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(54) **SHOE SOLE**

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(76) Inventor: **Wei Li**, San Francisco, CA (US)

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Correspondence Address:

**INTELLECTUAL PROPERTY LAW GROUP
LLP**

**12 SOUTH FIRST STREET
SUITE 1205
SAN JOSE, CA 95113 (US)**

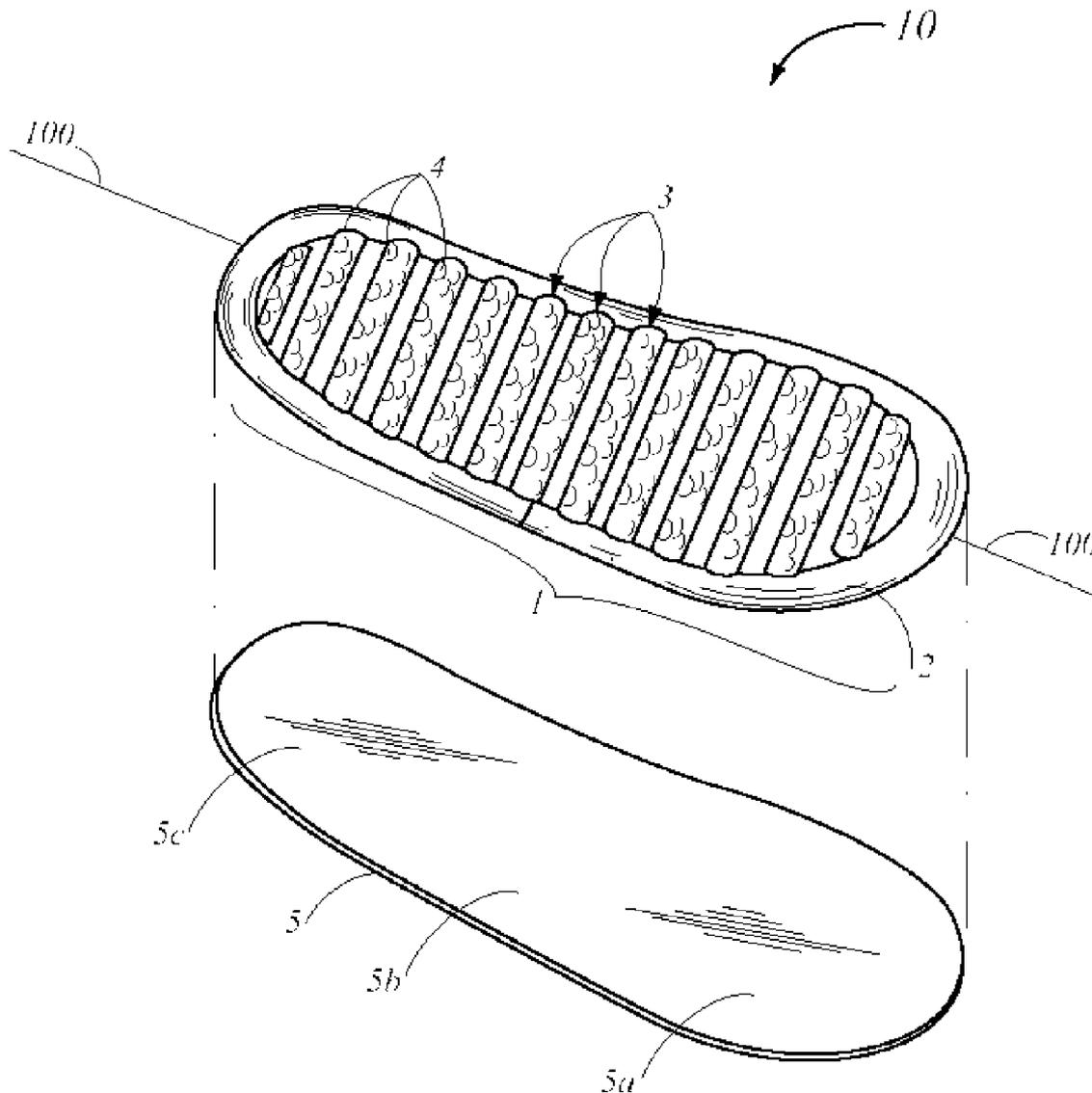
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ABSTRACT

A midsole for an article of footwear comprising a bottom member and a cushioning member. The cushioning member comprising a perimeter element and a central lining element, is lined on top of the bottom member. The midsole is fashioned to provide increased support and improved aeration for the user's foot. The midsole may be easily adapted for use in a wide variety of women's and men's footwear.

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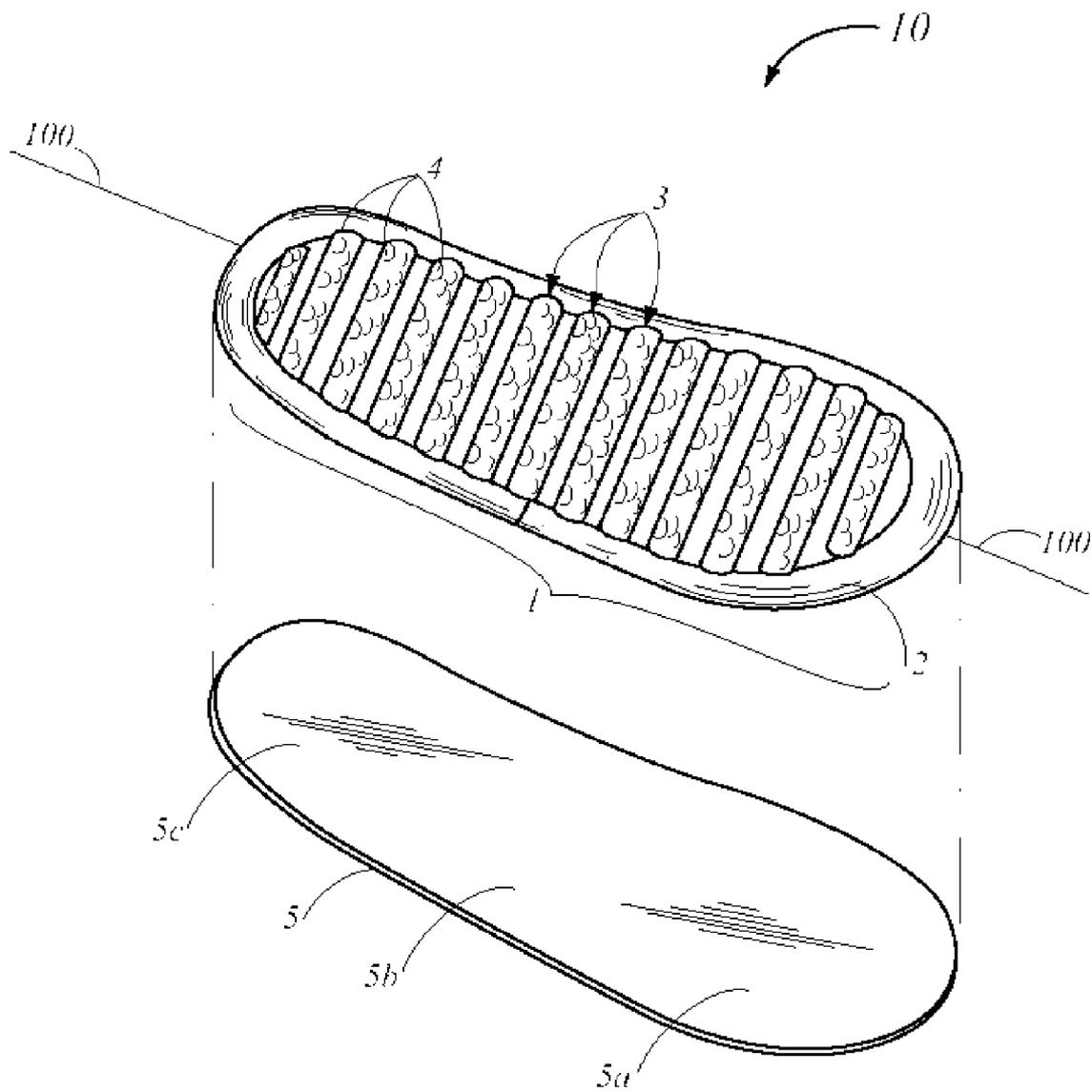


FIG. 1

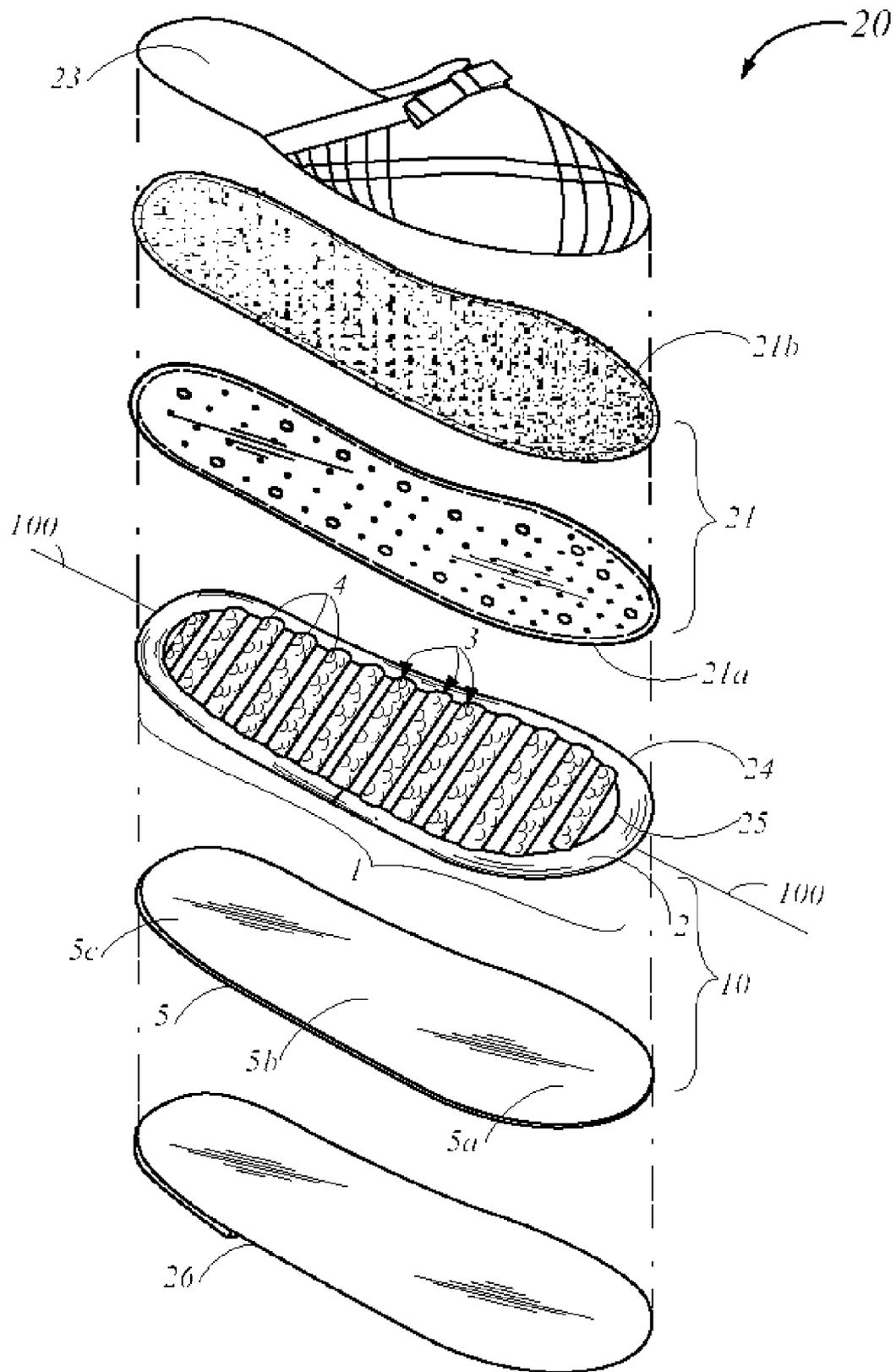


FIG. 2

SHOE SOLE

FIELD OF INVENTION

[0001] The present invention relates to an article of footwear, more specifically, to a shoe sole that provides a user added comfort and better aeration for the feet, the shoe sole can be adapted to fit a variety of men's and women's footwear.

BACKGROUND OF THE INVENTION

[0002] Footwear consists of two main parts, the portion responsible for attachment to the foot and the sole. The sole typically comprises the insole, outsole, and midsole. The insole is directly below the foot and provides the foot padding to rest upon. The outsole is the portion of the sole that contacts the ground, provides traction for the wearer, and is generally made of a harder, more durable material to resist the wear and tear of daily use. The midsole, situated between the insole and outsole, primarily serves as support for the foot.

[0003] Midsoles are typically constructed of conventional foam materials, including polyurethane or ethylene vinyl acetate, which compress and dampen to provide cushioning when the wearer applies force and return resiliently to a substantially predetermined shape after the force is removed. The use of such foam material has become widespread due to its availability and ease of manipulation during the footwear's manufacturing process. The use of such foam material, however, has certain drawbacks. First, as the foam has a uniform density, to increase or decrease the amount of cushioning depends solely on the thickness of the layer of foam, which reduces flexibility and may create aesthetic problems for footwear designers. Second, the total weight of the footwear is proportional to the amount of foam used. Lastly, although the foam reverts back to a substantially predetermined shape, this ability is lost over continued use as the foam deteriorates, resulting in decreased rebound and cushioning.

[0004] A midsole having sections of foam removed leaving apertures within the midsole has already been designed to address the issues of reduced flexibility and weight. However, the problem of foam deterioration is not addressed. Further, as the apertures are merely voids in the foam, the midsole does not achieve rebound and cushioning effect to the extent possible. Others have utilized hollow tubes embedded into the foam for added rebound and cushioning. Although this may increase the cushioning and support characteristics of the footwear, it does very little in addressing the problems of weight and of foam deterioration.

[0005] Other midsoles have incorporated a "bladder" or air-filled elastic cushioning devices into the midsole. Such bladders are encapsulated within the foam of the midsole. The cushioning characteristics, however, depend on the compressibility of the bladder, which is hindered because it is completely surrounded by the foam material. Others have further incorporated air gaps surrounding the bladder which allows for greater compressibility. Even so, these approaches only partially address the weight issue and do not address the problem of foam deterioration.

[0006] Still others have used a gas-filled tube disposed about the perimeter of the shoe. Utilizing a tube around the

perimeter eliminates the need for a layer of foam cushioning material in the midsole. Thus, the problem of weight, flexibility, and foam deterioration is addressed. The flaw of this design, however, is the reliance of the peripheral tubing to provide support for the entire foot. Without a form of additional cushioning below the heel, the tube would be subject to additional stress at the portion of the tube in the heel.

[0007] Some shoes today rely on the breathability of the upper shoe material to allow air circulation throughout the foot area. This may be sufficient for shoe uppers made of canvas or other porous materials. However many other shoes utilize upper materials that allow for little to no breathability which results in heat and in some cases moisture depositing at the forefront of the shoe where the air cannot escape. A past approach to this problem is to incorporate valves into the midsole to allow airflow through the sole where it can diffuse through the insole to the wearer's foot. The flaw of this invention is that it relies on the permeability of the shoe insole.

[0008] Another approach is to incorporate a plurality of side-by-side vertically placed columns within the midsole, which when compressed produces a bulging action between the columns and pushes air through the insole to the wearer's foot. The problem with this invention is the amount of air that can be forced through the insole is limited to the amount of space between the small columns, thus providing very little circulation. In addition, these inventions fail to address both the air circulation problem and the cushioning effect.

[0009] There is a need in the art, therefore, for creating midsoles that not only provide support and comfort, but also provide aeration for the wearer's feet. The prior approach is primarily focused on midsoles constructed of conventional foam materials which compress and dampen when force is applied and return to a predetermined shape after the force is removed.

[0010] Accordingly, it is a principal object of the present invention to provide an improved midsole that is not only comfortable and supportive but provides better aeration for the foot.

[0011] It is another object of the invention to provide an improved midsole that is not comprised of foam material.

[0012] Further objects of the invention will become apparent from the following description.

SUMMARY OF THE INVENTION

[0013] The embodiments of the present invention solve the problems and address the drawbacks of the approaches in the above description. An embodiment of the present invention is a midsole for an article of footwear comprising a bottom member and a cushioning member. The cushioning member comprising a perimeter element and a central lining element, is lined on top of the bottom member. The perimeter element and central lining element are in fluid connection with each other. A number of raised protrusions are fixed on top of the central lining element for providing increased airflow through the sole.

[0014] In a further embodiment, the midsole is disposed within an article of footwear. The article of footwear comprises an upper portion, an outsole, a midsole, and an insole.

The upper portion may be made of conventional materials for covering the foot. The midsole may be adapted for use in women's and men's footwear.

[0015] Some of the many advantages of the present invention include increased comfort for the wearer, and added air circulation about the foot. Another advantage is that the midsole of the present invention is easily manufactured and utilizes readily available materials.

[0016] These and other embodiments of the present invention are further made apparent, in the remainder of the present document, to those of ordinary skill in the art.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] In order to more fully describe embodiments of the present invention, reference is made to the accompanying drawings. These drawings are not to be considered limitations in the scope of the invention, but are merely illustrative.

[0018] FIG. 1 shows an exploded perspective view of a basic structure of a midsole according to an embodiment of the present invention.

[0019] FIG. 2 shows an exploded perspective view of a midsole disposed within an article of footwear.

DETAILED DESCRIPTION OF SPECIFIC EMBODIMENTS

[0020] The description above and below and the drawings of the present document focus on one or more preferred embodiments of the present invention and also describe some exemplary optional features and/or alternative embodiments. The description and drawings are for the purpose of illustration and not limitation. Those of ordinary skill in the art will recognize variations, modifications, and alternatives. Such variations, modifications, and alternatives are also within the scope of the present invention. Section titles are terse and are for convenience only.

[0021] An embodiment of the present invention includes a midsole 10, as shown in FIG. 1. Midsole 10 comprises a bottom member 5 and a cushioning member 1. Bottom member 5 has a heel portion 5c, an arch portion 5b, and a fore portion 5a. Bottom member 5 may be made of a conventional material used in shoe sole construction such as plastic, natural rubber, synthetic rubber, polyurethane, thermoplastic urethane, thermoplastic rubber, carbon-black rubber, or polyvinyl chloride. Cushioning member 1 includes a perimeter element 2 and a central lining element 3. Cushioning member 1 is lined on top of bottom member 5. Perimeter element 2 is comprised of a substantially tubular chamber disposed about an entire outside edge of bottom member 5. Perimeter element 2 may include a fluid-filled tube disposed about a perimeter of bottom member 5 defining a central region. Perimeter element 2 may be fixed to the upper surface of bottom member 5 by adhesives, heat fusing or other means. Central lining element 3 is comprised of a plurality of substantially tubular chambers in parallel arrangement. The tubular chambers in parallel arrangement extend in a generally perpendicular direction with respect to a longitudinal axis 100 of midsole 10. Each of the tubular chambers in parallel arrangement comprising central lining element 3 is fluidly connected to perimeter element 2. Perimeter element 2 and central lining element 3 may be

made of a conventional material such as natural rubber, synthetic rubber, thermoplastic rubber, polyvinyl chloride, or silicone.

[0022] With further reference to FIG. 1, a plurality of protrusions 4 are fixed to an outside surface of each of the tubular chambers in parallel arrangement 3. Protrusions 4 may comprise of dimples placed on the outside surface of central lining element 3, thus creating bumps on the outside surface. Protrusions 4 may aid air circulation within midsole 10 by creating air channels around central lining element 3. The tubular chambers in parallel arrangement comprising central lining element 3 are not secured to bottom member 5. No additional element for cushioning, such as foam, is disposed between bottom member 5 and cushioning member 1. Also, no additional element for cushioning is disposed between the tubular chambers in parallel arrangement 3. Thus, the embodiment of the present invention results in decreased overall weight and added flexibility of midsole 10.

[0023] In alternative embodiments, the number of chambers in parallel arrangement may vary depending on the nature and type of the footwear, for adjusting the cushioning characteristics of midsole 10. For example, the number of tubular chambers in parallel arrangement 3 may be increased for activities such as, running and basketball, which require additional support and cushioning beyond that of a typical shoe. By increasing the number of tubular chambers in parallel arrangement 3, midsole 10 gains additional resistance. Likewise, a reduction in the number of tubular chambers in parallel arrangement 3 reduces resistance of midsole 10.

[0024] In other embodiments, the wall thickness of some or all of the tubular chambers in parallel arrangement 3 as well as the tubular chamber comprising the perimeter element 2 may vary to influence cushioning characteristics of midsole 10. The strength and resiliency of the chambers is commensurate with the wall thickness of the tubular chambers. As wall thickness increases, the chamber may become increasingly resistant. Thus, varying the compression and resiliency of cushioning member 1. Some footwear may require extra support for the heel region of the sole. In which case, the tubular chambers fixed on top of heel portion 5c of bottom member 5 may have a greater wall thickness than the tubular chambers fixed on top of fore portion 5a of bottom member 5.

[0025] In another embodiment, cushioning member 1 may be pressurized with a gas to further add resistance beyond the resistance of the chambers alone. The pressure of the gas may be above ambient air pressure and may be tuned depending on the intended use of the article of footwear.

[0026] Referring now to FIG. 2, is an article of footwear 20 incorporating a midsole 10 according to an embodiment of the present invention. Footwear 20 comprises an upper portion 23, an outsole 26, a midsole 10, and an insole member 21. Midsole 10 attaches to an upper surface of outsole 26. Insole member 21 is disposed between midsole 10 and upper portion 23. Upper portion 23 may attach to insole member 21 by adhesives, heat fusing, sewing, or other means.

[0027] Upper portion 23 is adapted for covering the whole foot or part of the foot. Upper portion 23 may be made of material including leather, suede, vinyl, canvas, cloth, or plastic.

[0028] Midsole **10** comprises a bottom member **5** and a cushioning member **1**. Bottom member **5** has a heel portion **5c**, an arch portion **5b**, and a fore portion **5a**. Cushioning member **1** includes a perimeter element **2** and a central lining element **3**. Cushioning member **1** is lined on top of bottom member **5**. Perimeter element **2** is comprised of a substantially tubular chamber disposed about an entire outside edge of bottom member **5**. Perimeter element **2** may be fixed to the upper surface of bottom member **5** by adhesives, heat fusing or other means. Central lining element **3** is comprised of a plurality of substantially tubular chambers in parallel arrangement. The tubular chambers in parallel arrangement extend in a generally perpendicular direction with respect to a longitudinal axis **100** of midsole **10**. Each of the tubular chambers in parallel arrangement comprising central lining element **3** is fluidly connected to perimeter element **2**. A plurality of protrusions **4** are fixed to an outside surface of each of the tubular chambers in parallel arrangement **3**. Protrusions **4** may comprise of dimples placed on the outside surface of central lining element **3**, thus creating bumps on the outside surface. The tubular chambers in parallel arrangement comprising central lining element **3** are not secured to bottom member **5**.

[0029] Insole member **21** comprises an upper lining **21b** and a lower lining **21a**. Upper lining **21b** provides the wearer a medium for the foot to rest upon. Upper lining **21b** may comprise of material that is soft, stretchable, and breathable to ensure comfort for the wearer and to allow air to pass through. Lower lining **21a** may comprise of semi-rigid material such as, compressed cardboard or leather. Lower lining **21a** may also include apertures for allowing air to circulate between insole member **21** and midsole **10**. Lower lining **21a** is attached to an inner perimeter of cushioning member **1**. Inner perimeter is defined by a distance around an inside edge **25** of perimeter element **2**. Upper lining **21b** is disposed on top of lower lining **21a** and attaches to an outer perimeter of cushioning member **1**. Outer perimeter is defined by a distance around an outside edge **24**, of perimeter element **2**.

[0030] Outsole **26** includes an upper surface and a bottom surface. Outsole **26** may be comprised of material such as, plastic, natural rubber, synthetic rubber, polyurethane, thermoplastic urethane, thermoplastic rubber, carbon-black rubber, polyvinyl chloride, or other common shoe outsole material. The bottom surface may be comprised of a harder, more durable material to resist the wear and tear of everyday use. The bottom surface is in constant direct contact with the ground. Alternatively, bottom member **5** may also serve as an outsole, thus removing the need for a separate layer.

[0031] By incorporating midsole **10** into article of footwear **20**, midsole **10** provides added aeration to the foot during activity. During activity, the weight of the wearer compresses the tubular chambers comprising perimeter element **2** and central lining element **3**. In doing so, the wearer also compresses the amount of space between the tubular chambers in parallel arrangement resulting in air being forced out of the space and moving in through the apertures of lower lining **21a**. The air may then escape through the breathable material of upper lining **21b** and then distributed about the foot. Thus, keeping the foot cool and free of moisture.

[0032] The embodiments of the present invention may be readily incorporated into athletic shoes, dress shoes, casual shoes, boots, or other types of footwear for both men and women.

[0033] Throughout the description and drawings, example embodiments are given with reference to specific configurations. It will be appreciated by those of ordinary skill in the art that the present invention can be embodied in other specific forms. Those of ordinary skill in the art would be able to practice such other embodiments without undue experimentation. The scope of the present invention, for the purpose of the present patent document, is not limited merely to the specific example embodiments of the foregoing description, but rather is indicated by the appended claims. All changes that come within the meaning and range of equivalents within the claims are intended to be considered as being embraced within the spirit and scope of the claims.

What is claimed is:

1. A midsole for an article of footwear, the midsole comprising:

a bottom member having a having a heel portion, an arch portion, a fore portion, and an outside edge; and

a cushioning member lined on top of the bottom member, the cushioning member having a perimeter element and a central lining element,

wherein the perimeter element is comprised of a substantially tubular chamber disposed about the entire outside edge of the bottom member, and the central lining element is comprised of a plurality of substantially tubular chambers in parallel arrangement and extending generally perpendicular to a longitudinal axis of the midsole, the central lining element having a fluid connection with the perimeter element, and a plurality of protrusions fixedly securing to an outside surface of the central lining element.

2. The midsole of claim 1 wherein the bottom member is made up of material selected from the group consisting of plastic, natural rubber, synthetic rubber, polyurethane, thermoplastic urethane, thermoplastic rubber, carbon-black rubber, and polyvinyl chloride.

3. The midsole of claim 1 wherein the perimeter element is made up of material selected from the group consisting of natural rubber, synthetic rubber, thermoplastic rubber, polyvinyl chloride, and silicone.

4. The midsole of claim 1 wherein the central lining element is made up of material selected from the group consisting of natural rubber, synthetic rubber, thermoplastic rubber, polyvinyl chloride, and silicone.

5. The midsole of claim 1 wherein the cushioning member contains a gas.

6. The midsole of claim 5 wherein the gas is pressurized above ambient air pressure.

7. The midsole of claim 1 wherein the tubular chambers in parallel arrangement comprising the central lining element have a wall thickness greater than a wall thickness of the tubular chamber comprising the perimeter element.

8. The midsole of claim 1 wherein the tubular chamber comprising the perimeter element has a wall thickness greater than a wall thickness of the tubular chambers in parallel arrangement.

9. The midsole of claim 1 wherein the tubular chambers in parallel arrangement fixed on top of the heel portion of the bottom member have a wall thickness greater than a wall thickness of the tubular chambers in parallel arrangement fixed on top of the fore portion of the bottom member.

10. The midsole of claim 1 wherein the protrusions are a plurality of dimples fixed on an outside surface of the tubular chambers in parallel arrangement.

11. An article of footwear comprising:

an upper portion for covering a foot;

an outsole having an upper surface and a bottom surface;

a midsole assembly comprising:

a bottom member having a heel portion, an arch portion, a fore portion, and an outside edge, wherein the bottom member is attached to the upper surface of the outsole; and

a cushioning member lined on top of the bottom member, the cushioning member having a perimeter element and a central lining element,

wherein the perimeter element is comprised of a substantially tubular chamber disposed about the entire outside edge of the bottom member, and the central lining element is comprised of a plurality of substantially tubular chambers in parallel arrangement and extending generally perpendicular to a longitudinal axis of the midsole, the central lining element having a fluid connection with the perimeter element, and a plurality of protrusions fixedly securing to an outside surface of the central lining element; and

an insole member fixed on top of the cushioning member, the insole member comprising a lower lining and an upper lining,

wherein the lower lining having a plurality of apertures is attached to an inner perimeter of the cushioning member, the inner perimeter is defined by a distance around an inside edge of the perimeter element, and the upper lining comprising of a substantially stretchable and breathable material is disposed on top of the lower

lining and attaches to an outer perimeter of the cushioning member, the outer perimeter is defined by a distance around an outside edge of the perimeter element.

12. The article of footwear of claim 11 wherein the bottom member is made up of material selected from the group consisting of plastic, natural rubber, synthetic rubber, polyurethane, thermoplastic urethane, thermoplastic rubber, carbon-black rubber, and polyvinyl chloride.

13. The article of footwear of claim 11 wherein the perimeter element is made up of material selected from the group consisting of natural rubber, synthetic rubber, thermoplastic rubber, polyvinyl chloride, and silicone.

14. The article of footwear of claim 11 wherein the central lining element is made up of material selected from the group consisting of natural rubber, synthetic rubber, thermoplastic rubber, polyvinyl chloride, and silicone.

15. The article of footwear of claim 11 wherein the cushioning member contains a gas.

16. The article of footwear of claim 15 wherein the gas is pressurized above ambient air pressure.

17. The article of footwear of claim 11 wherein the tubular chambers in parallel arrangement comprising the central lining element have a wall thickness greater than a wall thickness of the tubular chamber comprising the perimeter element.

18. The article of footwear of claim 11 wherein the tubular chamber comprising the perimeter element has a wall thickness greater than a wall thickness of the tubular chambers in parallel arrangement comprising the central lining element.

19. The article of footwear of claim 11 wherein the tubular chambers in parallel arrangement fixed on top of the heel portion of the bottom member have a wall thickness greater than a wall thickness of the tubular chambers in parallel arrangement fixed on top of the fore portion of the bottom member.

20. The article of footwear of claim 11 wherein the protrusions are a plurality of dimples fixed on an outside surface of the tubular chambers in parallel arrangement.

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