of natural rubber and an ethylene-vinyl acetate (EVA) copolymer, azodicarbonamide (AC), maleic anhydride (e.g., FUSA-BOND), dicumyl peroxide, and a combination of zinc oxide and stearic acid, for example. More specifically, the foam composite may be made up of natural rubber present in about 5 wt. % to about 12 wt. % of the foam composite, an ethylene-vinyl acetate (EVA) copolymer present in about 79 wt. % to about 83 wt. % of the foam composite, azodicarbonamide (AC) present in about 3 wt. % to about 4.2 wt. % of the foam composite, maleic anhydride (e.g., FUSA-BOND) present in about 2.8 wt. % to about 3.9 wt. % of the foam composite, dicumyl peroxide present in about 0.5 wt. % to about 0.9 wt. % of the foam composite and a combination of zinc oxide and stearic acid may be present in about 0.5 wt. % to about 1.25 wt. % of the foam composite.

[0027] Further examples of materials that may be used as a reflex layer 104 are discussed in Koffler, et. al., U.S. Pat. No. 6,818,676, entitled “FOAM CUSHION AND METHOD OF MAKING AND USING THE SAME,” filed Feb 1, 2002, the disclosure of which is incorporated herein by reference in its entirety.

[0028] The one or more reflex layers 104 may be flat or may be curved in any direction or in any non-flat shape. For example, the reflex layer 104 may be curved in a “U” shape, in any of four directions relative to the user. The reflex layer 104 may be cylindrical, such as in the shape of one or more wires. The wires may run the direction of the length of the footwear or may run in the direction of the width of the
footwear or in other directions, for example. The reflex layer 104 may be "V" shaped or a series of unconnected strips or wires, for example.

[0029] Referring to FIG. 2, a perspective view of movement enhancing footwear with the one or more reflex layers positioned above the sole 200 is shown, according to some embodiments. One or more reflex layers 204 may be positioned above the sole 200 of a footwear component 102. The one or more reflex layers 204 may also be integrated into the insole of the footwear, above the sole 206, for example.

[0030] Referring to FIG. 3, a perspective view of movement enhancing footwear with one or more reflex layers as part of a removable attachment 300 is shown, according to some embodiments. One or more reflex layers 302 may be part of an attachment 306 to the footwear component 102. The attachment 306 may also include an optional support layer 304 that may be integrated with the reflex layer 302. The attachment 306 may be removable or may be permanently attached. If permanently attached, the attachment 306 may be adhered to the footwear component 102, such as by gluing, for example. If removable, the attachment 306 may be in contact with the footwear component 102 by clips, fittings or straps, for example.

[0031] Referring to FIG. 4, a perspective view of movement enhancing footwear with one or more reflex layers substantially spanning the sole 400 is shown, according to some embodiments. One or more reflex layers 402 may be incorporated into the entire sole of the footwear, such as in manufacturing of the footwear component 102. The reflex layer 402 may make up the entire sole or span the entire length and breadth of the sole, for example.

[0032] Referring to FIG. 5, a perspective view of movement enhancing footwear with one or more reflex layers as part of a removable insole 500 is shown, according to some embodiments. One or more reflex layers 504 may be integrated into an insert or insole 502. A support layer 506 may be in contact with the reflex layer 504. The insole 502 may be removable. The support layer 506 may be optional, as the reflex layer 504 may make up the entire insole 502.

[0033] Referring to FIG. 6, a cross-sectional view of movement enhancing footwear with one or more reflex layers spanning a portion of the footwear 600 is shown, according to some embodiments. One or more reflex layers 604 may be positioned near the ball of the foot, such as substantially covering the ball of the foot in a footwear component 602, for example. The reflex layer 604 may span about 1% to about 100% the width of the footwear, about 20% to about 80% the width of the footwear or about 40% to about 60% the width of the footwear, for example. The reflex layer 604 may span less than about 10%, less than about 30%, or less than about 50% the width, for example. The reflex layer 604 may cover about 50%, about 70%, or about 90%, or about 100% the width of the footwear. The reflex layer 604 may also span less than about 10% of the width of the footwear, such as in a wire form factor or wire-like reflex components (non-metallic, for example). A wire-like reflex component or wire may be cylindrical or flat strips, for example. The reflex layer 604 may also span substantially horizontally across the width of the footwear, such as one or more wires horizontal across the foot for enhanced left and right movements. The one or more reflex layers 604 may be irregularly shaped and span directions other than with the width or length of the footwear. One example may be a "V" shape, that lies planar to the sole of the shoe. The reflex layers 604 may be unconnected, stacked, overlapping, parallel, in series or lined in rows for example.

[0034] Referring to FIG. 7, a cross-sectional view of movement enhancing footwear with one or more reflex layers substantially spanning the footwear 700 is shown, according to some embodiments. One or more reflex layers 702 may substantially run the length of a footwear component 602. The reflex layer 702 may span about 20%, about 40%, about 60%, about 80% or about 100% the length of the footwear. The reflex layer 702 may span about 1% to about 100% the length, for example. The reflex layer 702 may also span less than about 20% or less than about 10% the length of the footwear, for example.

[0035] Referring to FIG. 8, a cross-sectional view of movement enhancing footwear with one or more wide reflex layers and support layer 800 is shown, according to some embodiments. One or more reflex layers 804 may be in contact with a support layer 802 that substantially spans the width of a footwear component 602. The reflex layer 804 may be positioned closer to the ball of the foot than the support layer 802. The support layer 802 may be manufactured of many types of material to support the positioning of the reflex layer 804, the comfort of the reflex layer or both. The support layer 802 may be manufactured of metal, plastic, cloth, rubber, etc.

[0037] Referring to FIG. 9, a cross-sectional view of movement enhancing footwear with one or more narrow reflex layers and support layer 900 is shown, according to some embodiments. One or more reflex layers 904 and support layer 902 may make up a narrow strip the runs near the middle of a footwear component 602. The reflex layer 804 may be positioned closer to the ball of the foot than the support layer 802.

[0038] Referring to FIG. 10, a cross-sectional view of movement enhancing footwear with one or more reflex layers spanning the footwear 1000 is shown, according to some embodiments. A reflex layer 1002 may substantially to wholly span the length and width of a footwear, such as when integrated into the sole or insole of a footwear.

[0039] Referring to FIG. 11, a block flow diagram of a method of making movement enhancing footwear 1100 is shown, according to some embodiments. Footwear may be formed 1102. One or more reflex layers may be contacted 1104 with the footwear. The contacting 1104 may occur during forming 1102 or simultaneously, for example. If simultaneous, the one or more reflex layers may be the footwear, for example. Forming 1102 may include any typical manufacturing process to provide footwear or a footwear component, such as a shoe. Contacting 1104 may include adhering, attaching or clipping, for example.

[0040] The Abstract is provided to comply with 37 C.F.R. §1.72(b) to allow the reader to quickly ascertain the nature and gist of the technical disclosure. The Abstract is submitted with the understanding that it will not be used to interpret or limit the scope or meaning of the claims.

What is claimed is:
1. Footwear for enhanced movement, comprising:
   a. a footwear component; and
   b. one or more reflex layers, in contact with a portion of the footwear component;

   wherein the one or more reflex layer enhance the movement of the user during normal or athletic use of the footwear.
2. The footwear of claim 1, wherein the footwear component comprises a shoe, sandal, slipper, sneaker, sole, insole or insert.

3. The footwear of claim 1, wherein the one or more reflex layers comprise one or more layers integrated into the sole of the footwear component.

4. The footwear of claim 1, wherein the one or more reflex layers comprise one or more layers integrated above the sole of the footwear.

5. The footwear of claim 1, wherein the one or more reflex layers comprises steel, tempered steel, super tensile steel, carbon steel, alloy steel, sheet steels, metal laminates and titanium.

6. The footwear of claim 1, wherein the one or more reflex layers comprise plastic.

7. The footwear of claim 1, wherein the one or more reflex layers comprise a thermosetting plastic.

8. The footwear of claim 7, wherein the thermosetting plastic comprises alkyd thermoset, diallyl phthalate (DAP, DAIP) thermoset, epoxy thermoset, melamine (MF, MFEP thermoset, urea (UF) thermoset, phenolic (phenol-formaldehyde) thermoset, polybutadiene (PBS, PBAN) thermoset, polyester (ununsaturated, UP) thermoset, silicone (both flexible and rigid) thermoset, combinations thereof and laminates thereof.

9. The footwear of claim 1, wherein the one or more reflex layers comprise a thermoplastic.

10. The footwear of claim 9, wherein the thermoplastic comprises acrylonitrile-butadiene-styrene (ABS) amorphous thermoplastic, acetal (polyoxymethylene) (POM) semicrystalline thermoplastic, acrylic (polymethylmethacrylate) (PMMA) amorphous thermoplastic, cellulose acetate (CA) semicrystalline thermoplastic, cellulose acetate butyrate (CAB) semicrystalline thermoplastic, cellulose acetate propionate (CAP) semicrystalline thermoplastic, ethyl cellulose (EC) semicrystalline thermoplastic, polystyrene (PSU) amorphous thermoplastic, polycarbonate (PC) amorphous thermoplastic, polybutylene terephthalate (PBT) semicrystalline thermoplastic, polyethylene terephthalate (PET) semicrystalline thermoplastic, polyethersulfone (PES) amorphous thermoplastic, polyethylene (PE) semicrystalline thermoplastic, polypropylene (PP) semicrystalline thermoplastic, polyallomer (PAL) semicrystalline thermoplastic, polyamide (PA) amorphous thermoplastic, polyamide-imide (PAI) amorphous thermoplastic, poly(ethylene-polypropylene) (PEP) semicrystalline thermoplastic, polyphenylene oxide (PPO) amorphous thermoplastic, polyphenylene sulfide (PPS) semicrystalline thermoplastic, polystyrene (PS) amorphous thermoplastic, polysulfone (PSU) amorphous thermoplastic, polyvinyl acetate (PVAC) semicrystalline thermoplastic, polyvinyl alcohol (PVOH) semicrystalline thermoplastic, polyvinyl carbazole (PVCL) semicrystalline thermoplastic, polyvinyl chloride (PVC) semicrystalline thermoplastic, polyvinyl chloride-acetate (PVAC) semicrystalline thermoplastic, polyvinylidene chloride (PVDC) semicrystalline thermoplastic, combinations thereof and laminates thereof.

11. The footwear of claim 1, wherein the one or more reflex layers comprise a fluorocarbon.

12. The footwear of claim 11, wherein the fluorocarbon comprises tetrafluoroethylene (TFE), fluorinated ethylene propylene (FEP), ethylene-tetrafluoroethylene (ETFE) copolymer, perfluoroalkoxy (PFA) resin, chlorotrifluoroethylene (CTFE), ethylene-chlorotrifluoroethylene (E-CTFE) copolymer, vinylidene fluoride (PVDF), polyvinyl fluoride (PVF), combinations thereof and laminates thereof.

13. The footwear of claim 1, wherein the one or more reflex layers comprise a composite material.

14. The footwear of claim 1, wherein the one or more reflex layers comprise carbon fiber, graphite, fiberglass, Kevlar, combinations thereof or laminates thereof.

15. The footwear of claim 1, wherein the one or more reflex layers comprise at least one of rubber and a resin, a blowing agent, a polymeric adhesion modifier, a decomposition accelerating agent, and a cross-linking agent.

16. The footwear of claim 1, wherein the one or more reflex layers comprise at least one of natural rubber and an ethylene-vinyl acetate (EVA) copolymer, azodicarbonamide (AC), maleic anhydride, dicumyl peroxide, and a combination of zinc oxide and stearic acid.

17. The footwear of claim 1, wherein the one or more reflex layers comprise a foam composite.

18. The footwear of claim 17, wherein the foam composite comprises natural rubber present in about 5 wt. % to about 12 wt. % of the foam composite; an ethylene-vinyl acetate (EVA) copolymer present in about 79 wt. % to about 83 wt. % of the foam composite; azodicarbonamide (AC) present in about 3 wt. % to about 4.2 wt. % of the foam composite; maleic anhydride present in about 2.8 wt. % to about 3.9 wt. % of the foam composite; dicumyl peroxide present in about 0.5 wt. % to about 0.9 wt. % of the foam composite; and a combination of zinc oxide and stearic acid; wherein the zinc oxide may be present in about 1.0 wt. % to about 2.2 wt. % of the foam composite and the stearic acid may be present in about 0.5 wt. % to about 1.25 wt. % of the foam composite.

19. The footwear of claim 1, wherein the one or more reflex layers comprise about 1% to about 100% of the width of the footwear.

20. The footwear of claim 1, wherein the one or more reflex layers comprise one or more wires or wire-like reflex components.

21. The footwear of claim 20, wherein the one or more wires or wire-like reflex components are positioned along the length of the footwear.

22. The footwear of claim 20, wherein the one or more wires or wire-like reflex components are positioned along the width of the footwear.

23. The footwear of claim 1, wherein the one or more reflex layers are curved.

24. The footwear of claim 1, wherein the one or more reflex layers are non-flat in shape.

25. The footwear of claim 1, wherein the one or more reflex layers are unconnected from each other.

26. The footwear of claim 1, wherein the one or more reflex layers are overlapping.

27. The footwear of claim 1, wherein the one or more reflex layers are in the same plane.

28. The footwear of claim 1, wherein the one or more reflex layers are “V” shaped, “U” shaped or curved.

29. The footwear of claim 1, wherein the one or more reflex layers substantially cover the ball of a foot in contact with the footwear.
30. The footwear of claim 1, wherein the one or more reflex layers comprise about 1% to about 100% of the length of the footwear.

31. The footwear of claim 1, wherein the one or more reflex layers are removable from the footwear.

32. The footwear of claim 31, wherein the one or more reflex layers comprise at least a portion of an insole insert.

33. The footwear of claim 31, wherein the one or more reflex layers comprise at least a portion of a sole attachment to the footwear.

34. Footwear for enhanced movement, comprising:
   a footwear component; and
   a reflex layer, in contact with a portion of the footwear, the reflex layer comprising:
   at least one of rubber and a resin;
   a blowing agent;
   a polymeric adhesion modifier;
   a decomposition accelerating agent;
   a cross-linking agent;

35. A method of manufacturing movement enhancing footwear, the method comprising:
   forming footwear; and
   contacting one or more reflex layers.

36. The method of claim 35, wherein the forming and contacting are simultaneous.

37. The method of claim 35, wherein the contacting occurs during the forming.

38. The method of claim 35, wherein contacting comprises adhering.


40. The method of claim 35, wherein contacting comprises clipping.

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