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(54) Title: IMPROVED VENTILATED AND RESILIANT SHOE APPARATUS AND SYSTEM

(57) Abstract: An improved shoe includes an apparatus and system for ventilating inside the shoe and a resilient shoe. External air desirably enters the shoe around the wearer's foot and flows through holes in the sole into aeration chambers. The air circulates to the heel by a suction valve and is controllably directed out to the exterior of the shoe through a one-air air exhaust valve, ventilating the wearer's foot while an individual is walking. The heel is made from a resilient material and has a cavity extending under the entire instep portion of the shoe's upper. Compression springs are placed in the cavity, including a mainspring located at approximately the heelstrike point and two auxiliary springs for stability located forward of the mainspring toward the shoe's toe. The action of the springs is distributed throughout the sole by a resilient layer of softer rubber adjacent the sole to provide for a resilient walking experience.

IMPROVED VENTILATED AND RESILIENT SHOE APPARATUS AND SYSTEM

RELATED APPLICATION DATA

The present application is related to and claims the benefit of U.S. Provisional Application No. 60/889,725 entitled "Shoe with Resilient Heel" filed Feb. 13, 2007, which is hereby incorporated by reference in its entirety.

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention pertains generally to wearable articles for the feet and more particularly to shoes where air is circulated through the sole and heel and out via a one-way valve and has a resilient heel formed inside a shock-absorbing cavity.

2. Description of the Related Art

Conventional shoes are often uncomfortable. They do not allow the wearer to walk or stand for long because they do not provide any cushion or resiliency for the pressure put on the feet. This lack of cushion causes pressure to be felt in the spine, knees, and other joints. Heels with recesses and springs are not new; however, none of the prior art attempts successfully cushions the wearer's feet to the extent of the instant invention. Conventional shoes also do not provide for the flow of fresh air throughout the inside of the shoe around the individual's foot.

For instance, U.S. Patent No. 1,471,042 to Lewis (1923) discloses a shoe that uses coil springs internal to the defined heel. Lewis's shoe, however, uses metal plates (circular metal disks) above and below the coil spring(s) to help distribute pressure and also has no real cavity. U.S. Patent No. 2,257,482 to Resko (1941) discloses using lugs to better seat the coil spring in the defined heel, but still uses a metal reinforcing plate

between the upper and lower soles to distribute pressure. U.S. Patent No. 3,886,674 to Pavia (1975) discloses a shoe having a plurality of springs in the non-defined heel. However, the heel is open and the springs are not enclosed. Further, there is still a metal plate above the springs, and the springs are all still located in the heelstrike area, so the wearer's foot still strikes against a hard surface.

Another family of prior art patents has addressed heel/cavity design. For instance, U.S. Patents to Bunns 1,502,087, Denk 2,299,009, Carroll 6,622,401, and Dixon 5,544,431, and U.S. Pat. App. 10/022,477 to Wu disclose cavities in well defined heels. Lombardino 5,743,028 discloses a blended heel, but the cavity is still limited to the heel portion, and consequently, the springs are necessarily limited to the heelstrike area.

Still other patents, for instance U.S. Patent 7,159,338 to LeVert et al., disclose a spring cushioned shoe with an inner vacuity that is connected by a passageway to an opening on the exterior of the shoe. The passageway opening described in the '338 patent, however, is both an inlet and an outlet and thus undesirably allows fluids and other unwanted debris into the shoe to the discomfort of the wearer and associated problems from water and mold developing within the shoe. Similarly, U.S. Patent 1,069,001 to Guy discloses a cushioned sole and heel that allows air or other fluids in through a check valve to serve as the cushioning medium. Thus, a needs exists for an improved ventilated and resilient shoe that overcomes the numerous limitations and problems in the prior art.

SUMMARY OF THE INVENTION

The present invention solves the above-mentioned problems in convention shoes by providing an improved ventilated and resilient shoe apparatus and system.

The invention includes a novel shoe in one embodiment that is ventilated with external air. The apparatus and system circulate air around the wearer's foot without impacting the stability or comfort of an individual's walk. Circulating air throughout the shoe while an individual is walking provides an additional benefit that conventional shoes do not provide: reducing athlete's foot and foot odor. Conventional shoes do not allow the free flow of air throughout the inside of the shoe. Moisture and bacteria build up inside most conventional shoes, causing athlete's foot and making such shoes smell. The present invention provides that with every step, the individual is circulating fresh air throughout the shoe and around his foot. The result is a shoe interior that will not be a breeding ground for odor-causing bacteria. The wearer's feet will feel refreshed and better rested at the end of the day. Individuals may also find themselves walking longer distances in the improved shoes because their feet will feel more comfortable.

In an embodiment, air enters the shoe from outside around the wearer's foot and flows through openings in a sole and then through aeration chambers. The air thereafter circulates to an air suction valve in the heel and then is directed out to the exterior of the shoe through a one-air air exhaust valve and thereby ventilates the wearer's foot with free flowing air. In other embodiments, the invention includes an air pump in the heel that operates with the one way air suction valve for air intake and operates to expel air through the one-way air exhaust valve. In further embodiments, the invention includes an upper sole with a plurality of air suction holes or openings and a lower sole made from

porous, air permeable material such as open cell foam or the like. In one or more embodiments, the shoe includes bacteria fighting chemicals or other substances known to persons skilled in the art to reduce shoe odor.

One embodiment of the invention includes a blended heel made from a resilient material and has a cavity extending under the entire instep portion of the shoe's upper. Compression springs are placed in the cavity, including a mainspring located at approximately the heelstrike point and two auxiliary springs for stability located forward of the mainspring toward the shoe's toe. The extended cavity provides even resiliency throughout the upper sole without having to resort to metal plates. The springs assist the resilient walls of the cavity, which extends under the instep portion of the shoe, in supporting the wearer's foot, and the spring's compression load is distributed throughout the sole by a resilient layer of softer rubber adjacent the sole.

The blended heel of the invention extends under the sole in a wedge-type configuration. This extension provides arch support and resiliency at the shoe's instep, or midsole. In one or more embodiments, the heel includes a height enhancer to provide lift without the appearance of "elevator shoes." This pad located under the heel portion also serves to distribute the load of the springs and provides that the entire shoe is lifted, not just the wearer's foot.

In one embodiment, the springs include a mainspring and two smaller auxiliary springs in front of and evenly spaced to the inside and outside of the mainspring. The mainspring offers lift to the wearer reducing, if not eliminating, pressure on the wearer's spine, knees, and other joints. The auxiliary springs offer stability and additional absorption of the pressure forces generated from walking and

other activity. In one or more embodiments, the springs are made from industrial grade aluminum spring material or many other suitable materials are within the scope of the invention. For example, instead of metallic springs, other spring members such as air balls or rubber balls could be used. The springs are aided by the resilient material itself that makes up the heel and the cavity walls.

One embodiment of the invention includes a magnetic sleeve that serves to further enhance the well-being of the wearer. Such an insert uses magnetic therapy technology to offer the wearer the additional benefit of enhancing blood circulation in the heel, foot, and ankle areas. While embodiments and features of the invention have been described herein, other and additional embodiments will be apparent to persons skilled in the art from the attached figures and written disclosure herein.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 is a side cutaway view of one embodiment of the shoe with resilient sole having heel cavity and compression springs.

FIGURE 2 is a top view of the heel area showing one possible configuration of compression springs.

FIGURE 3 is a bottom detail view of a resilient plate with lower sole and springs Removed and showing an optional one-way exit air valve.

FIGURE 4 is a side cutaway view of another embodiment of the shoe with resilient heel cavity and springs and showing ventilation of the inside sole.

FIGURE 5 is a top cutaway view of the heel portion in one or more embodiments of the invention, again showing ventilation of the inside sole.

FIGURE 6 is a top cutaway view of the upper sole in one or more embodiments of the invention.

FIGURE 7 is a cutaway perspective view of a variation of a ventilation apparatus and system in one or more embodiments of the invention.

FIGURE 8 is an exploded partial view of the upper sole, second sole and the bottom with the aeration channels in one or more embodiments of the invention.

DETAILED DESCRIPTION OF EMBODIMENTS OF THE INVENTION

Figure 1 shows an embodiment of the shoe 10 with upper 14 and lower 16 joined along the upper sole 18 extending through the heel portion 20, instep portion 22, and toe portion 24. The blended heel 26 defines a cavity 28 that extends from the rearmost point of the heel portion 20 forward under the instep portion 22. The blended heel 26 is made from a resilient material, typically rubber so the cavity walls offer some resiliency, but other resilient materials known to persons skilled in the art are within the scope of the present invention.

Two separate materials may be used, as is shown here, with the layer adjacent the upper sole of a softer material than the remainder of the heel. The mainspring 30 is positioned orthogonal to the longitudinal axis 12, as shown in Figure 2, and under the heelstrike point of the interior of the shoe. The mainspring 30 may be secured by lugs 36 (upper) and 38 (lower; not shown) set into recesses 40 and 42, and provides the majority of resilient force to the wearer's steps. Auxiliary springs 32 and 34 shown in Figure 2 add stability and enhanced resiliency.

In one or more embodiments, a magnetic sleeve 46 is included as shown in figure 1 to further enhance the well-being of the wearer with magnetic therapy. Also, the pad 48 at the bottom of the blended heel 26 serves not only as a height-enhancer, but also helps to distribute the spring load throughout the heel portion 20 so that the entire shoe is lifted, not just the wearer's foot.

Figure 2 shows one configuration of the springs. The mainspring 30 is located generally on the longitudinal axis 12 in the center of the shoe width, and the auxiliary springs 32 and 34 are located forward of the mainspring, toward the toe portion 24 and to either side of the longitudinal axis. The lateral spacing of the auxiliary springs 32 and 34 provides overall stability to the shoe and enhances the lift felt by the wearer.

One placement of the auxiliary springs 32 and 34 is to have them spaced evenly in front of the mainspring, equidistant from both the mainspring and the longitudinal axis, so that the wearer's ankle is not turned either inward or outward. Also in this configuration, the lift from the springs is directed upward to enhance the lift from the mainspring. On the other hand, strategic placement of the springs offset from each other may aid in the correction of pronation or other ankle alignment problems in other embodiments.

Figure 3 shows the recesses 40, 52, 54 for the springs in one embodiment and also shows how there may be other recesses 56 (rectangular, circular, or of any other shape) built into the rubber material to aid in overall stability. The design of these various smaller recesses 56 may aid in air circulation within the heel cavity and may work in concert with an air pressure valve to help express air from the cavity on depression thereof. In one or more embodiments, the shoe 10 includes a one-way air exhaust valve

100 as shown in Figure 3 whereby air is expelled out the valve 100 when the heel 20 is compressed and the volume of the cavity 28 is reduced. The valve 100 is a one-way valve so that water or other unwanted debris is prevented from entering the cavity 28. The valve 100 is also such that air freely flows out rather than seeking a path in a forward direction through the sole as described in other embodiments herein.

Figure 4 shows one embodiment where a load 80 is placed onto the shoe heel portion 20 so as to compress the mainspring 30 and the auxiliary springs 32 and 34 within the cavity 28. The cavity 28 is not sealed (and the one-way air exhaust or exit valve 100 not present), and thus when the volume of the cavity 28 is reduced air is discharged in a forward direction towards the instep portion 22 and toe portion 24 and through the upper sole 18 as shown in Figure 4, which provides overall stability to the shoe and enhances the lift and fresh air feeling felt by the wearer.

Figure 5 shows the air flow depicted in Figure 4 with arrows in one embodiment within the shoe 10 through a channel structure 82 and channel structure 84 to aeration channels 86 in the instep portion 22 and toe portion 24 of the shoe 10. Figure 6 illustrates an embodiment with the upper sole 18 includes a plurality of openings 18a to further facilitate the flow of air within the shoe 10.

Figure 7 illustrates another embodiment of a ventilated shoe of the present invention. In this embodiment an air pump 90 is provided in the cavity 28 in the heel portion 20, rather than the cavity 28 itself in conjunction with the one way valve 100 acting in a similar manner as described above. The air pump 90 is made of a conventional construction well known to persons skilled in the art and is not described in detail here. The air pump 90 is connected to the one-way air suction valve 92 as shown

in Figure 7 and is also connected to the one-way air exhaust valve 100 also as shown in Figure 7. The one-way air suction valve 92 is adjacent to the air channel 82 and the air channel 84, although an intermediate connecting channel 94 can be provided to connect the air channels 82 and 84 to the one-way air suction valve 92.

When the shoe 10 is used for walking, air enters the shoe adjacent to the where the user's ankle and leg are near to the shoe 10 or at or near the upper 14. The air flows through the upper sole 18 including through the openings 18a in the upper sole 18 to the aeration channels 86 on the lower 16 of the shoe 10. Air then flows to the air channels 82 and 84 to the one-way suction valve 92. The air then enters the air pump 90 and is expelled out the one way air exhaust valve 100 to the exterior of the shoe 10 as depicted schematically in Figure 7 by arrow 104. In one or more embodiments, a waterproof ventilation valve 102 is provided on the exterior of the shoe 10 as shown in Figure 7 to further inhibit water or other debris from entering the shoe 10 or cavity 28.

The air pump 90 operates so that when it is compressed, such as by a wearer's foot while walking, the air pump 10 is compressed which forces the air in the air pump 90 out through the valve 100. When the air pump 90 expands, such as when the wearer lifts his foot and heel during a walking stride, air flows into the air pump 90 through the one-way air suction valve 92. Therefore, while walking at even a normal pace, the shoes and thus the feet of the individual wearing the inventive shoes are ventilated with fresh air. Alternatively, the air pump 90 could include a small thermoelectric device 91 to remove heat (or cold) and humidity from the inside of the shoe.

Figure 8 illustrates an embodiment which includes a lower sole 150, made from open cell foam or equivalent materials well known to persons skilled in the art,

positioned between the upper sole 18 and the aeration channels 86 to further facilitate the flow of air within the shoe 10 with the upper sole 18 having a plurality of openings 18a as shown in Figure 8. Alternatively, the lower sole 150 could be made of generally air impervious material having one or more large holes for air to pass from the lower 16 up through the upper sole 18.

While the present invention has been described with regards to particular embodiments, it is recognized that additional variations of the present invention may be devised by persons skilled in the art without departing from the inventive concepts disclosed herein. By way of example, although the preferred embodiments have been shown and described in terms of Men's casual or dress shoes, the invention as claimed may apply to all types of shoes and even open-toed or sandals and other variations of footwear.

WHAT IS CLAIMED IS:

1. A shoe having a longitudinal shoe axis, comprising:

a lower having an upper sole extending the length of the shoe, including a heel portion, an instep portion, and a toe portion, and said lower including a blended heel extending under said instep portion of said upper sole;

a cavity in said blended heel extending under said instep portion of said upper sole toward said toe portion; and

a plurality of springs within said cavity, said springs being oriented generally orthogonal to said shoe axis.

2. The shoe of claim 1 wherein said lower, including said blended heel, is made of resilient material to cushion the steps of the wearer.

3. The shoe of claim 2 wherein there are two separate resilient materials comprising the heel, the top material being softer than the remainder.

4. The shoe of claim 2 wherein said cavity tapers from a relatively large area at the heel of the shoe to a point under the toe portion of said sole.

5. The shoe of claim 4 wherein there are three springs in the cavity, and said three springs comprise a mainspring located so as to align with the point of heelstrike on the sole and at least one auxiliary spring located forward of the mainspring.

6. The shoe of claim 5 wherein said mainspring is secured into said cavity by lugs at either end of the spring, said lugs are formed in recesses extending above and below said cavity.

7. The shoe of claim 5 wherein two auxiliary springs are located forward of said mainspring, the mainspring is located on the longitudinal axis, and the two auxiliary springs are located on either side of said longitudinal axis, and said auxiliary springs are located about equidistant from both the mainspring and said longitudinal axis.

8. A ventilated shoe comprising

a lower with an upper sole having a plurality of openings therein, said lower having aeration channels and at least one air suction channel adjacent to said aeration channels;

a heel portion having a cavity with a volume therein, said heel portion adjacent to said at least one air suction channel, said cavity in communication with a one-way exhaust valve in communication with the exterior of the shoe to expel air from the cavity,

wherein the shoe is adapted to provide that air flows into the shoe through the upper sole to said aeration channels through said at least one air suction channel to said cavity and is expelled outside of the shoe through said one-way exhaust valve by reduction of the volume of the cavity.

9. The ventilated shoe of claim 8 further comprising an air pump within said cavity having a one-way air suction valve for intake of air from said at least one air

suction channel, said air pump configured to expel air through said one-way exhaust valve upon the compression of said air pump.

10. The ventilated shoe of claim 8 further comprising a second sole placed between said upper sole and said aeration chambers, said second sole being air permeable.

11. A system for ventilating a shoe comprising:

a lower having an upper sole with a plurality of openings therein, said lower having air flow structures therein in communication with said upper sole;

a heel portion having an air pump therein, said air pump having an air suction valve in communication with said air flow structures, said air pump also in communication with an exhaust valve, said exhaust valve in communication with the exterior of the shoe to expel air from said air pump, said air pump configured to intake air from said air suction valve when expanded and to expel air to said exhaust valve when compressed; and

whereby the shoe is adapted to provide that air enters the shoe and flows through the upper sole to said air flow structures to said air suction valve and is expelled outside of the shoe through said one-way exhaust valve by operation of said air pump.

12. The system for ventilating a shoe of claim 11 further comprising a water proof ventilation valve on the exterior of the shoe and in communication with said exhaust valve.

13. The system for ventilating a shoe of claim 11 further comprising a second sole placed between said upper sole and said aeration chambers, said second sole made from air permeable material.

14. A combination resilient and ventilated shoe comprising:

a lower having an upper sole with a plurality of openings therein and air flow structures therein in communication with said upper sole and extending the length of the shoe into a heel portion,

a cavity in said heel portion and at least one spring member within said cavity, said cavity having a one-way exhaust valve in communication with the exterior of the shoe to expel air from the cavity;

wherein the shoe is adapted to provide that air enters the shoe and flows through the upper sole to said cavity in the heel and is expelled outside of the shoe through said one-way exhaust valve by reduction of the volume of the cavity.

15. The combination resilient and ventilated shoe of claim 14 further comprising an air pump within said heel cavity, said air pump configured to expel air through said one-way exhaust valve upon the compression of said air pump.

16. The combination resilient and ventilated shoe of claim 14 further comprising permanently magnetic material disposed in the lower.

17. The ventilated shoe of claim 14 further comprising a second sole placed between said upper sole and said aeration chambers, said second sole being air permeable.

18. The combination resilient and ventilated shoe of claim 17 further comprising a thermoelectric cooling device in the lower to remove heat and humidity from said second sole.

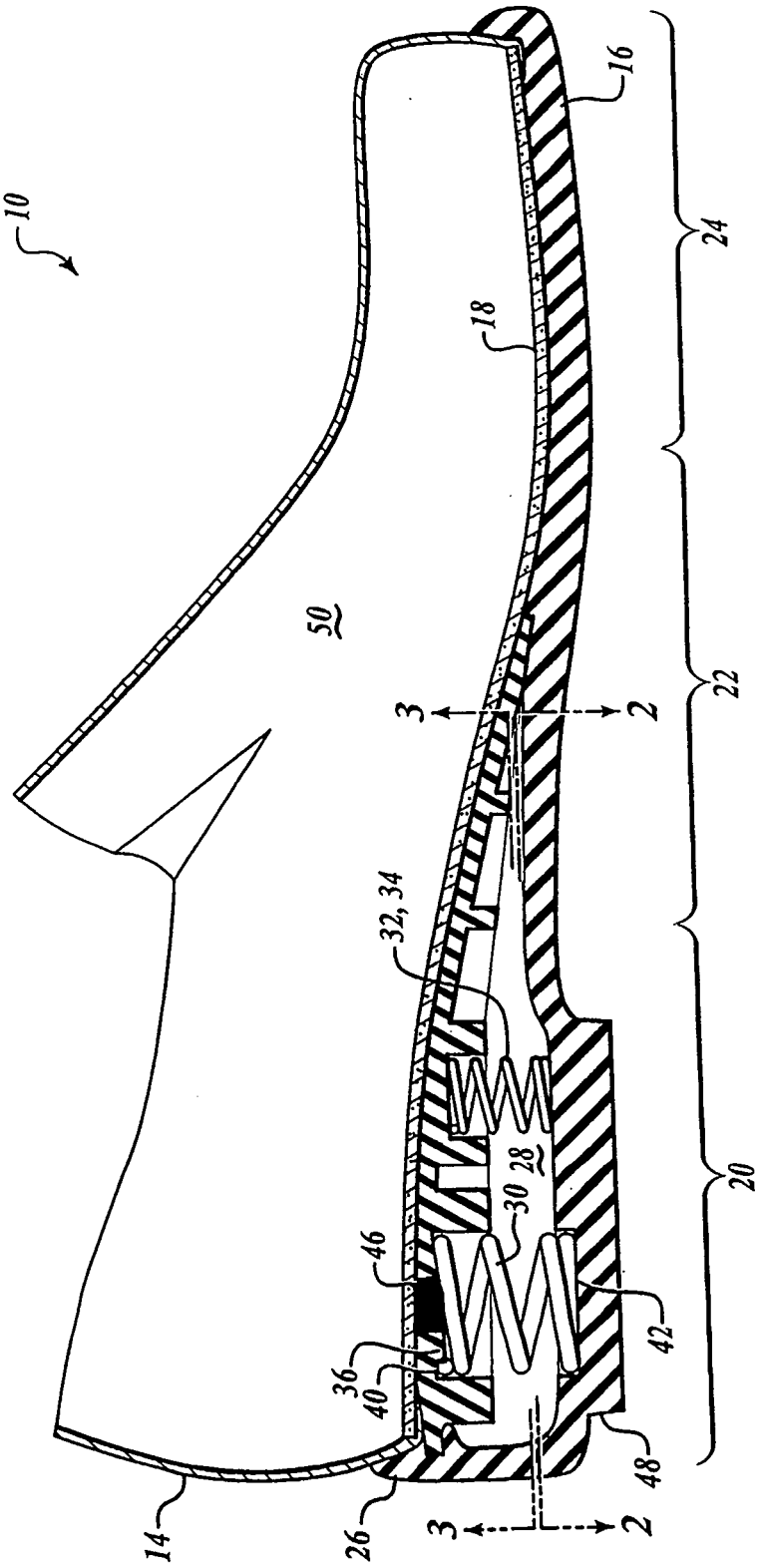


FIG.1

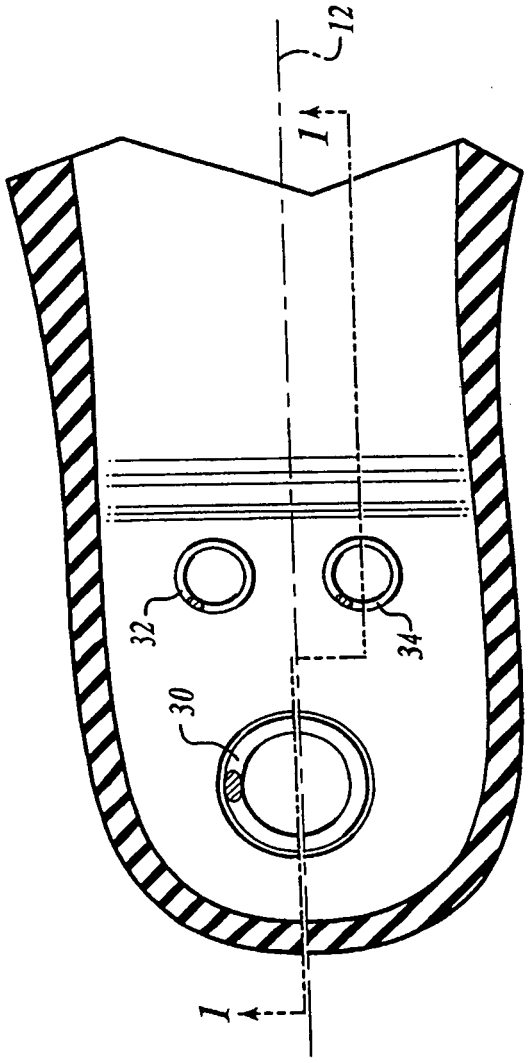


FIG.2

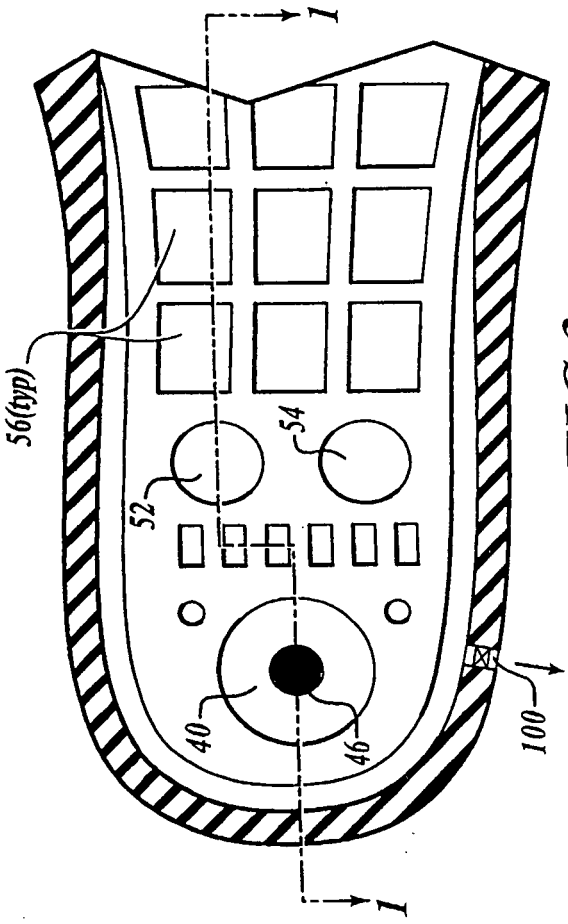


FIG.3

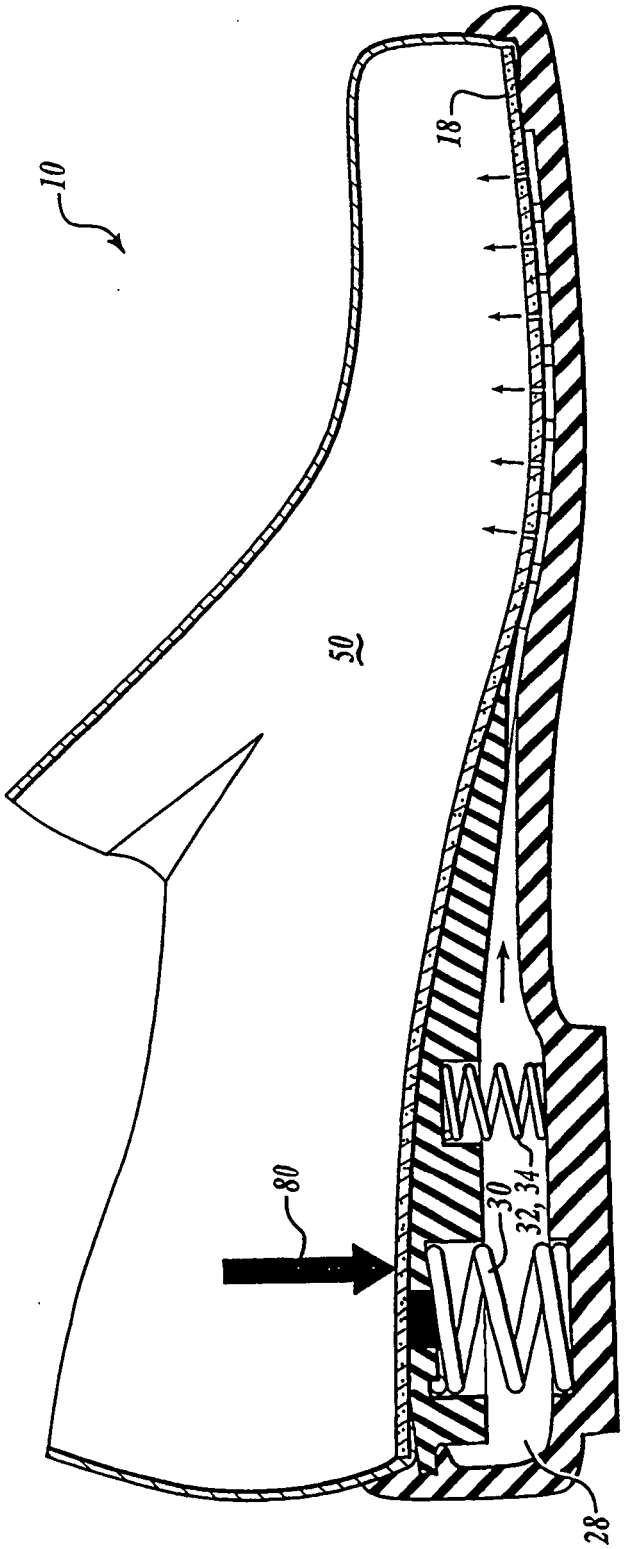


FIG.4

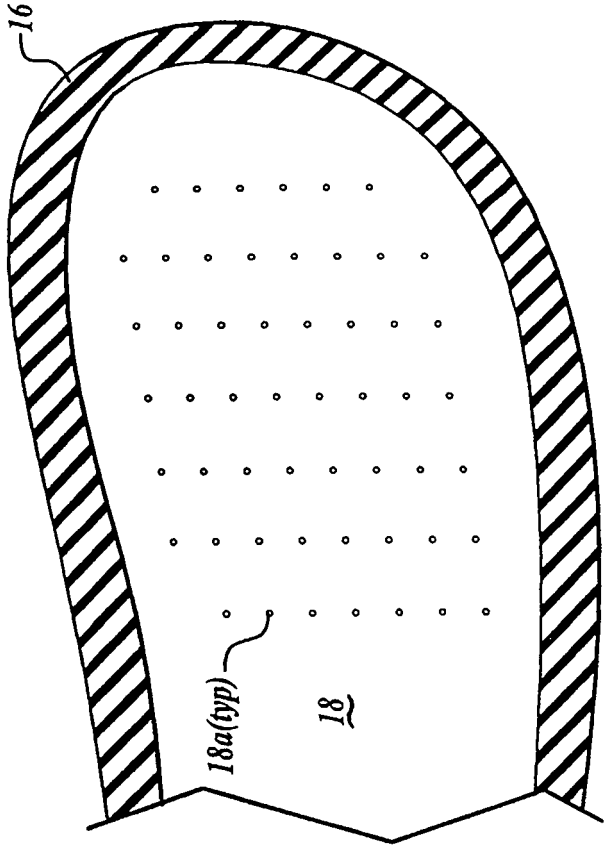


FIG.6

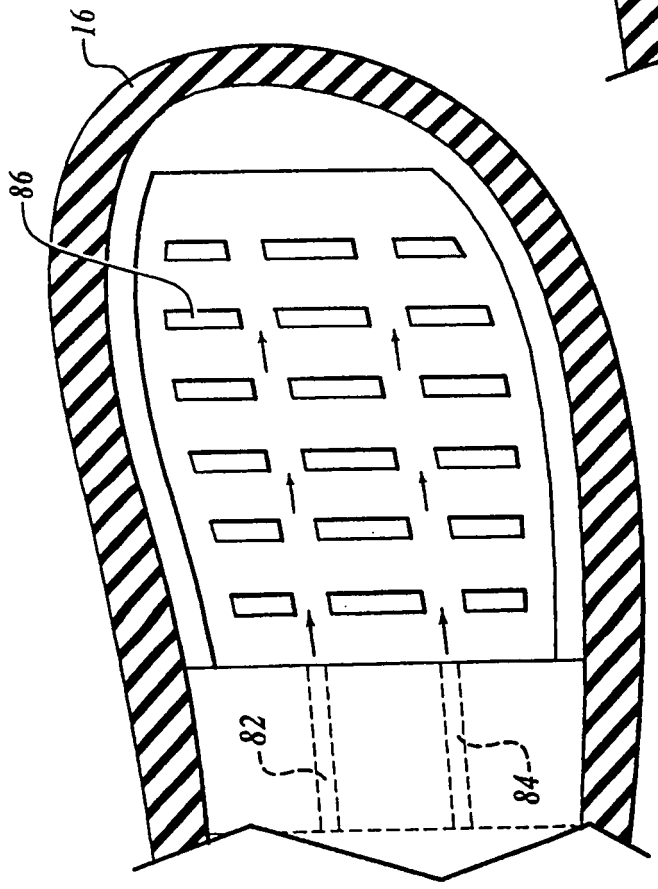


FIG.5

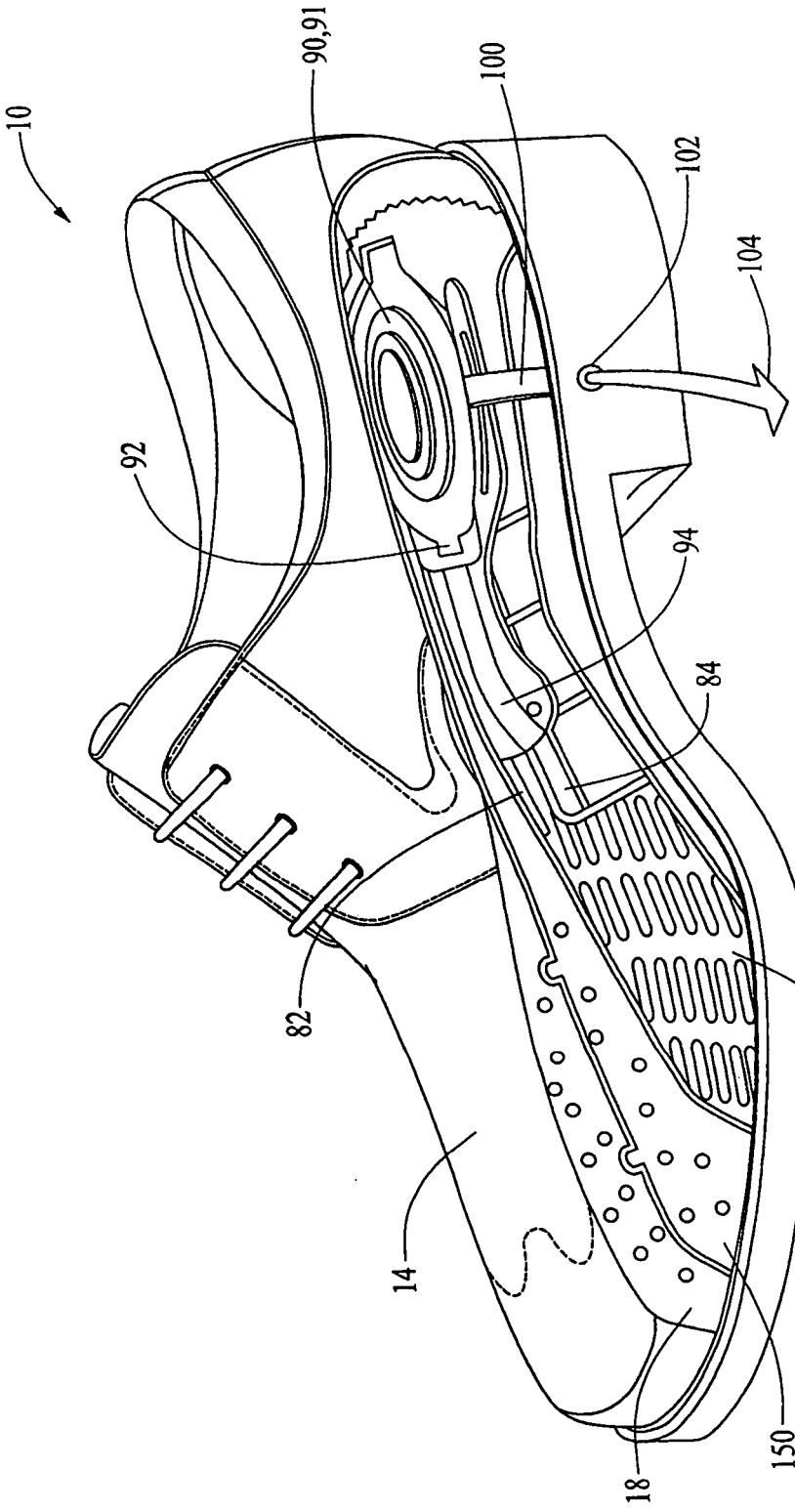


FIG.7

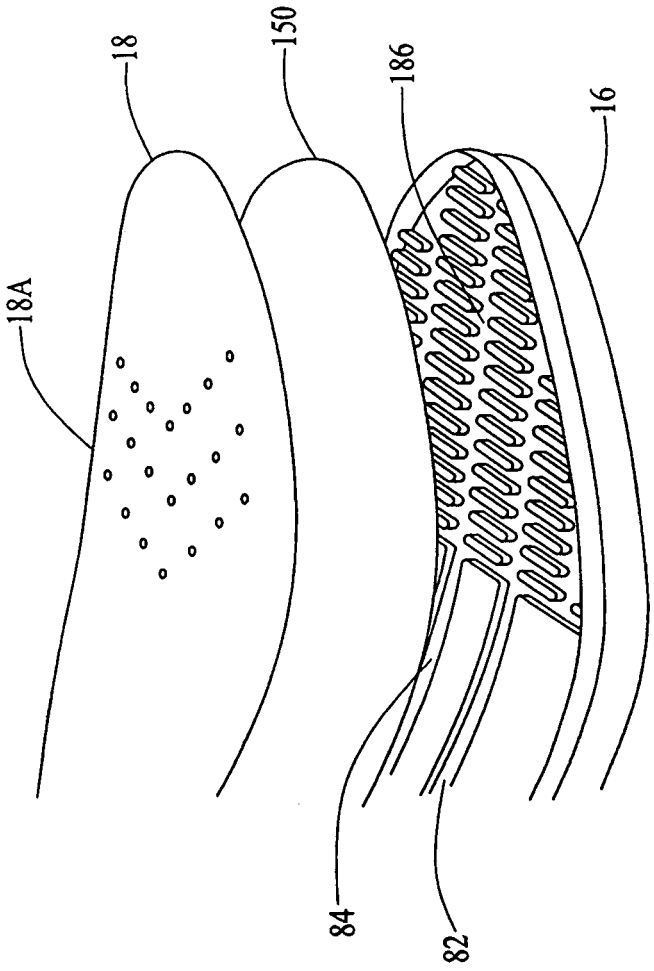


FIG.8