A ventilation device is provided in a shoe. The device includes a porous member fitted in a receiving means in a rear of the insole, an intake pipe interconnected between a first check valve and the porous member, and a discharge pipe interconnected between a second check valve and porous member. Foul air is driven from porous member to the outside through the intake pipe and second check valve when the porous member is compressed by a foot. Conversely, fresh air is drawn into the porous member from the outside through the first check valve and intake pipe when the porous member is returned from the compressed state to an original state as the foot stops exerting force thereon.
SHOES HAVING VENTILATION DEVICES

This application is a continuation-in-part of U.S. patent application Ser. No. 09/960,319, filed Sep. 24, 2001.

FIELD OF THE INVENTION

The present invention relates to shoes and more particularly to a pair of shoes having improved ventilation devices.

BACKGROUND OF THE INVENTION

It is known that microorganisms may grow inside a shoe after wearing because salty components of sweat secreted from the foot accumulate therein. It is also understood that such shoes full of foul air are not hygienic. Hence, an endless array of shoes having ventilation arrangements are commercially available for eliminating the above drawback.

But such conventional shoes are unsatisfactory for the purpose for which the invention is concerned for the following reasons: a) Its ventilation performance is not high because air brought in is mixed with air given out in the ventilation cycle. In fact, most of such products are merely a gimmick of one sort or another. b) Manufacturing cost is high due to its complex construction. c) The design of one type of shoe is not aesthetic because a discharge pipe is projected from the toe of shoe. d) Poor adaptability with respect to various sizes of shoes.

Thus, it is desirable to provide a pair of shoes having improved ventilation devices in order to overcome the above drawbacks of the prior art.

SUMMARY OF THE INVENTION

It is therefore an object of the present invention to provide a ventilation device in either one of a pair of shoes, an insole of each shoe having receiving means, the device comprising a porous member fitted in the receiving means; an intake pipe having one end coupled to the porous member; a discharge pipe having one end coupled to the porous member; a first check valve connected to the other end of the intake pipe being in communication with the outside; a second check valve connected to the other end of the discharge pipe being in communication with the outside; wherein air is driven from the porous member to the outside through the intake pipe and the second check valve when the porous member is compressed by foot; and air is brought in from the outside through the intake pipe, and the intake pipe when the porous member expands, i.e., is returned from the compressed state to an original state, as the user’s foot stops exerting force thereon.

The above and other objects, features and advantages of the present invention will become apparent from the following detailed description taken with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an exploded view of an insole incorporating a first preferred embodiment of a ventilation device according to the invention;

FIG. 2 is a perspective view of the assembled insole of FIG. 1;

FIG. 3 is a cross-sectional view of FIG. 2;

FIG. 4 is a cross-sectional view of the porous member, intake pipe, and discharge pipe of FIG. 1;

FIGS. 5A and 513 are perspective views showing the insole mounted in two different types of shoes;

FIGS. 6A and 6B are views similar to FIG. 4 showing air giving off by the porous member and air sucked into the porous member, respectively;

FIG. 7 is a perspective view showing the provision of holes on the base of the insole;

FIG. 8 is a perspective view of a second preferred embodiment of a ventilation device for a shoe according to the invention;

FIG. 9 is a cross-sectional view of the porous member, intake pipe, and discharge pipe of FIG. 8;

FIG. 10 is a perspective view showing the provision of branch pipes in the discharge pipe of FIG. 8;

FIG. 11 is a perspective view showing the insole being adapted to different sizes of shoes;

FIG. 12 is a perspective view showing the insole mounted in a shoe;

FIG. 13 is an exploded view showing the FIG. 8 ventilation device mountable in a double insole;

FIG. 14 is a perspective view showing the assembled ventilation device and double insole of FIG. 13;

FIG. 15 is a cross-sectional view of FIG. 14;

FIG. 16 is an exploded view showing another configuration of the lower insole of FIG. 13;

FIG. 17 is a perspective view showing another configuration of the discharge pipe of the invention;

FIG. 17A is an enlarged fragmentary view of the discharge pipe of FIG. 17.

FIG. 18 is a bottom view of a ventilating insole of an alternative preferred embodiment of the invention.

FIG. 19 is a top view of the ventilating insole of FIG. 18.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIGS. 1 to 7, there is shown an insole 10 incorporating a first preferred embodiment of a ventilation device constructed in accordance with the invention. Insole 10 comprises a base 1 having an opening 11 on the rear, an intake pipe 3, a discharge pipe 4, a porous member 2 with an inside formed of foam 23 or elastic elements, porous member 2 being fitted in the opening 11 and including an inlet connector 21 coupled to one end of intake pipe 3, an outlet connector 22 coupled to one end of discharge pipe 4, a first check valve 51 interconnected between the other end of intake pipe 3 and one of a plurality of holes 101 on the external side of shoe 100 (FIG. 5A) or an appropriately meshed fabric member 102 for bringing in fresh air from outside (FIG. 5B), and a second check valve 52 coupled to the other end of discharge pipe 4 (i.e., at the bottom of shoe) for letting air out. The ventilation mecha-
nism of the invention will be described in detail by referring to FIGS. 6A and 6B specifically. As shown in FIG. 6A, air is driven out of porous member 2 as the bottom of the wearer’s foot presses down on porous member 2 (i.e., porous member 2 is compressed). As a result, foul air is driven out of second check valve 52 through discharge pipe 4. Conversely, as shown in FIG. 6B, air is drawn into intake pipe 3 through first check valve 51 as the bottom of the foot stops exerting force on porous member 2 and porous member 2 expands (i.e., porous member 2 is returned to normal position). As a result, fresh air is fed to porous member 2 through intake pipe 3. Hence, air brought in is not mixed with air given out in a ventilation cycle. Such ventilation cycle is repeated during walking. As a result, a satisfactory ventilation effect is achieved, thereby forestalling the growth of microorganisms in shoes.

[0029] Referring to FIG. 7 specifically, for the purpose of enhancing ventilation a plurality of additional holes 12 are provided on base 1. As such, fresh air is brought in to contact the bottom of the wearer’s foot directly and foul air is driven out through multiple holes 12 during walking.

[0030] Referring to FIGS. 8 to 12, there is shown a second preferred embodiment of ventilation device of shoe 100. The characteristics of the embodiment are detailed below. A third check valve 53 is provided on a position on discharge pipe 4 other than the other (i.e., external) end of discharge pipe 4. Also, first check valve 51 is provided on a position on intake pipe 3 other than the other (i.e., external) end of intake pipe 3. Further, a plurality of short branch pipes 41 (three are shown) are perpendicular to and in communication with discharge pipe 4 for driving out more foul air the inside shoe (FIG. 10). Moreover, a user may cut base 1 of insole 10 to fit the size of foot that may be accommodated by the insole (FIG. 11). For mass production in a factory, intake pipe 3 is embedded inside the compartmented outsole 104 with first check valve 51 at the other end of intake pipe 3 coupled to hole 103 on the external surface of outsole 104 (FIG. 12).

[0031] Referring to FIGS. 13 to 17, there is shown the FIG. 8 ventilation device mounted in a double insole 10 (i.e., upper insole 1 and lower insole 6). As shown in FIG. 15, the ventilation device is sandwiched between upper and lower insoles 1 and 6 with porous member 2 projected above opening 11. This can bring a better degree of comfort to a user since the buffering effect on the bottom of foot is enhanced. For enhancing the securing of the ventilation device between upper and lower insoles 1 and 6, a first recess 13 with top slightly raised is provided on the rear of upper insole 1 and a longer slit 61, a short slit 62, and a second recess 63 are provided on lower insole 6. Hence, porous member 2 is received in recesses 13 and 63, discharge pipe 4 is received in longer slit 61, and intake pipe 3 is received in shorter slit 63 respectively. This may also facilitate assembly in mass production. Additionally, a slip resistant arrangement may be provided on the bottom of lower insole 6.

[0032] Referring to FIGS. 17 and 17A, there is shown another configuration of discharge pipe 4 of the invention in which a plurality of apertures 42 are equally spaced along discharge pipe 4. This can also enhance the escape of foul air.

[0033] FIGS. 18 and 19 are, respectively, a bottom view and a top view of a ventilating insole according to another preferred embodiment of the invention. As shown in FIGS. 18 and 19, the ventilating insole 200 includes a bladder 210, an air intake passage 220, an intake valve 230, an air discharge passage 240, and a discharge valve 250. The ventilating insole 200 includes fore, arch, and heel portions 202, 204, and 206. The bladder 210 is at the heel portion 206 of the ventilating insole 200. The ventilating insole 200 further includes an elastic means, not shown in the figures, which is situated in or makes up the bladder 210 to cause the bladder 210 to be elastic. The elastic means may be latex or other materials with good elastic properties.

[0034] The air intake passage 220 is in the lower surface of the ventilating insole 200. The air intake passage 220 is coupled with the bladder 210, and the other end of the air intake passage 220 is coupled with the intake valve 230. In one preferred version of this embodiment, the intake valve 230 is on the lower surface and at the arch portion 204 of the ventilating insole 200, as shown in FIG. 18. The intake valve 230 is a one-way valve.

[0035] The discharge passage 240 is in the upper surface of the ventilating insole 200. One end of the discharge passage 240 is coupled to the bladder 210, while the other end of the discharge passage 240 is coupled with the discharge valve 250. The discharge valve 250 is a one-way valve, and is on the upper surface of the ventilating insole 200. The ventilating insole 200 may further comprise at least one ventilating capillary opening 260 on the upper surface. The ventilating capillary opening 260 is coupled with the discharge valve 250. Referring to FIG. 19, in a preferred variation of this embodiment, the ventilating capillary opening 260 may be a trench on the upper surface of the ventilating insole 200. The cover layer has many porous portions along the ventilating capillary opening 260.

[0036] The basic operation of the ventilating insole of this embodiment is as follows: according to the design of this embodiment, when the heel strikes the ground, the bladder 210 is compressed and air in the bladder 210 is expelled through the air discharge passage 240 and out the ventilating capillary opening 260. During expulsion of air, the intake valve 230 closes and the discharge valve 250 opens under pressure. As the foot is lifted from the ground and pressure removed from the bladder 210, the discharge valve 250 is closed and the intake valve 230 is opened by the vacuum created by the expansion of the bladder 210. In other words, when the heel strikes the ground, air in the bladder 210 is expelled through the ventilating capillary opening 260 to the toes and to the entire sole. When the foot is lifted from the ground, fresh air is sucked from the outside of the shoe with the ventilating insole 200 through the arch portion 204 and the intake valve 230 into the bladder 210. Therefore, according to the design of this embodiment, the insole can provide a breathable surrounding to the foot, and made the foot comfortable and healthy. In the above-mentioned breathable surrounding, the insole of the embodiment not only can lower the temperature in the shoe, but also freshen and dry the inside of the shoe. Thus, many diseases, such as mycetoma, or peculiar smells can be kept from the foot by employing the insole of this embodiment.

[0037] Moreover, according to the design of this embodiment, because the bladder is located at the heel portion, the bladder can absorb shocks and provide a cushion function. Furthermore, due to the design of this embodiment, the
ventilating insole of this embodiment can be easily trimmed to fit different foot sizes and the ventilating function will not be decreased. Additionally, the cost of producing or buying a pair of ventilating insoles constructed in accordance with the principles of the invention is far less than those of a conventional ventilating shoe, and one pair of the ventilating insoles of the invention can be used in many shoes. Thus, the ventilating insole of this invention is more economical than a ventilating shoe.

[0038] While the invention has been described by means of specific embodiments, numerous modifications and variations could be made thereto by those skilled in the art without departing from the scope and spirit of the invention set forth in the claims.

What is claimed is:
1. A structure of a ventilating insole, wherein said ventilating insole comprises fore, arch, and heel portions, comprising:
   a bladder at said heel portion of said ventilating insole;
   an air intake passage coupled with said bladder, wherein said air intake passage is in a first surface of said ventilating insole;
   an intake valve coupled with said air intake passage;
   an air discharge passage coupled with said bladder, wherein said air discharge passage is in a second surface of said ventilating insole; and
   a discharge valve coupled with said discharge passage.
2. The structure according to claim 1, wherein said intake passage is in an upper surface of said ventilating insole.
3. The structure according to claim 1, wherein said discharge passage is in a lower surface of said ventilating insole.
4. The structure according to claim 1, wherein said bladder further comprises an elastic means for providing said bladder with elasticity.
5. The structure according to claim 1, further comprising at least one ventilating capillary opening on said second surface of said ventilating insole, wherein said ventilating capillary opening is in communication with said discharge passage.
6. The structure according to claim 1, wherein said intake valve is a one-way valve.
7. The structure according to claim 1, wherein said discharge valve is a one-way valve.
8. The structure according to claim 1, wherein said air intake passage is at said arch portion of said ventilating insole.
9. The structure according to claim 1, further comprising a cover layer on the second surface of said ventilating insole.