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**ST LOUIS, MO 63102 (US)**(57) **ABSTRACT**(73) Assignee: **NINE WEST DEVELOPMENT**  
**CORPORATION**, White Plains,  
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A laminated foam sockliner for use in combination with footwear. The sockliner has a forward part generally underlying and supporting toes and metatarsal heads, a middle part generally underlying and supporting an arch, and a back part generally underlying and supporting a heel of the wearer. The sockliner includes a porous upper layer made from a flexible air permeable material. The upper layer provides support for at least a portion of the foot of the wearer including a heel and an arch of the foot. The sockliner also includes a shockfoam layer positioned generally at the back part of the sockliner below the upper layer. A top surface of the shockfoam layer being permanently bonded to at least a portion of a bottom surface of the upper layer underlying the back part of the sockliner. The forward part of the sockliner substantially lacks the shockfoam layer.

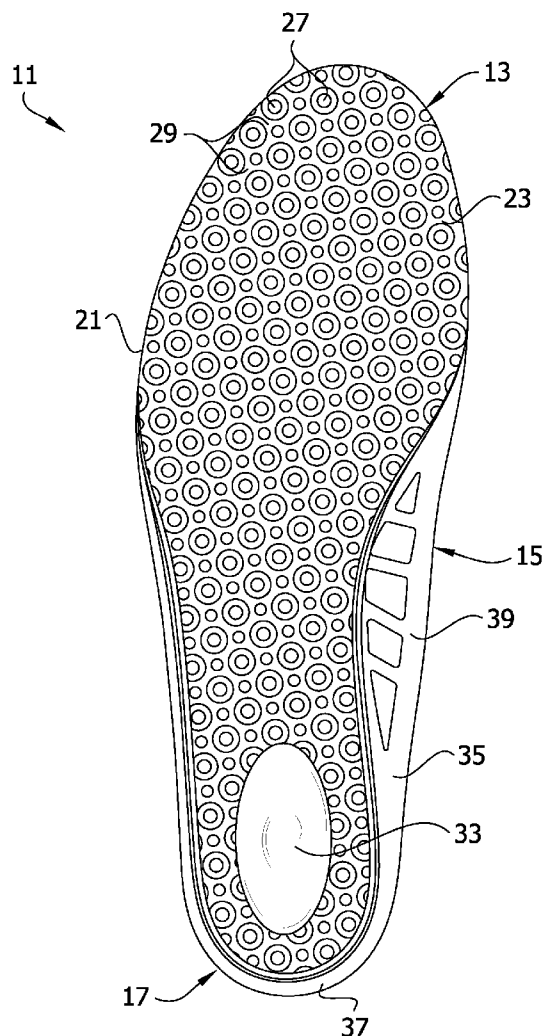


FIG. 1

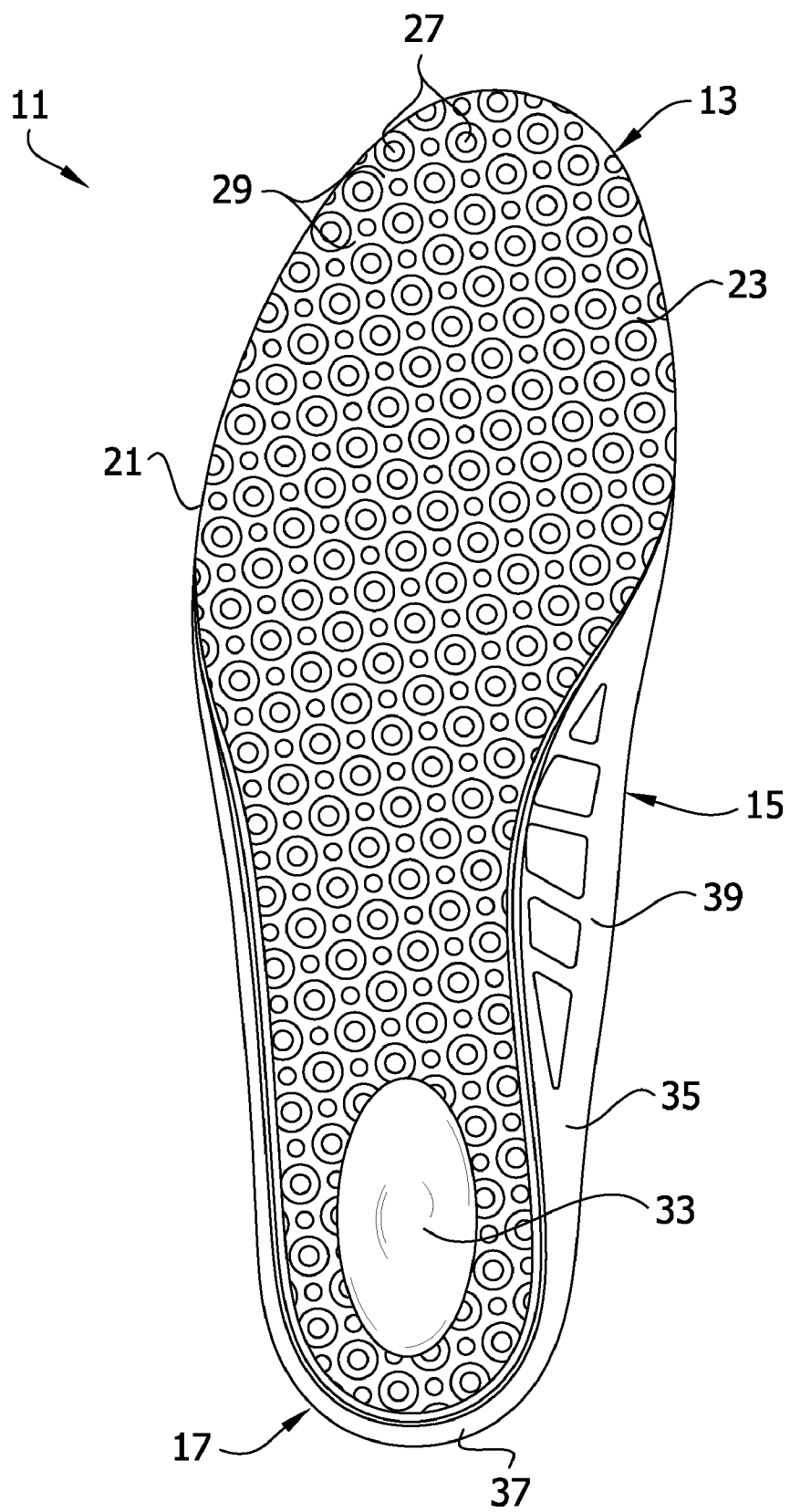
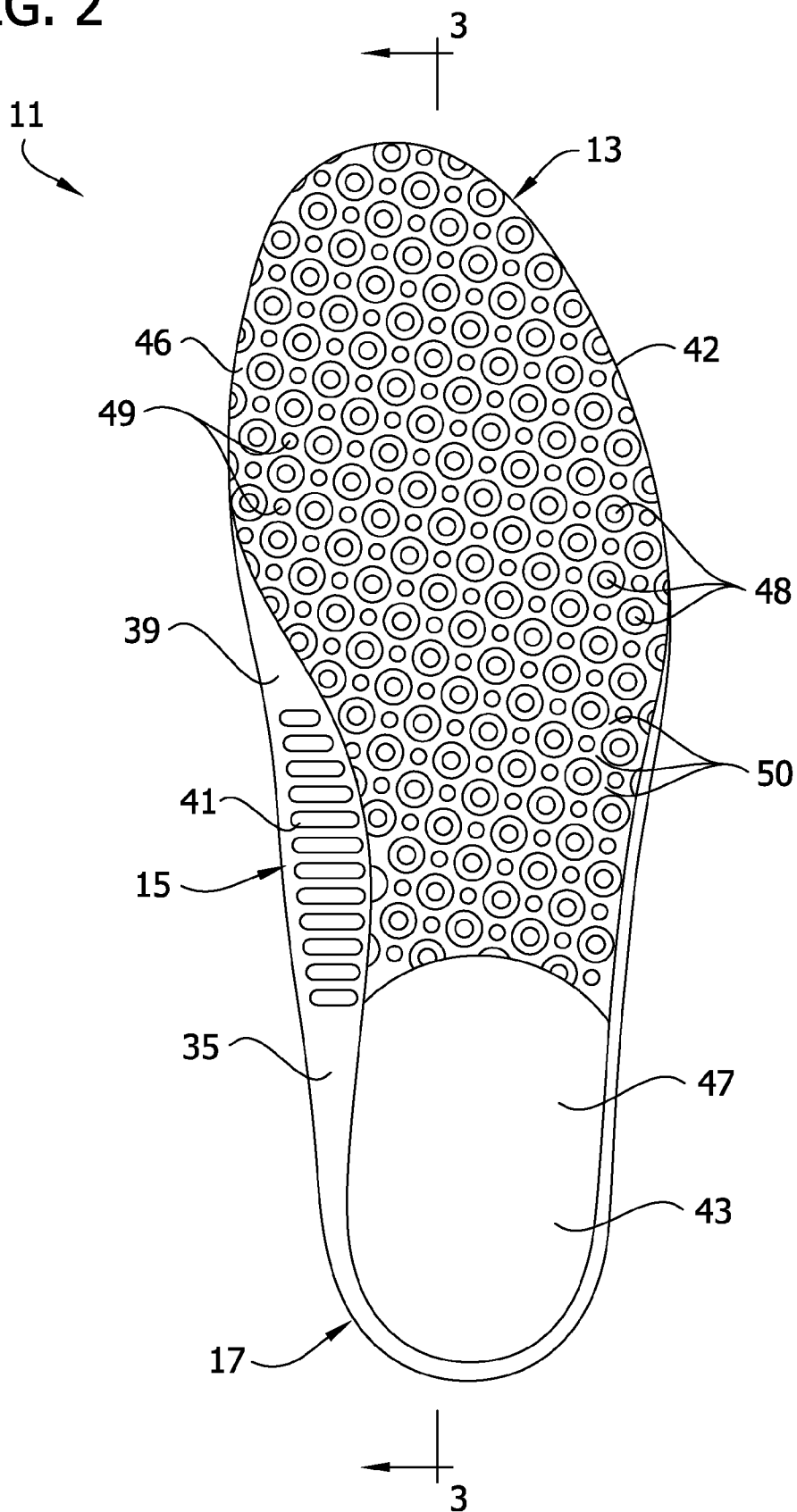


FIG. 2



**FIG. 3**

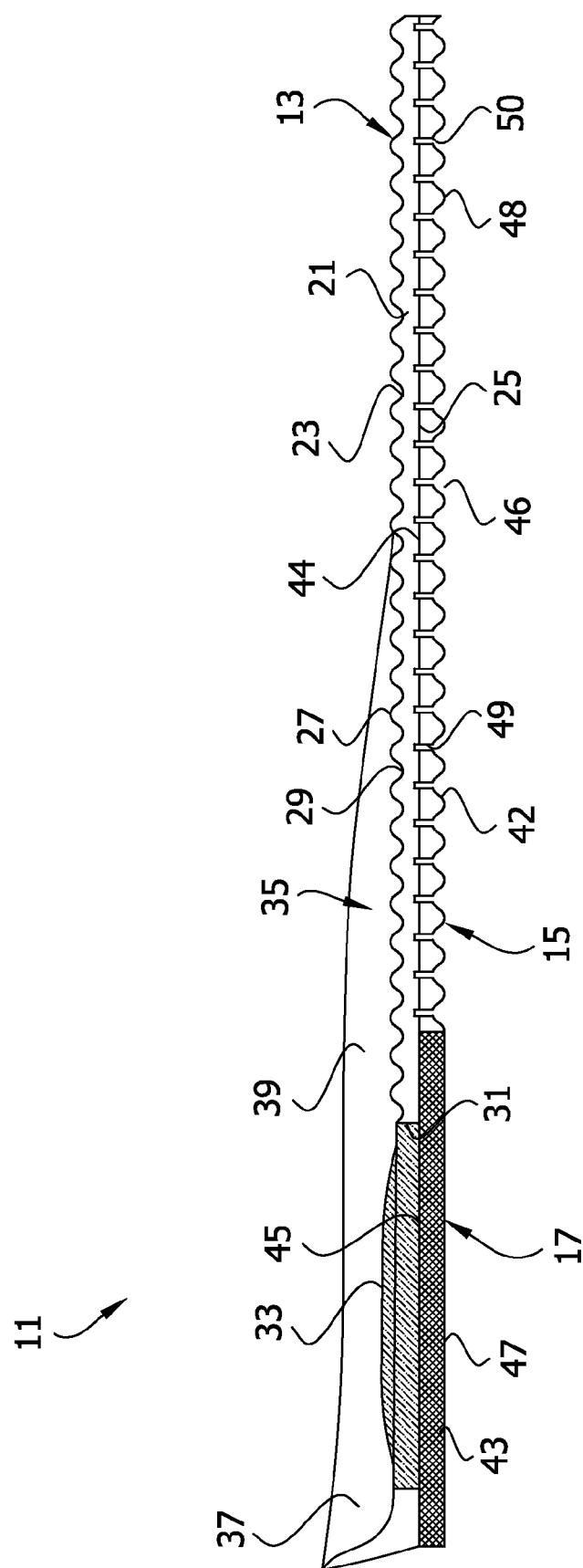
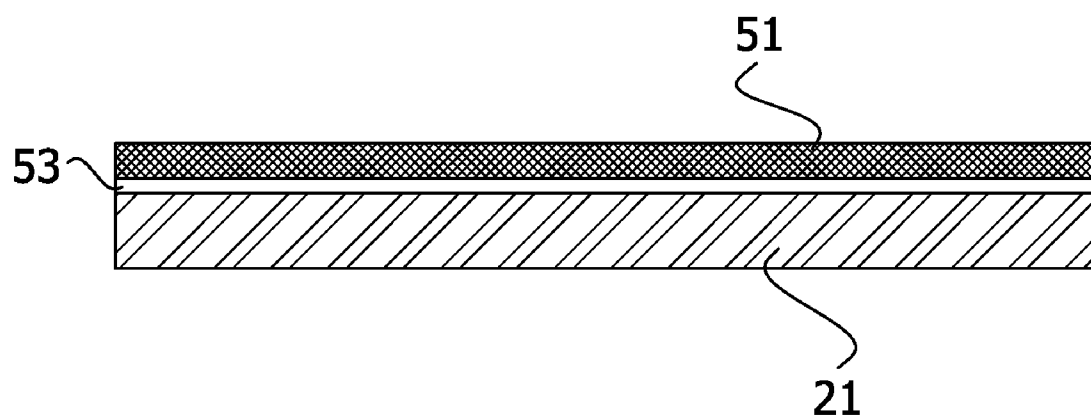


FIG. 4



## SOCKLINER

### FIELD OF THE INVENTION

**[0001]** The present invention generally relates to footwear and more particularly to footwear having a sockliner for cushioning a foot in the footwear.

### BACKGROUND OF THE INVENTION

**[0002]** During walking and running, various portions of the foot impact the ground at different times resulting in certain parts of the foot being subjected to repeated impact forces. For instance, an outside portion of the heel experiences high impact forces during the initial heel strike phase of a gait cycle. These forces can transfer to other parts of the leg including the shins and knees. Over time, injury can result from these forces.

**[0003]** Foam sockliners are used to attenuate impact forces applied to the feet during walking and running. These liners are frequently made using a closed cell polyurethane or EVA (ethylene vinyl acetate) foam in a heel portion of the sockliner due to the ability of these types of foam to attenuate shock. These sockliners help to reduce the forces transferred to the feet. However, closed cell foam has limited durability and degrades over time eventually failing to provide adequate shock absorption.

### SUMMARY OF THE INVENTION

**[0004]** In one aspect, the present invention includes a laminated foam sockliner for use in combination with footwear for cushioning a foot of a wearer of the footwear. The sockliner has a forward part generally underlying and supporting toes and metatarsal heads of a wearer in use, a middle part generally underlying and supporting an arch of the wearer in use, and a back part generally underlying and supporting a heel of the wearer in use. The sockliner comprises a porous upper layer made from a flexible air permeable material. The upper layer has a top surface and a bottom surface opposite the top surface. The upper layer is sized and shaped to be inserted in the footwear and to provide support for at least a portion of the foot of the wearer including a heel and an arch of the foot. The sockliner also comprises a shockfoam layer positioned generally at the back part of the sockliner below the upper layer. The shockfoam layer has a top surface and a bottom surface opposite the top surface. The top surface of the shockfoam layer is permanently bonded to at least a portion of the bottom surface of the upper layer underlying the back part of the sockliner. The forward part of the sockliner substantially lacks the shockfoam layer.

**[0005]** In another aspect, the present invention includes a method of making a laminated foam sockliner for use in combination with footwear for cushioning a foot of a wearer of the footwear. The sockliner has a forward part generally underlying and supporting toes and metatarsal heads of a wearer in use, a middle part generally underlying and supporting an arch of the wearer in use, and a back part generally underlying and supporting a heel of the wearer in use. The method comprises molding an open cell foam upper layer to have a lower surface and an upper surface opposite the lower surface and to be sized and shaped to cover at least a portion of a sole of the footwear to underlie at least a portion of the foot of the wearer including a heel and an arch of the foot. A closed cell foam lower layer is molded to have a lower surface and an upper surface opposite the lower surface. The lower

layer is sized and shaped to cover at least a portion of the foot of a wearer including at least the toes of the foot. The upper surface of the lower layer is bonded to the lower surface of the upper layer. A shockfoam layer is formed to a predetermined size and shape corresponding to a portion of the upper layer included in the back part of the sockliner. The method also includes bonding the shockfoam layer to the lower surface of the upper layer so the shockfoam layer is positioned below a portion of the upper layer and at the back part of the sockliner and not at the forward part of the sockliner.

**[0006]** In still another aspect, the present invention includes a laminated foam sockliner for use in combination with footwear for cushioning a foot of a wearer of the footwear. The sockliner has a forward part generally underlying and supporting toes and metatarsal heads of a wearer in use, a middle part generally underlying and supporting an arch of the wearer in use, and a back part generally underlying and supporting a heel of the wearer in use. The sockliner comprises a porous upper layer having a top surface and a bottom surface opposite the top surface. The upper layer is sized and shaped to be inserted in the footwear and to support at least a portion of the foot of the wearer including a heel and an arch of the foot. Further, the sockliner comprises a closed cell foam lower layer positioned generally at the forward part of the sockliner having a top surface and a bottom surface opposite the top surface. The lower layer is sized and shaped to be inserted into the footwear and to support at least a portion of the foot. The top surface of the lower layer is permanently bonded to the bottom surface of the upper layer. The sockliner also includes a nitrile butadiene rubber compound shockfoam layer positioned generally at the back part of the sockliner. The forward part of the sockliner substantially lacks the shockfoam layer.

**[0007]** Other objects and features will be in part apparent and in part pointed out hereinafter.

### BRIEF DESCRIPTION OF THE DRAWINGS

**[0008]** FIG. 1 is a top plan of a sockliner of the present invention

**[0009]** FIG. 2 is a bottom plan of the sockliner;

**[0010]** FIG. 3 is a cross section of the sockliner taken through a plane including line 3-3 of FIG. 2; and

**[0011]** FIG. 4 is a schematic cross section of a cloth layer bonded to a base layer of the sockliner.

**[0012]** Corresponding reference characters indicate corresponding parts throughout the drawings.

### DESCRIPTION OF THE PREFERRED EMBODIMENTS

**[0013]** Referring to the drawings and in particular FIG. 1, a sockliner or inner sole is designated in its entirety by the reference number 11. The sockliner has a forward part 13 (generally underlying and supporting toes and metatarsal heads of a wearer), a middle part 15 (generally underlying and supporting an arch of the wearer), and a back part 17 (generally underlying and supporting a heel of the wearer). In some embodiments, the sockliner 11 is sized and shaped to be inserted in footwear (not shown) so it rests on a sole of the footwear. The sockliner 11 attenuates shock imparted on a foot in the footwear during running and walking. Although the illustrated sockliner 11 is sized and shaped to underlie the entire area of the foot, other sizes and shapes may be used without departing from the scope of the invention. For

instance, the sockliner 11 may be a “three-quarter length” sockliner sized for extending from a heel of the foot to a position slightly in front of the metatarsal heads of the foot.

[0014] The sockliner 11 includes a porous upper layer 21 made from a flexible, air permeable material such as an open cell polyurethane foam. The upper layer 21 has a top surface 23 and a bottom surface 25 (FIG. 3). In some embodiments, the upper layer 21 is sized and shaped about the same as the entire sockliner 11. In some embodiments, the upper layer 21 is sized and shaped to underlie and support the entire foot in the footwear as previously described. The top surface 23 has a staggered grid of truncated cone-shaped protrusions 27 extending from the top surface. Channels 29 formed between the protrusions 27 permit air circulation under the foot to keep the foot cool and dry. The upper layer 21 includes an opening 31 (FIG. 3) in the back part 17 of the sockliner 11 for receiving a raised pillow 33 for cushioning the heel when the footwear initially impacts the ground. The raised pillow 33 comprises a polyurethane gel having a C-type durometer hardness in a range from about 30 to about 35 and a density in a range from about 1.03 g/cc to about 1.04 g/cc. In some embodiments, the pillow 33 has properties particularly suited for attenuating shock that would otherwise be transmitted from the footwear to a heel of the foot inside the footwear. The pillow 33 also provides a smooth surface for displaying a trademark or other indicia regarding the sockliner 11. A wall, generally designated by 35, extends around the back part 17 of the sockliner 11 forming a heel cup, generally designated by 37, for positioning the heel of the wearer squarely on the sockliner 11 and an arch support 39 for supporting the arch of the wearer.

[0015] Referring to FIG. 2, a closed cell foam lower layer 42 is positioned generally in the forward part 13 and arch area 15 of the sockliner 11. The lower layer 42 has a top surface 44 (FIG. 3) and a bottom surface 46. The lower layer 42 is sized and shaped to be inserted into the footwear and for supporting at least a portion of the foot. The bottom surface 46 has a staggered grid of generally truncated cone-shaped protrusions 48 extending from the bottom surface. Channels 50 formed between the protrusions 48 define a rectilinear grid extending across the bottom surface 46 for circulating air under the foot to keep the foot cool and dry. Openings 49 extend upward into the sockliner 11 between the protrusions 48 at evenly spaced intervals along the rectilinear grid of channels 50 for permitting air to flow through the sockliner 11 from the channels 50 (FIG. 3). The openings 49 permit air to pass through the closed cell foam of the lower layer 42 and into the open cell foam of the upper layer 21 to cool and dry the foot. The channels 50 extend between the openings 49 and the edges of the sockliner 11 for permitting air to flow under the sockliner and through the openings when the bottom surface 46 contacts the sole of the footwear. Ribs 41 may be molded into the wall 35 beneath the arch support 39 to add stiffness to the wall 35 in that area.

[0016] Referring to FIG. 3, the top surface 44 of the lower layer 42 is permanently bonded to the bottom surface 25 of the upper layer 21. In the illustrated embodiment, the lower layer 42 is glued to the upper layer 21. The lower layer 42 has a compressibility sufficient to permit the lower layer to resiliently compress under the foot in response to pressure applied to the lower layer by the foot when the footwear impacts the ground thereby absorbing and cushioning the foot during impact.

[0017] A shockfoam layer 43 is positioned generally in a back portion of the sockliner 11. The shockfoam layer 43 is

positioned under the back part 17 and in some embodiments extends to a rearward portion of the middle part 15 of the sockliner 11. In other embodiments, the shockfoam layer 43 extends at least partially over the middle part 15 of the sockliner 11. The shockfoam layer 43 has a top surface 45 and a bottom surface 47. The top surface 45 is permanently bonded to the bottom surface 25 of the upper layer 21. In the illustrated embodiment, the shockfoam layer 43 is glued to the upper layer 21. The shockfoam material comprises a nitrile butadiene rubber compound having a C-type durometer hardness in a range from about 8 to about 10 and a density in a range from about 0.08 g/cc to about 0.11 g/cc. Although the shockfoam layer 43 may have other thicknesses without departing from the scope of the present invention, in one embodiment, the shockfoam layer has a thickness in a range from about 3 mm to about 4 mm. The shockfoam layer 43 provides the sockliner 11 with decreased weight and very good durability. The shockfoam layer 43 is positioned at the back part 17 of the sockliner 11 where durability is needed and less breathability can be tolerated.

[0018] Although the sockliner 11 may be made by other processes without departing from the scope of the present invention, in one embodiment, the open cell polyurethane foam is cut and molded to form the upper layer 21 and the closed cell polyurethane foam is cut and molded to form the lower layer 42. Next polyurethane gel is poured into the same mold that formed the lower layer 42 to form the raised pillow 33. Lastly, nitrile butadiene rubber is laminated to the upper layer 21, after the upper and lower layers 21, 42 are demolded, to form the shockfoam layer 43 and a substantially complete sockliner 11.

[0019] Referring to FIG. 3, the sockliner 11 rests on a sole of the footwear on the staggered grid of rounded protrusions 48 extending from the bottom surface 46 of the lower layer 42. The channels 50 between the protrusions 48 permit air circulation under the sockliner 11 to keep the foot cool and dry. The portion of the sockliner 11 having the shockfoam layer 43 corresponds to the part of the sockliner subjected to the highest loading during running and walking.

[0020] As illustrated in FIG. 4, a cloth layer 51 is permanently bonded to the top surface 23 of the upper layer 21 with a breathable adhesive 53 in some embodiments. The cloth layer 51 is sized and shaped to correspond with the upper layer 21. Although the cloth layer 51 may be made of other materials without departing from the scope of the present embodiment, in one embodiment the cloth layer is a conventional sockliner covering such as brushed nylon fabric. The cloth layer 51 is permanently bonded to the top surface 23 of the upper layer 21 by the porous adhesive 53 applied between the upper layer and the cloth layer. Because the adhesive 53 is porous, air can pass through the adhesive and flow substantially unimpeded between the upper layer 21 and the cloth layer 51. In the illustrated embodiment, polyurethane cement is used for the adhesive 53. However, other adhesives can be used without departing from the scope of the invention.

[0021] As will be understood by those skilled in the art, although the shockfoam layer 43 has good cushioning properties, it generates heat from repeated compression during walking and running. The upper layer 21 spaces the shockfoam layer 43 from the foot to reduce heat transfer between the shockfoam layer and the foot and to insulate the foot from thermal energy generated by the shockfoam layers. Additionally, the shockfoam layer 43 is positioned at the back portion of the sockliner 11, away from the forward part 13, so

breathability of the sockliner is not compromised in the forward arch and toe areas. The shock foam layer 43 maintains superior cushioning and durability under the heel of the foot where high impact loads are generated.

[0022] In the illustrated embodiments, the sockliner 11 comprises upper layer 21 and lower layer 42 similar to the upper layer and lower layer described in U.S. Pat. No. 6,199,304, entitled, "Sockliner", which is incorporated by reference in its entirety. In other embodiments, the upper and lower layers of the sockliner 11 may have a unitary construction.

[0023] Having described the invention in detail, it will be apparent that modifications and variations are possible without departing from the scope of the invention defined in the appended claims.

[0024] When introducing elements of the present invention or the preferred embodiments(s) thereof, the articles "a", "an", "the", and "said" are intended to mean that there are one or more of the elements. The terms "comprising", "including", and "having" are intended to be inclusive and mean that there may be additional elements other than the listed elements.

[0025] As various changes could be made in the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description and shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. A laminated foam sockliner for use in combination with footwear for cushioning a foot of a wearer of said footwear, the sockliner having a forward part generally underlying and supporting toes and metatarsal heads of a wearer in use, a middle part generally underlying and supporting an arch of the wearer in use, and a back part generally underlying and supporting a heel of the wearer in use, the sockliner comprising:

a porous upper layer made from a flexible air permeable material, said upper layer having a top surface and a bottom surface opposite the top surface, said upper layer being sized and shaped to be inserted in the footwear and to provide support for at least a portion of the foot of the wearer including a heel and an arch of the foot; and

a shockfoam layer positioned generally at the back part of the sockliner below the upper layer, said shockfoam layer having a top surface and a bottom surface opposite the top surface, said top surface of the shockfoam layer being permanently bonded to at least a portion of the bottom surface of the upper layer underlying the back part of the sockliner, and said forward part of the sockliner substantially lacking the shockfoam layer.

2. A sockliner as set forth in claim 1 further comprising a closed cell foam lower layer positioned generally at the forward part of the sockliner and having a top surface and a bottom surface opposite the top surface, said lower layer being sized and shaped to be inserted into the footwear and to provide support for at least a portion of the foot, said top surface of the lower layer being permanently bonded to the bottom surface of the upper layer.

3. A sockliner as set forth in claim 2 wherein said back part of the sockliner entirely lacks the closed cell foam layer.

4. A sockliner as set forth in claim 2 wherein the lower layer includes a channel permitting air pass to cool and dry the foot.

5. A sockliner as set forth in claim 1 wherein at least a portion of the middle part of the sockliner entirely lacks the shockfoam layer.

6. A sockliner as set forth in claim 1 wherein the shockfoam layer comprises a nitrile butadiene rubber compound.

7. A sockliner as set forth in claim 5 wherein the shockfoam layer has a C-type durometer hardness from about 8 to about 10.

8. A sockliner as set forth in claim 6 wherein the shockfoam layer has a density from about 0.08 to about 0.11 g/cc.

9. A sockliner as set forth in claim 5 wherein the shockfoam layer has a density from about 0.08 to about 0.11 g/cc.

10. A sockliner as set forth in claim 1 further comprising a pillow positioned in the back part of the sockliner.

11. A sockliner as set forth in claim 9 wherein said pillow comprises a polyurethane gel positioned in an opening in the upper layer.

12. A sockliner as set forth in claim 10 wherein said pillow has a C-type durometer hardness from about 30 to about 35.

13. A sockliner as set forth in claim 11 wherein the pillow has a density from about 1.03 g/cc to about 1.04 g/cc.

14. A sockliner as set forth in claim 10 wherein the pillow has a density from about 1.03 g/cc to about 1.04 g/cc.

15. A sockliner as set forth in claim 1 wherein the upper layer comprises an open cell polyurethane foam.

16. A sockliner as set forth in claim 1 wherein the upper layer includes a channel permitting air to pass to cool and dry the foot.

17. A sockliner as set forth in claim 1 further comprising a cloth layer bonded to the upper surface of the base layer.

18. A method of making a laminated foam sockliner for use in combination with footwear for cushioning a foot of a wearer of said footwear, the sockliner having a forward part generally underlying and supporting toes and metatarsal heads of a wearer in use, a middle part generally underlying and supporting an arch of the wearer in use, and a back part generally underlying and supporting a heel of the wearer in use, the method comprising:

molding an open cell foam upper layer to have a lower surface and an upper surface opposite said lower surface and to be sized and shaped to cover at least a portion of a sole of the footwear to underlie at least a portion of the foot of the wearer including a heel and an arch of the foot;

molding a closed cell foam lower layer to have a lower surface and an upper surface opposite said lower surface, the lower layer being sized and shaped to cover at least a portion of the foot of a wearer including at least the toes of the foot;

bonding the upper surface of the lower layer to the lower surface of the upper layer;

forming a shockfoam layer to a predetermined size and shape corresponding to a portion of the upper layer included in the back part of the sockliner; and

bonding the shockfoam layer to the lower surface of the upper layer so the shockfoam layer is positioned below a portion of the upper layer and at the back part of the sockliner and not at the forward part of the sockliner.

19. A method as set forth in claim 18 further comprising molding a gel insert into an opening in the upper layer.

20. A laminated foam sockliner for use in combination with footwear for cushioning a foot of a wearer of said footwear, the sockliner having a forward part generally underlying and supporting toes and metatarsal heads of a wearer in use, a middle part generally underlying and supporting an arch of



the wearer in use, and a back part generally underlying and supporting a heel of the wearer in use, the sockliner comprising:

a porous upper layer having a top surface and a bottom surface opposite the top surface, said upper layer being sized and shaped to be inserted in the footwear and to support at least a portion of the foot of the wearer including a heel and an arch of the foot;

a closed cell foam lower layer positioned generally at the forward part of the sockliner and having a top surface and a bottom surface opposite the top surface, said lower layer being sized and shaped to be inserted into the footwear and to support at least a portion of the foot, said

top surface of the lower layer being permanently bonded to the bottom surface of the upper layer; and  
a nitrile butadiene rubber compound shockfoam layer positioned generally at the back part of the sockliner, said forward part of the sockliner substantially lacking the shockfoam layer.

**21.** A sockliner as set forth in claim **20** wherein the shockfoam layer has a C-type durometer hardness from about 8 to about 10 and a density from about 0.08 to about 0.11 g/cc.

**22.** A sockliner as set forth in claim **21** further comprising a pillow positioned in the back part of the sockliner having a C-type durometer hardness from about 30 to about 35 and a density from about 1.03 g/cc to about 1.04 g/cc.

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