ARTICLES OF FOOTWEAR

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ABSTRACT

A sole assembly for an article of footwear includes a sole assembly, optionally including an outsole and a midsole adjacent outsole. The sole assembly and/or its components can include a heel portion that defines a void. First and second inserts can be located in the void, adjacent one another. The first and second inserts are movable and/or slideable relative to one another. This construction can attenuate vibration and shock imparted to the outsole and subsequently transferred to a wearer of the footwear.
ARTICLES OF FOOTWEAR

TECHNICAL FIELD

This disclosure relates to articles of footwear.

BACKGROUND OF THE INVENTION

In general, most footwear includes an upper and a sole. When the upper is secured to the sole, the upper and the sole together define a void that is configured to securely and comfortably hold a wearer’s foot. Often, the upper and/or sole are/is formed from multiple layers that can be stitched or adhesively bonded together. For example, the upper can be made of a combination of leather and fabric, or foam and fabric, and the sole can be formed from at least one layer of natural rubber. Often, materials are chosen for functional reasons, e.g., water-resistance, durability, abrasion-resistance, and breathability, while shape, texture, and color are used to promote the aesthetic qualities of the shoe.

SUMMARY OF THE INVENTION

In one aspect of the invention, an article of footwear includes a footwear upper and a sole assembly secured to the footwear upper. The sole assembly includes an outsole, a midsole disposed on the outsole, and having a heel portion that defines a void, and first and second inserts disposed in the void. The first insert is attached to the outsole, and the second insert is disposed on top of the first insert in a manner such that the first and second inserts are movable relative to one another.

In another aspect of the invention, a sole assembly for an article of footwear includes an outsole, a midsole disposed on the outsole, and having a heel portion that defines a void, and first and second inserts disposed in the void. The first insert is attached to the outsole, and the second insert is disposed on top of the first insert in a manner such that the first and second inserts are movable relative to one another.

Implementations can include one or more of the following features.

In some implementations, a portion of the second insert extends above (e.g., 1.0 mm to 3.0 mm above) top surfaces of the midsole that are adjacent to the void.

In certain implementations, the second insert is more compliant than the first insert.

In some implementations, the first insert is formed of a material having a durometer of 50 Asher C to 55 Asher C, and the second insert is formed of a material having a durometer of 40 Asher C to 45 Asher C.

In certain implementations, the first and second inserts are more compliant than the midsole.

In some implementations, the midsole includes at least one insert of a polyurethane, ethylene vinyl acetate, and thermo plastic elastomer (TPE).

In certain implementations, the first insert is formed of ethylene vinyl acetate having a durometer of 50 Asher C to 55 Asher C, the second insert is formed of ethylene vinyl acetate having a durometer of 40 Asher C to 45 Asher C, and the midsole is formed of ethylene vinyl acetate having a durometer of 50 Asher C to 55 Asher C.

In some implementations, the first insert is bonded to the outsole.

In certain implementations, the void is sized to accommodate a heel of a wearer of the article of footwear.

In some implementations, the first and second inserts are formed of one or more high rebound materials (e.g., one or more materials having a resilience of optionally 40-70 percent, and further optionally 45-60 percent, as determined by the ASTM D2652 resilience test).

In certain implementations, the article of footwear further includes a footbed having a base that defines a cavity in a heel region of the footbed and an insert disposed in the cavity. The insert is formed of a material having a durometer of 30 Asher C to 35 Asher C (e.g., 33 Asher C).

In certain implementations, the cavity is configured to receive a heel bone of a wearer of the article of footwear.

In certain implementations, the base is formed of a material having a durometer of 35 Asher C to 40 Asher C.

In some implementations, the base is formed of ethylene vinyl acetate.

In certain implementations, the insert is formed of thermoplastic elastomer.

In some implementations, the insert has a thickness of 2 mm to 10 mm (e.g., 4 mm).

These and other objects, advantages, and features of the invention will be more fully understood and appreciated by reference to the description of the current embodiment and the drawings.

Before the embodiments are explained in detail, it is to be understood that the invention is not limited to the details of operation or to the details of construction and the arrangement of the components set forth in the following description or illustrated in the drawings. The invention may be implemented in various other embodiments and of being practiced or being carried out in alternative ways not expressly disclosed herein. Also, it is to be understood that the phraseology and terminology used herein are for the purpose of description and should not be regarded as limiting. The use of “including” and “comprising” and variations thereof is meant to encompass the items listed thereafter and equivalents thereof as well as additional items and equivalents thereof. Further, enumeration may be used in the description of various embodiments. Unless otherwise expressly stated, the use of enumeration should not be construed as limiting the invention to any specific order or number of components. Nor should the use of enumeration be construed as excluding from the scope of the invention any additional steps or components that might be combined with or into the enumerated steps or components.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a boat shoe;
FIG. 2 is an outside view of a sole assembly of the boat shoe of FIG. 1;
FIG. 3 is a bottom view of the sole assembly of the boat shoe of FIG. 1;
FIG. 4 is an inside view of the sole assembly of the boat shoe of FIG. 1;
FIG. 5 is a cross-sectional view of the sole assembly of the boat shoe of FIG. 1, taken along line A-A' in FIG. 3;
FIG. 6 is a top view of the sole assembly of the boat shoe of FIG. 1;
FIG. 7 is a cross-sectional view of the sole assembly of the boat shoe of FIG. 1, taken along line B-B' in FIG. 3;
FIG. 8 is a cross-sectional view of the sole assembly of the boat shoe of FIG. 1, taken along line C-C' in FIG. 3;
FIG. 9 is a cross-sectional view of the sole assembly of the boat shoe of FIG. 1, taken along line D-D' in FIG. 3;
[0032] FIG. 10 is a cross-sectional view of the sole assembly of the boat shoe of FIG. 1, taken along line E-E' in FIG. 3;
[0033] FIG. 11 is a back view of the sole assembly of the boat shoe of FIG. 1;
[0034] FIG. 12 is a perspective view of a testing apparatus for a sole assembly;
[0035] FIG. 13 is a top perspective view of a sole assembly with a testing block placed on the heel portion thereof;
[0036] FIG. 14 is a side view of the shoe of a first alternative embodiment;
[0037] FIG. 15 is a cross-sectional view of the sole assembly of the boat shoe of the first alternative embodiment;
[0038] FIG. 16 is a cross-sectional view of the sole assembly of the boat shoe of the first alternative embodiment of FIG. 15 taken along the lines 16-16;
[0039] FIG. 17 is a cross-sectional view of the sole assembly of the boat shoe of the first alternative embodiment of FIG. 16 taken along the lines 17-17;
[0040] FIG. 18 is a cross-sectional view of the sole assembly of the boat shoe of the first alternative embodiment of FIG. 17 taken along the lines 18-18;
[0041] FIG. 19 is a cross-sectional view of the sole assembly of the boat shoe of the first alternative embodiment of FIG. 18 taken along the lines 19-19;
[0042] FIG. 20 is a cross-sectional view of the sole assembly of the boat shoe of the first alternative embodiment of FIG. 19 taken along the lines 20-20;
[0043] FIG. 21 is a side view of the boat shoe of a second alternative embodiment;
[0044] FIG. 22 is a cross-sectional view of the sole assembly of the boat shoe of the second alternative embodiment;
[0045] FIG. 23 is a cross-sectional view of the sole assembly of the boat shoe of the second alternative embodiment taken along the lines 23-23 of FIG. 21;
[0046] FIG. 24 is a cross-sectional view of the sole assembly of the boat shoe of the second alternative embodiment taken along the lines 24-24 of FIG. 21;
[0047] FIG. 25 is a cross-sectional view of the sole assembly of the boat shoe of the second alternative embodiment taken along the lines 25-25 of FIG. 21;
[0048] FIG. 26 is a cross-sectional view of the sole assembly of the boat shoe of the second alternative embodiment taken along the lines 26-26 of FIG. 21;
[0049] FIG. 27 is a cross-sectional view of the sole assembly of the boat shoe of the second alternative embodiment taken along the lines 27-27 of FIG. 21; and
[0050] FIG. 28 is a cross-sectional view of the sole assembly of a shoe of the third alternative embodiment.

DETAILED DESCRIPTION OF THE CURRENT EMBODIMENTS

[0051] Shock and vibrations experienced while boating, in particular power boating, can cause fatigue and even muscle soreness. A person can experience forces, translated from a power boat deck, several times that of running. A reduction in the shock and vibrations experienced while boating typically enhances the boating experience. The present disclosure describes a sole assembly, and, in some examples, a shoe that reduces the shock and vibrations experienced while boating, thereby likely reducing fatigue and enhancing enjoyment of boating. The sole assemblies and shoes described herein have been found to reduce shock and vibrations more effectively than various running shoes, which many people have chosen to wear in the past while boating.

[0052] Referring to FIG. 1, a shoe 100 includes a shoe upper 110 and a sole assembly 200 secured to the shoe upper 110. Any of various different techniques, including adhesive bonding, thermal bonding, and stitching, can be used to secure the shoe upper 110 to the sole assembly 220. The sole assembly 200, as described below, is constructed in a way to reduce shock and vibrations that are transmitted to a heel bone of the wearer (e.g., by a power boat deck) during use.

[0053] As shown in FIGS. 2-6, the sole assembly 200 has a heel portion 202 and a forefoot portion 204, and includes an outsole 210 that is attached (e.g., adhesively bonded, thermally bonded, and stitched) to a midsole 220. The outsole 210 has a heel portion and a forefoot portion corresponding to the heel portion 202 and the forefoot portion 204 of the sole assembly 200.

[0054] As shown in FIGS. 5, 9, and 10, the midsole 220 forms a void or cavity 120 in which top and bottom shock absorption inserts 122, 124 are positioned. The void 120 is sized to approximately match the expected sized of a wearer’s heel bone. The shock absorption inserts 122, 124 are sized and shaped to closely correspond to the size and shape of the void 120 such that the inserts 122, 124 experience little movement within the void 120 during use. The shock absorption inserts 122, 124 absorb shock and vibrations and thus reduce the stress experienced by the heel of the wearer as a result of forces applied to the sole assembly 200 (e.g., by a power boat deck). The bottom shock absorption insert 124 is attached (e.g., adhesively bonded, thermally bonded or stitched) to the heel region of the outsole 210. The top shock absorption insert 122 is positioned atop the bottom shock absorption insert 124 but is not attached to the bottom shock absorption insert 124. Thus, the top shock absorption insert 122 is free to move relative to the bottom shock absorption insert 124 to some extent.

[0055] When shock and vibrations are applied to the heel portion 202 of the sole assembly 200, those forces and vibrations are in large part absorbed by the shock absorption inserts 122, 124. As a result, ground contact forces directly below the heel are substantially mitigated prior to being transmitted to the heel of the wearer. In this way, the shock absorption inserts 122, 124 reduce a wearer’s exposure to shock and vibrations from a moving surface, such as the deck of a boat. Without wishing to be bound by theory, it is believed that the material selection of the shock absorption inserts 122, 124 and the ability of the shock absorption inserts 122, 124 to move slightly relative to one another enhances the ability of the heel portion 202 of the sole assembly 200 to mitigate forces and vibrations transmitted to the heel of the wearer during use.

[0056] Still referring to FIGS. 5, 9, and 10, the top shock absorption insert 122 is typically formed of ethylene vinyl acetate (EVA) having a durometer of 40 Asker C to 45 Asker C, and the bottom cushioning insert 124 is typically formed of EVA having a durometer of 50 Asker C to 55 Asker C. The midsole 220 is typically formed of EVA having a durometer of 50 Asker C to 55 Asker C.

[0057] The void 120 formed in the midsole 220, as noted above, is sized and shaped to accommodate a wearer’s heel. In an average size adult shoe (e.g., a size 9D shoe), the void 120 has a width of about 40 mm to about 50 mm (e.g., about 45 mm) and a length of about 60 mm to about 70 mm (e.g., about 65 mm). The top and bottom shock absorption inserts 122, 124 are substantially the same size as the void 120 such that the shock absorption inserts 122, 124 can be securely
positioned within the void 120 with limited front-to-back and side-to-side movement relative to the midsole 220.

[0058] The depth of the void and the thicknesses of the shock absorption inserts 122, 124 are dependent on the thickness of the sole assembly to be used for a particular style of shoe. In many implementations, the void 120 has a depth of about 8 mm to about 20 mm (e.g., about 15 mm to about 20 mm), the top shock absorption insert 122 has a thickness of about 2 mm to about 8 mm (e.g., about 4 mm to about 6 mm), and the bottom shock absorption insert 124 has a thickness of about 8 mm to about 16 mm (e.g., about 11 mm to about 13 mm).

[0059] As shown in FIGS. 5, 9, and 10, the top shock absorption insert 122 extends slightly above the void 120 (i.e., slightly above the top surfaces of the midsole 220 that are adjacent to the void 120). The top shock absorption insert 122 can, for example, extend about 1.0 mm to about 3.0 mm (e.g., about 2.0 mm) above the top surfaces of the midsole 220 adjacent to the void 120. The material of the top shock absorption insert 122 tends to compress and lose some of its height or thickness over time. Extending a portion of the top shock absorption insert 122 above the void 120 in the manner described helps to ensure that the top surface of the top shock absorption insert 122 remains at or above the level of the top surface of the midsole 220 over the course of the life of the shoe 100, and thereby helps to ensure that the shock absorption and comfort levels provided by the sole assembly 200 are maintained over the course of the life of the shoe 100.

[0060] The outsole 210 is formed of a material that compliments dampening and shock absorption. The outsole 210 is typically formed of thermoset elastomeric material, such as natural rubber. In some implementations, the outsole 210 is formed of a rubber compound including isobutylene rubber, butadiene rubber, styrene butadiene rubber and/or natural rubber, which exhibits a balance of traction and shock absorbing characteristics. The outsole 210 can have a durometer of 40 Shore A to 70 Shore A (e.g., 50 Shore A). The outsole 210, as shown in FIG. 3, has a bottom surface that has siped or molded-siped regions 218. The siped or molded-siped bottom surface provides traction on wet surfaces, such as boat decks.

[0061] In some implementations, the shoe 100 includes a removable footbed (not shown). The footbed includes a base that is formed of EVA having a durometer of 35 Asher C to 40 Asher C and defines a cavity in its heel region. The cavity of the footbed, like the cavity 120 of the midsole 220 on which the footbed sits, is typically sized and shaped to accommodate or receive a wearer's heel bone. The insert is typically formed of thermoplastic elastomer (TPE) having a durometer of 30 Asher C to 35 Asher C (e.g., 33 Asher C) and a thickness of 2 mm to 10 mm (e.g., about 4 mm). It has been found that using a footbed of this type in combination with the sole assembly 200 enhances the shock absorbing capabilities of the shoe 100.

[0062] While standing on a moving surface (e.g., boat deck), a person’s ability to press his/her toes downwardly against the surface affects that person’s stability on the moving surface. In some implementations, the shoe 100 includes a toe box portion configured to allow a user to easily press one or more of his/her toes downwardly against a supporting surface. The shoe 100 defines a toe spring of 1 mm to 20 mm (e.g., 15 mm) to bring the toes of a user within close proximity of the supporting surface and prevent forward rocking exhibited by shoes with greater toe springs (e.g., as with typical running shoes). As a result, this toe spring is not a mere cosmetic design choice, but instead, is chosen to provide a specific level of shoe stability suitable for standing on moving surfaces, such as the deck of a boat. Generally, shoe designers select a toe spring that is considered aesthetically pleasing. However, this larger toe spring lends the shoe to forward rocking and increases the distance user must flex his/her toes downwardly to increase stability. An upper portion of the toe box portion is constructed of one or more flexible materials to allow easy flexion of the toe box portion upwardly and downwardly. Again, a user’s ability to easily flex his/her toes downwardly increases stability and prevents rocking.

[0063] The shock and vibration absorption properties of individual materials and/or constructed shoes may be measured using the following testing procedure. Referring to FIGS. 12 and 13, a shaker table 600 is equipped with a base fixture plate 610 having, for example, a diameter of about 30 inches (762 mm) and a thickness of about 2 inches (51 mm) (e.g., made of 50-52 Alumium). A cross bar 620 (e.g., having length of about 348 mm, a width of about 39 mm, and a thickness of about 19.5 mm) defines first and second apertures 622, 624 for receiving respective first and second cross bar rods 626, 628 (e.g., ½ inch (9.5 mm) diameter, 16 course thread) to attach the cross bar 620 to the base fixture plate 610. The sole assembly 200 is placed on the base fixture plate 610. The sole assembly samples to be tested should be conditioned to the humidity and temperature of the testing facility by bringing them to the testing facility at least 24 hours prior to testing.

[0064] In the example shown, right and left sole assemblies 200 are placed on the base fixture plate 610. A heel block 630 (e.g., an aluminum block having a length of about 38 mm, a width of about 38 mm, and a thickness of about 26 mm high) is used to simulate the heel bone and is placed substantially centered on the heel portion 202 of each sole assembly 200 with a rearward edge located a distance D of about 15% an overall length L of the sole assembly 200. A weight 640 (e.g., steel bar having length of 465 mm, width of 100 mm, and height of 50.5 mm and weighing 42 lbs (19 kg)) is placed over the heel block 630 in the heel portion 202 of each sole assembly 200. The cross bar 620 secures the weight 640 in place. Nuts 627, 629 are tightened on the respective threaded cross bar rods 626, 628 to 1 in-lb for shock testing and 10 in-lb for vibration testing. A rubber pad 642 having a thickness of about ½ inch (6.35 mm), a durometer of between about 50 Shore A and about 55 Shore A, a length of 100 mm, and a width of about 39 mm is inserted between cross bar 620 and the weight 640 to deaden any ringing generated there between. A monitor accelerometer 650 is disposed on the weight 640 (e.g., about 1 inch (25.4 mm)) from the cross bar 620, which is centered width-wise on the weight 640. The monitor accelerometer 650 measure shock and vibrations that a supposed user of the sole assembly 200 would experience. A control accelerometer 660 is disposed on the base fixture plate 610 for measuring the actual input shocks and vibrations (in g’s) delivered by the shaker table 600.

[0065] A minimum of 5 test repetitions at least 2 hours apart and on at least 2 different days should be executed to acquire data. In addition, “control samples” should be the first and last tests conducted each day. Control samples are a predetermined group of items, generally selected towards the beginning of the project (3-5 samples is reasonable). Often, these “controls” are the project benchmarks, most relevant items, or the best performing sample(s) (can be shoes, materials, or
assembled parts). Check that “control” results are similar through the course of day and from one day to the next.

Shock testing includes performing sine shock pulses on the shaker table 600 as follows (all with 10 ms durations): 1 g pulse, then re-torque the nuts 627, 629; 3 g pulse, then re-torque the nuts 627, 629; and 5 g pulse, then re-torque the nuts 627, 629. Vibration testing includes performing a half-sine sweep 5-200 Hz at 0.5 g/s at 1 octave per minute on the shaker table 600. Signals of the monitor accelerometer 650 and the control accelerometer 660 are recorded during execution of the testing.

Table 1 below provides summary of shock testing results across a number of shoes, including the shoe 100 (referred to as “ASV Production” in the table) and a number of shoes without the shock absorbing inserts described herein. While shock testing with a sine shock pulse at 1 g, the shoe 100 (ASV) provided a 27% reduction in the shock wave transmitted to a user’s heel relative to wearing no shoe, while shoes without the shock absorbing inserts described herein provided between an 21% reduction and a 36% amplification of the shock wave. While shock testing with a sine shock pulse at 3 g/s, the shoe 100 (ASV) provided a 41% reduction in the shock wave transmitted to a user’s heel relative to wearing no shoe, while shoes without the shock absorbing inserts described herein provided between a 38% reduction and a 49% amplification of the shock wave. While shock testing with a sine shock pulse at 5 g/s, the shoe 100 (ASV) provided a 45% reduction in the shock wave transmitted to a user’s heel relative to wearing no shoe, while shoes without the shock absorbing inserts described herein provided between a 41% reduction and a 26% amplification of the shock wave.

Across all of the shoes tested the ASV shoe provided the greatest reduction in shock transmission to a user.

While certain implementations have been described, other implementations are possible.

While the shock absorption inserts 122, 124 have been described as being formed of EVA, other materials can alternatively or additionally be used to effectively dampen shock and vibrations acting on the heel region 202 of the shoe 100. Examples of other materials from which the shock absorption inserts 122, 124 can be formed include polyurethane foam and TPE foam.

It has been found that certain combinations of shock absorption insert materials are particularly effective at absorbing shock and vibrations acting on the heel portion 202 of the sole assembly 200 of the shoe 100. For example, using high rebound materials for the top and bottom inserts 122, 124 can provide desirable results. High rebound materials are materials having a resilience of optionally 40-70 percent, further optionally 45-60 percent, as determined by the ASTM D2632 resilience test. In some implementations, the top shock absorption insert 122 is formed of EVA or TPE having a durometer of 30 Asker C to 35 Asker C (e.g., 33 Asker C) and the bottom shock absorption insert 124 is formed of EVA or TPE having a durometer of 50 Asker C to 55 Asker C.

It is believed that in many cases using high rebound materials to form the top insert 122 and high shock absorbing materials (e.g., materials having a resilience of 20 percent or less, as determined by the ASTM D2632 resilience test) to form the bottom insert 124 can also provide suitable shock and vibration absorption. Alternatively, the top insert and/or bottom inserts can be constructed from specially designated high rebound materials. In certain implementations, for example, the top shock absorption insert 122 is formed of EVA having a durometer of 40 Asker C to 45 Asker C and the bottom shock absorption insert 124 is formed of polyurethane foam having a durometer of 50 Asker C to 55 Asker C. Optionally, the top insert can be constructed with a material having a durometer that is the same as, less than, or more than a durometer of material from which the bottom insert is constructed.

While the midsole 220 has been described as being formed of EVA in certain implementations discussed above, the midsole 220 can alternatively or additionally be constructed of one or more other shock absorbing materials, such as...
as shock absorbing polyurethane. In some implementations, the midsole 220 has a durometer of 40 Ask C to 70 Ask C (e.g., 50 Ask C).

[0074] While the midsole 220 has been illustrated as directly contacting and resting on the outsole 210 in the forefront portion of the sole assembly 200, in some implementations, the forefront portion of the sole assembly 200 includes a forefront cushion layer in a cavity of the midsole 220. The cushion layer can, for example, be disposed in a recess defined in a forefront region of the midsole 220. The forefront cushion layer provides additional shock absorption and cushioning for a user's foot. The forefront cushion layer can be made of polyurethane, (e.g., polyurethane foam), EVA and/or TPE and can have a durometer of 40 Ask C to 70 Ask C (e.g., 50 Ask C).

[0075] While the sole assembly 200 has been described as including two inserts 122, 124 within the cavity 120 defined by the midsole 220, more than two inserts (e.g., three, four, five, or six inserts) can alternatively be used.

[0076] While the footbed has been described as being removable, in certain cases, the footbed may be permanently affixed within the shoe.

[0077] While the insert for the footbed has been described as being formed of TPE, in certain implementations, the footbed insert can be formed of other high rebound materials, such as EVA having a durometer of 40 Ask C to 45 Ask C.

[0078] Although the sole assembly 200 has been shown as being attached to a shoe, it may be used for other types of articles of footwear, including, but not limited to boots, sandals, flip-flops, etc.

[0079] While the footwear have been described as reduce shock and vibrations that are transmitted to the heel of the wearer from the deck of a boat, it should be understood that the footwear described herein can be used to reduce such shock and vibrations from a variety of other moving surfaces, such as construction vehicles, large machinery, etc.

First Alternative Embodiment

[0080] A first alternative embodiment of a boat shoe and sole and its respective sole assembly is illustrated in FIGS. 14-20 and generally designated 300 and 400, respectively. This first alternative embodiment is similar to and can include the same components and properties of the current embodiments noted above with several exceptions. Accordingly, the similar components, properties and characteristics are carried over to the respective shoe and sole assembly of this embodiment.

[0081] The shoe 300 includes a sole assembly 400. The sole assembly can include a midsole 420 jointed with an outsole 310. The midsole 420 and outsole can be constructed from the materials described in connection with the embodiments above, and therefore will not be explained again here. The sole assembly 400 can also include a frame or chassis 470. This chassis 470 can extend generally from the toe toward the heel, stopping short of the first and second inserts 422, 424. The frame can continue, however, rearward of the first and second inserts in the heel portion of the shoe as designated at 472. The forward portion of the frame 470 can include an upper surface 473 and a lower surface 474. The lower surface 474 can be cemented to or directly attached to the rubber outsole 310. The frame can be constructed from EVA, for example in sheet form, and can extend laterally from a medial side to a lateral side of the footwear, generally traversing longitudinal axis LA of the footwear as shown in FIG. 16. The sheet can be optionally 1.5 millimeters to 6 millimeters in thickness, further optionally, 3 millimeters, or other thicknesses as desired. The sheet can be constructed from materials other than EVA, such as other foams or polymers.

[0082] As illustrated in FIG. 15, the rearward portion 472 of the frame 470 includes an upwardly extending wall 476 which transitions to a lower wall or flange 477. The lower flange 477 can be attached to the outsole 310. Optionally, this element is the rearward portion 472 of the frame 470, and can be eliminated in certain applications. As shown, however, it offers additional stability and support in the heel region with the upwardly extending wall 476. This upwardly extending wall of the frame also can extend above one or both of the first insert 422 and second insert 424, if desired.

[0083] As noted above, the sole assembly 400 includes a midsole 320. The midsole can be constructed from the same materials and can be defined in the respective portions of the shoe as noted in connection with the embodiments above. As illustrated in FIGS. 15-20, the midsole 420 generally is continuous, extending from the toe toward the heel portion 402. At or within the heel portion it can define a midsole void or cavity 320 within which the first and second inserts 422, 424, are disposed or otherwise oriented. The midsole void 320 can generally extend longitudinally along the longitudinal axis LA of the midsole 420. It also can extend laterally from medial side of the shoe to the lateral side of the shoe. In this construction, the first and/or second inserts 422, 424 can extend through the void and can be visually perceivable and exposed on the exterior of the shoe so that an observer can view the exterior surfaces 422E of the inserts within the void.

[0084] The midsole, shown in FIG. 20, can define a heel button void 421 in the heel portion. The heel button void 421 can generally be an elongate or oval shape and generally positioned so that it is disposed below the heel bone of a wearer when the wearer wears the footwear. Of course, the heel button can be of another geometric configuration, for example, it could be a simple circular heel button, square, polygonal or other shapes. Generally, the heel button 421 is attached to an integral with the first insert 422 and extends upwardly from an upper surface 422 of the first insert 422. Of course, although not shown, the heel button 421 can be attached to or joined with and integral with the second insert 424. In such a configuration, the heel button can extend through another recess or aperture in the midsole. Optionally, the heel button void can be defined above the midsole and can be generally contiguous with the midsole void, with the heel button extending at least partially through the heel button void.

[0085] As shown in FIGS. 16-20, the midsole 420 and frame 470 extend laterally from a lateral side to a medial side of the sole assembly all the way to the heel portion 402. At that location, the frame can terminate or be interrupted and the midsole can thereafter be discontinuous or form an aperture such as the heel button void 421.

[0086] The sole assembly 300 includes two or more inserts that are disposed generally in the heel portion 402. These inserts can be constructed from the same materials in the same general configurations as those described in the embodiment above. The ability of these inserts to slide or move relative to one another in the heel region contributes to the attenuation of shock and/or vibration transmitted to the outsole 310 of the footwear, thereby impeding or preventing all or a portion of the shock and/or vibration being transmitted to heel or foot of a wearer of the footwear from an underlying surface or deck.
Referring to FIGS. 15 and 20, the first insert 422 is disposed generally adjacent the second insert 424. As described above, the first insert 422 can include a heel button 421. The first insert 422 also can include an upper surface 422U. This upper surface generally transitions to forward and rearward surfaces 422F and 422R. These surfaces can be generally forward and reward from one another along the longitudinal axis L.A of the footwear. Both the forward and rearward surfaces can be located in the heel portion 402. These forward and rearward surfaces generally transition to a lower surface 422L of the first insert 422. This lower surface 422L can be cemented directly to or attached to the outssole 310. Of course in certain constructions, that lower surface 422L can be free from attachment from the outssole and generally floating above and slideable relative to the upper surface 474 of the outssole 310.

The insert can be disposed within the void 320 defined by the midsole 420. Optionally, the respective sidewalls, and front and rear surfaces 422F, 422R can be adhered, cemented, or otherwise permanently affixed to the midsole materials surrounding the void in those locations. Alternatively these sidewalls and/or surfaces can be free floating relative to the midsole 420 and void, depending on the particular application.

The sole assembly 400 also includes a second insert 424. This second insert 424 can be disposed in an insert void 480. This insert void 480 can generally be in the shape and geometric construction of the first insert 424. Optionally, the insert void 480 can include a bottom 480B and one or more sidewalls 480S that transition to the void bottom 480B. The void bottom can be relatively flat, although optionally it can be concave or convex to mirror a shape or configuration of the upper surface 424U of the first insert 424. Of course, this upper surface 424U can be planar, convex, or concave or other geometric shape as desired. Generally when the second insert 424 is disposed within the insert void 480, the sides 424S of the second insert are disposed adjacent and optionally contacting the sides 480S of the void 480.

As shown in FIGS. 15 and 20, the second insert 424 can include the surface 424U, which also can be referred to as a second surface. The first insert can be disposed above at least a portion of the first insert, and can surround the sidewalls 424S of the second insert as illustrated. Further, when the first insert is disposed adjacent the second insert, the second insert is generally within the void 480. The void bottom 480B which also forms a first surface of the first insert, can contact the second surface or upper surface 424U of the second insert 424.

Generally the first surface and the second surface are movable relative to one another. As an example, they can slide, shake or vibrate relative to one another and are generally not connected to one another at the inner face where they contact. Accordingly, vibration imparted into the sole assembly for example through the outssole 310 is impaired or prevented from being transferred to at least one of the first insert and the second insert, and ultimately to the foot of a wearer of the footwear construction. More specifically, the vibration imparted from the outside 310 to the second insert 424 will not entirely be transferred to the first insert 422 due to the movement or sliding of the surface 424U relative to the surface or bottom 480S of the void. In turn, the vibration or shock can be attenuated or prevented from transfer to the heel of the wearer.

Generally the first and second surfaces and/or the first insert and second insert are free from any cement attachment directly to one another. As an example, the first insert and second insert can be free from any cement, adhesive, stitching, gluing or other attachment elements that goes between the void and second insert. As another example, the second insert upper surface 424U and sidewalls 424S can be free of any glue, cement or other attachment to the respective bottom 480B or sidewalls 480S of the void 480. Thus, the first insert and second insert can move at the surfaces relative to one another, for example, in a sliding or shifting manner.

As illustrated in FIGS. 15 and 19, the first insert 422 can include a portion that extends above the second insert and another portion that generally surrounds at least two sides 424S of the second insert 424. Further, the lower surface 424L of the second insert 424 can be disposed adjacent the lower surface 422L of the first insert. The lower surface 422L of the first insert can completely surround the lower surface of the 424L of the second insert. These two surfaces can also be co-planar with one another and can lie generally adjacent one another. Optionally the second insert 424 can be glued, adhered or otherwise fastened to the outssole 310 in certain embodiments. Further, although not shown, the second insert 424 can actually be integral with and form an extension of the outssole 310. In this construction, the respective upper surface and/or sidewalls of that extension of the outssole forming the second insert can generally be free from attachment to the first insert and the respective sidewalls of the void 480. Optionally, the second insert 424 can be completely free-floating within the void 480, and not attached to the outssole or the first insert in any manner, other than being captured within the void 480.

Further, although not shown, the void 320 can be configured in a slightly different way. For example, instead of the shoe 300 including a sole assembly 400 having a midsole, the midsole and/or frame can be eliminated from the construction. These components can be replaced by an extension of the outssole 310 extending into and generally filling the same space as these components. In such a configuration, the sole assembly can generally define the void 320 and the first and second inserts can be disposed therein as described in the above embodiments.

The second insert can be constructed from the same materials as the second insert in the other embodiments above. Further, the inserts can have the respective properties of the embodiments above. As an example, the first insert can be constructed from the first material having a first durometer and the second insert constructed from the second material of a second durometer. The second durometer can be less than that of the first durometer, or vice-versa as noted in the above embodiments.

Second Alternative Embodiment

A second alternative embodiment of a boat shoe and its respective sole assembly is illustrated in FIGS. 21-27 and generally designated 500 and 600, respectively. This second alternative embodiment is similar to and can include the same components and properties of the current embodiments noted above with several exceptions. Accordingly, the similar components and properties and characteristics are carried over to the respective shoe and sole assembly of this embodiment. For example, the shoe 500 can include a sole assembly 600. The sole assembly 600 can include a midsole 620 that defines a midsole void 680. Within the midsole void, first 622 and second 624 inserts can be disposed. These midsole inserts and
sole assembly in general can be constructed from the same materials and include the same constructions as those of the other embodiments above.

[0097] In addition, however, the construction shown in FIGS. 21-27 can include a secondary frame 570 which is different from the frame 470 described above in connection with the first alternative embodiment. Specifically, the secondary frame 570 can be constructed of the same material as the frame 470 described above. The secondary frame 570 however can include a frame aperture or recess 572. This aperture 572 or recess can generally be disposed within the middle portion of the footwear, extending from the lateral side to the medial side about the longitudinal axis LA of the footwear. The aperture can generally enable the midsole 620 to come in direct contact with the outsole 310 while still providing enhanced rigidity and/or structural integrity or strength about the lateral and medial sides of the footwear. Optionally, the secondary frame 570 can terminate generally short of the heel portion 602 of a sole assembly 510.

[0098] The secondary frame 570 can include lower portions 573 and frame sidewalls 575. The lower portions can generally be disposed against and engage or be cemented or otherwise attached to the outsole 510. The lower portions 573 transition to the upstanding sidewalls 575. The sidewalls are embedded within the midsole 620 and dispose a pre-selected distance D3 from the exterior surfaces of the midsole 620; or generally the sole assembly. In this manner, the frame can be completely concealed within the midsole and not visible to a user of the finished footwear construction.

[0099] As shown in FIGS. 22 and 27, the secondary frame 570 can terminate generally short of the heel portion 602 of a sole assembly 510. The heel portion 602 can also include the respective first 622 and second 624 inserts. These inserts can be of the constructions identified above and can be configured similarly and of the same materials. Therefore, they will not be described in further detail here.

Third Alternative Embodiment

[0100] A third alternative embodiment of a boot shoe and its respective sole assembly is illustrated in FIG. 28 and generally designated 700 and 800, respectively. This third alternative embodiment is similar to and can include the same components and properties of the embodiments above with several exceptions. Accordingly, the similar components, properties and characteristics are carried over to the respective shoe and sole assembly of this embodiment.

[0101] For example, the shoe 700 can include a sole assembly 800, which can include a midsole 720 that defines a forefoot midsole void 780 and optionally a heel midsole void 780. The forefoot midsole void 780 can be located in a forefoot region of the shoe, generally forward of the arch of the shoe, and forward of the heel of the shoe. The two voids 780 and 780 can be separately formed in the midsole or sole assembly in general.

[0102] The forefoot midsole void 780 can include first 722 and second 724 inserts respectively. These inserts can be similar or identical to any of the inserts in the embodiments described herein. An optional difference is that the inserts may located in the forefoot of the footwear, where the forefoot midsole void 780 is defined, rather or in addition to being located in the heel of the shoe.

[0103] As illustrated, the forefoot inserts, and corresponding shock and vibration attenuation in the forefoot that they provide, can be complimented with a similar dual insert construction in the heel as illustrated with first 722 and second 724 inserts in the heel midsole void 780. These inserts 722 and 724 in the heel can be similar or identical to the first and second inserts described in any of the embodiments above.

[0104] Optionally, the footwear 700 and sole assembly 800 of the third embodiment as shown in FIG. 28 can include a footbed 790 that extends rearwardly from the heel to the forefoot and/or toe portion of the shoe. The footbed 790 can be constructed from any suitable cushioning material. The footbed 790 can also include first 791 and second 792 anti-shock and vibration pads. These pads can be integrally formed with the sole 790 and can extend downward from an undersurface 795 of the midsole 790. The pads 791 and 792 can be constructed from EVA, TPE and/or polyurethane and can include the same properties and characteristics as the first and/or second inserts as described above.

[0105] The first pad 791 can be located in the forefoot portion of the shoe and generally disposed above the uppermost surface 721 of the midsole 720. The second pad 792 can be located in the heel portion of the footwear. This pad can be disposed above the first 722 and 724 inserts in the midsole heel void 780. If desired, the insert 722 can define a small shallow recess 793 in its top surface into which the second pad 792 can fit.

[0106] Optionally, the footbed 790 can include the insert 722 integrally molded, bonded or otherwise joined therewith. In such a construction, when the footbed 790 is placed within the shoe, the insert 722 fits downwardly and into the heel midsole void 780. In this construction the second pad 792 can be eliminated if desired.

[0107] Directional terms, such as “vertical,” “horizontal,” “top,” “bottom,” “upper,” “lower,” “inner,” “outwardly,” “outer” and “outwardly,” are used to assist in describing the invention based on the orientation of the embodiments shown in the illustrations. The use of directional terms should not be interpreted to limit the invention to any specific orientation(s).

[0108] The above description is that of current embodiments of the invention. Various alterations and changes can be made without departing from the spirit and broader aspects of the invention as defined in the appended claims, which are to be interpreted in accordance with the principles of patent law including the doctrine of equivalents. This disclosure is presented for illustrative purposes and should not be interpreted as an exhaustive description of all embodiments of the invention or to limit the scope of the claims to the specific elements illustrated or described in connection with these embodiments. For example, and without limitation, any individual element(s) of the described invention may be replaced by alternative elements that provide substantially similar functionality or otherwise provide adequate operation. This includes, for example, presently known alternative elements, such as those that might be currently known to one skilled in the art, and alternative elements that may be developed in the future, such as those that one skilled in the art might, upon development, recognize as an alternative. Further, the disclosed embodiments include a plurality of features that are described in concert and that might cooperatively provide a collection of benefits. The present invention is not limited to only those embodiments that include all of these features or that provide all of the stated benefits, except to the extent otherwise expressly set forth in the issued claims. Any reference to claim elements in the singular, for example, using the articles “a,” “an,” “the” or “said,” is not to be construed as
limiting the element to the singular. Any reference to claim elements as “at least one of X, Y and Z” is meant to include any one of X, Y or Z individually, and any combination of X, Y and Z, for example, X, Y; Z; X, Y, Z; and Y, Z.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A footwear construction comprising:
an upper;
an outsole;
a midsole joined with the outsole and located generally above the outsole, the midsole including a heel portion, the heel portion defining a midsole void;
a first insert disposed in the midsole void, the first insert joined with the outsole;
a second insert disposed in the midsole void, the second insert being disposed adjacent and generally contacting the first insert, the first and second inserts being movable relative to one another,

whereby vibration imparted to the outsole and transferred to at least one of the first insert and the second insert is impaired or prevented from being transferred to the other of the first insert and the second insert, and ultimately to a foot of a wearer of the footwear construction.

2. The footwear construction of claim 1 wherein at least one of the first insert and the second insert defines an insert void, wherein the other of the at least one of the first insert and second insert is located at least partially within the insert void.

3. The footwear construction of claim 2 wherein the first insert defines the insert void, wherein the second insert is located in the insert void.

4. The footwear construction of claim 3, wherein the first insert includes a first insert portion located above the second insert, and another portion that generally surrounds at least two sides of the second insert.

5. The footwear construction of claim 1 wherein the first insert includes a lower surface, wherein the lower surface defines an upwardly extending insert void, the insert void bounded by a void bottom located above the lower surface, wherein the second insert is located in the insert void.

6. The footwear construction of claim 5 wherein the insert void includes at least one wall that transitions to the void bottom, wherein the second insert includes a side, wherein the wall is adjacent the side when the second insert is in the insert void.

7. The footwear construction of claim 1 wherein the midsole includes a lateral side defining a lateral side aperture and a medial side defining a medial side aperture, wherein the first insert extends across a width of the heel portion, and is visually exposed within the lateral side aperture and the medial side aperture to a viewer of the footwear construction.

8. A footwear construction comprising:
an upper;
a sole assembly including a heel portion and defining a void substantially only in the heel portion;
a first insert disposed in the void, the first insert including a first surface;
a second insert disposed in the void, the second insert including a second surface, the second insert being disposed adjacent the first insert so that the first surface contacts the second surface, the first surface and second surface slideable relative to one another whereby vibration imparted to the sole assembly is impaired or prevented from being transferred to at least one of the first insert and the second insert and ultimately to a foot of a wearer of the footwear construction.

9. The footwear construction of claim 8 wherein the first insert is disposed generally over the second insert.

10. The footwear construction of claim 8 wherein the first insert defines an insert void having a bottom that forms the first surface, wherein the second insert is disposed in the insert void, wherein the second insert void includes a wall that extends downward from the bottom, the wall surrounding at least a portion of the second insert.

11. The footwear construction of claim 9 wherein the sole assembly includes an outsole, wherein the first insert is secured to an outsole, but the second insert is not attached to the outsole.

12. The footwear construction of claim 11 wherein the sole assembly includes a midsole joined with the outsole, wherein the midsole defines the insert void, wherein the first insert and second insert are stacked on one another in the insert void.

13. The footwear construction of claim 8 wherein the first insert extends laterally across a width of the sole assembly and is visible from a lateral or medial side view of the footwear construction.

14. The footwear construction of claim 8 wherein the first insert is constructed from a first material having a first durometer, wherein the second insert is constructed from a second material having a second durometer that is less than, more than or the same as the first durometer.

15. The footwear construction of claim 14 wherein the first and second inserts are constructed from at least one of ethyl vinyl acetate, TPE and polyurethane.

16. A footwear construction comprising:
an upper;
an outsole;
a midsole joined with the outsole and located generally above the outsole, the midsole including a heel portion, the heel portion defining a midsole void;
a first insert disposed in the midsole void, the first insert including a first surface;
a second insert disposed in the midsole void, the second insert including a second surface, the second insert being disposed adjacent the first insert, so that the first surface contacts the second surface, the first surface and second surface slideable relative to one another whereby vibration imparted to the sole assembly is impaired or prevented from being transferred to at least one of the first insert and the second insert and ultimately to a foot of a wearer of the footwear construction.

17. The footwear construction of claim 16 wherein at least one of the first insert and the second insert defines an insert recess, wherein the other of the at least one first insert and second insert is disposed in the insert recess.

18. The footwear construction of claim 17 wherein the first insert includes a first bottom surface wherein the second insert includes a second bottom surface, wherein the first bottom surface and the second bottom surface lay generally in the same plane.

19. The footwear construction of claim 16 wherein the first insert and second insert are free from any cement attachment directly to one another.

20. The footwear construction of claim 16 wherein the first insert includes a heel button, wherein the midsole defines a
heel button void above and contiguous with the midsole void, wherein the heel button extends at least partially through the heel button void.

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