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(54) **FUNCTIONAL SHOE HAVING A CUSHIONING FUNCTION AND AN AIR CIRCULATION FUNCTION**

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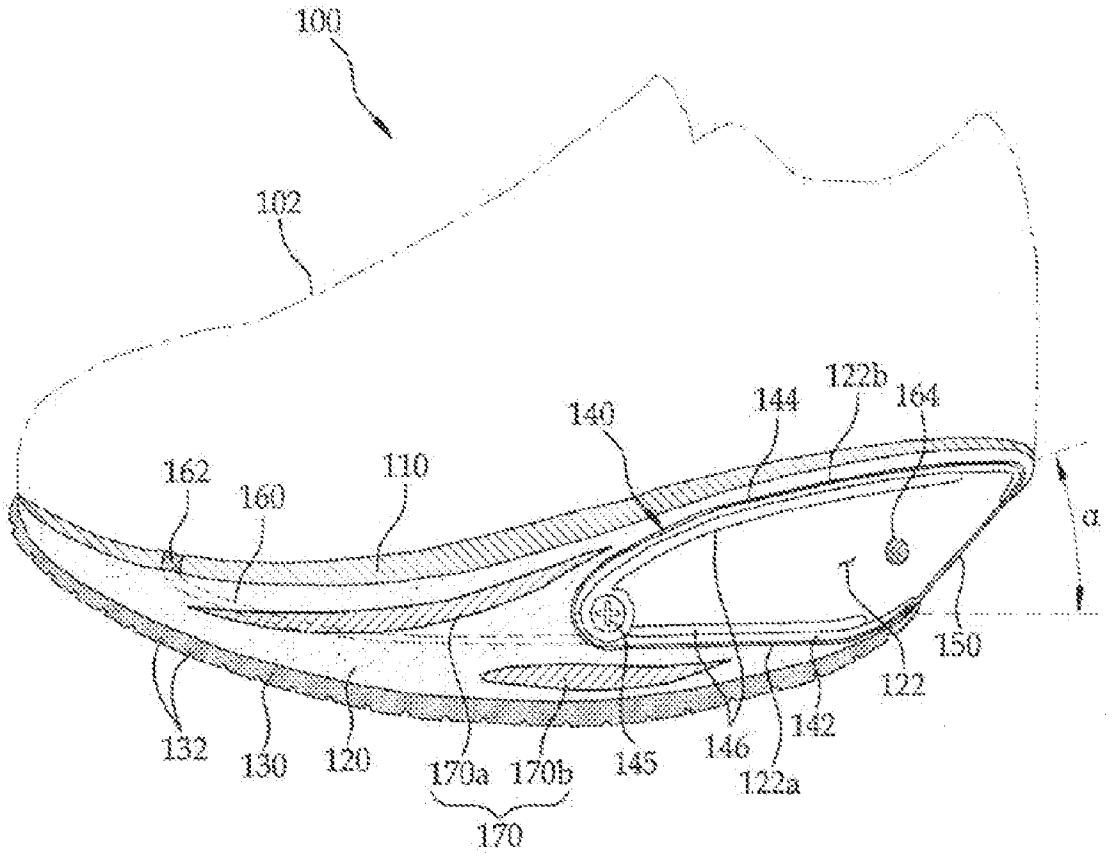
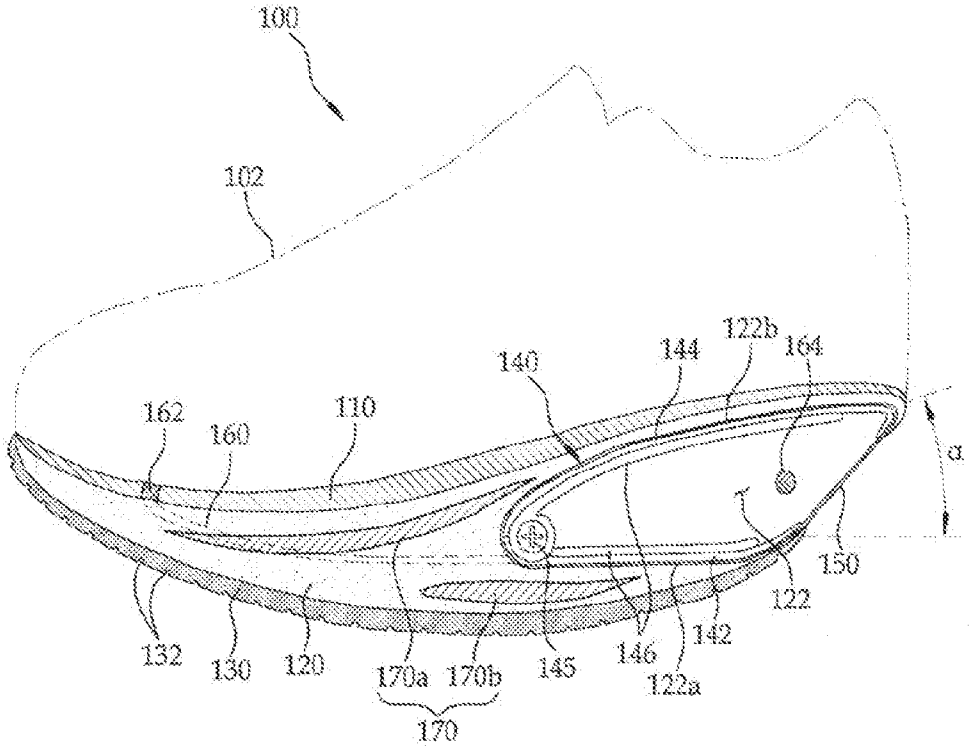
(57) **ABSTRACT**

A functional shoe pertains to a cushioning function and an air circulation function, which integrally performs the cushioning function and the air circulation function. The functional shoe includes: an insole (**110**) and a midsole (**120**) having a tunnel portion (**122**). The tunnel portion (**122**) has a lower surface (**122***a*) and an upper surface (**122***b*) having a predetermined angle (α) with the lower surface (**122***a*); an outsole (**130**) having an anti-slip tread (**132**); a foldable resilient member (**140**) having a support portion (**142**) for supporting the lower surface (**122***a*) of the tunnel portion (**122**), and a rotating portion (**144**). The rotating portion (**144**) is resiliently folded by the load being applied thereto; a sealing member (**150**); and an air channel (**160**) having one end communicated to the closed tunnel (**122**) and the other end located at the front end of the insole (**110**).



[Fig. 1]


100
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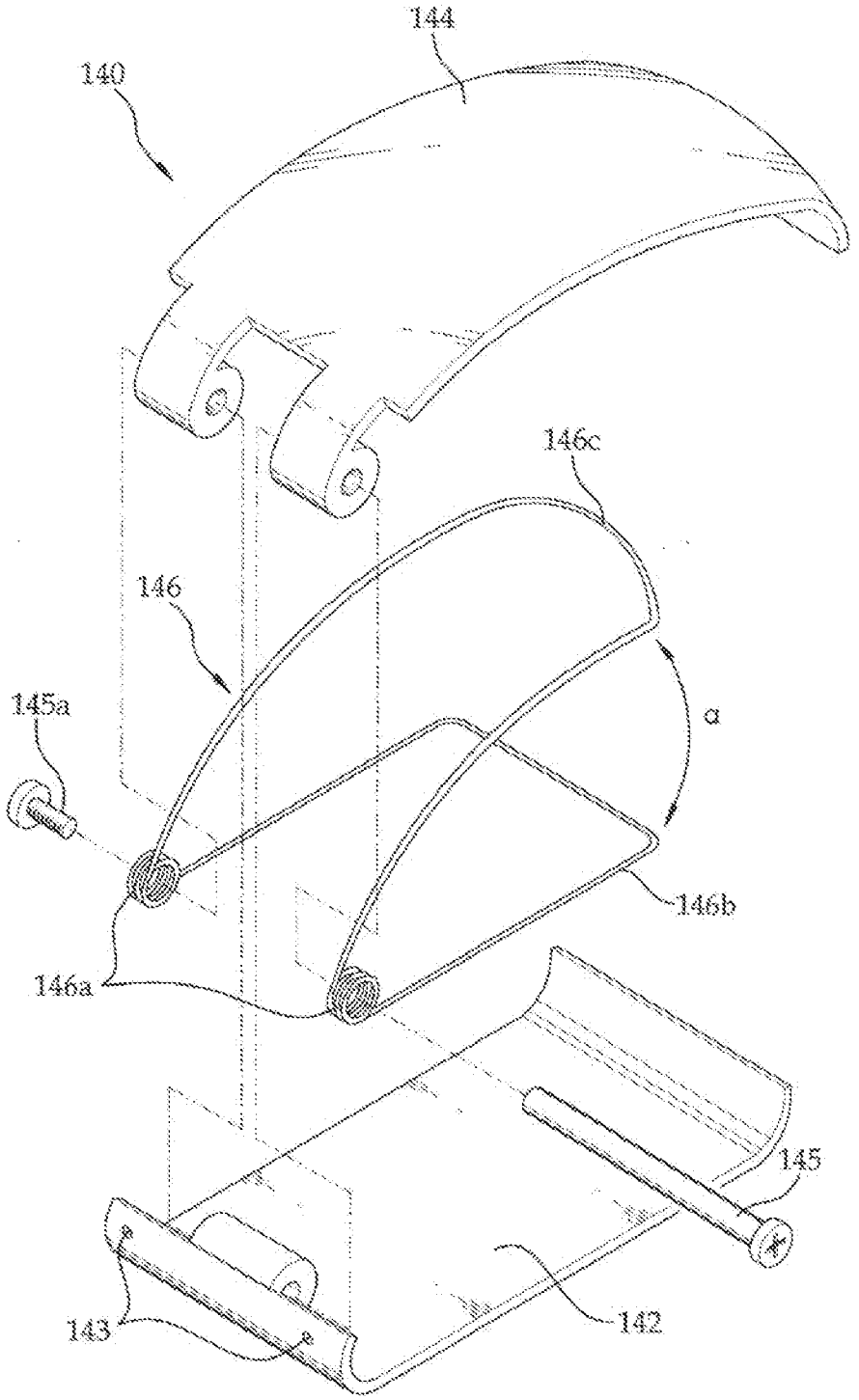
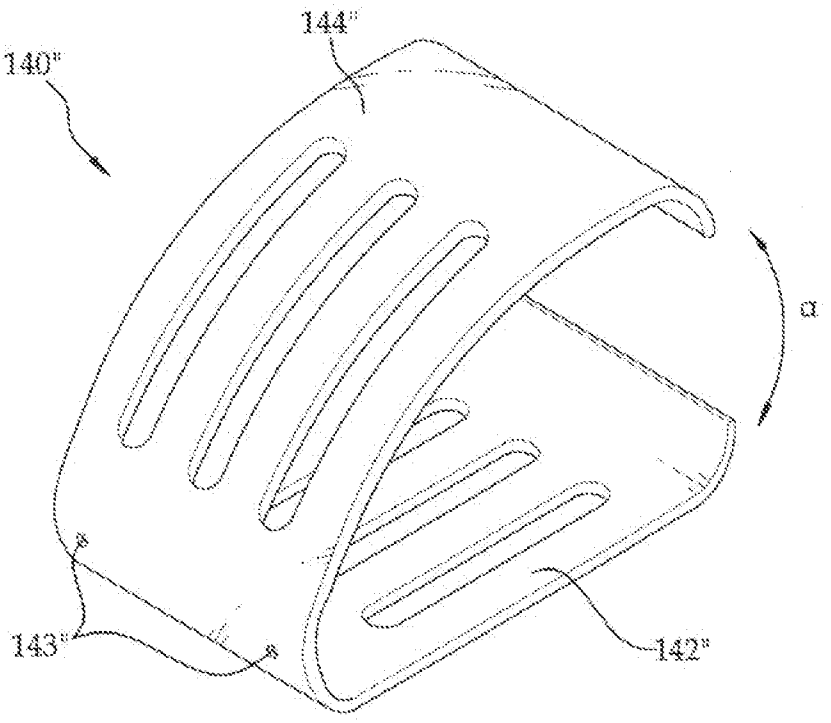
[Fig. 2]



[Fig. 3]



# FUNCTIONAL SHOE HAVING A CUSHIONING FUNCTION AND AN AIR CIRCULATION FUNCTION

## TECHNICAL FIELD

**[0001]** The present invention relates to a shoe, and more particularly, to a functional shoe having cushioning and air circulation functions capable of providing good landing comfort and pleasant wearing comfort by simultaneously performing the cushioning and air circulation functions.

## BACKGROUND ART

**[0002]** In shoes, one of daily necessities, as the standard of living is increased, various functional shoes based on an ergonomic design beyond a simple function for protecting the feet are being developed. Major functions of the functional shoes may include a cushioning function, an air circulation function, and so on.

**[0003]** The cushioning function is provided to absorb impact applied to a heel of a shoe that first comes in contact with the ground surface upon walking, improving landing comfort. That is, the impact applied from the heel through the cushioning function is attenuated to reduce fatigue felt by a walker. As a conventional art for the cushioning function, a method of manufacturing a sole such as a midsole or an outsole using an elastic material such as polyurethane or synthetic rubber, or a method of vertically installing a plurality of coil springs in a heel of a shoe, is mainly used. However, when elastic material is used, manufacturing cost is increased, and elasticity of the elastic material is gradually reduced as time elapses. In addition, since the method of installing coil springs in the heel is limited to a resilient distance of the spring, a sufficient cushioning function cannot be expected and a structure thereof becomes complex, making it difficult to manufacture the shoe.

**[0004]** The air circulation function is provided to remove moisture in the shoe and improve wearing comfort. That is, the air circulation function is provided to dry moisture due to sweat generated from the foot of a walker to prevent breeding of various bacteria, or prevent skin ailments such as athlete's foot. One of conventional techniques for the air circulation function is a method of manufacturing leather uppers of a shoe mainly using a breathable material. However, since this technique is a passive method, air circulation efficiency is largely decreased. Accordingly, a technique of air-circulating the inside of the shoe through a more active method is needed.

## DISCLOSURE

### Technical Problem

**[0005]** In order to solve the foregoing and/or other problems, it is an aspect of the present invention to provide a functional shoe having cushioning and air circulation functions capable of remarkably improving shock-absorbing efficiency and air circulation efficiency, and increasing durability and production efficiency of the shoe through a simple structure.

**[0006]** In addition, it is another aspect of the present invention to provide a functional shoe having cushioning and air circulation functions capable of implementing rolling movement and sterilization action of the shoe to maximize landing comfort and wearing comfort.

### Technical Solution

**[0007]** The foregoing and/or other aspects of the present invention may be achieved by providing a functional shoe having cushioning and air circulation functions, including: an insole (**110**) having an upper surface to which leather uppers (**102**) are adhered; a midsole (**120**) including a tunnel portion (**122**) formed at a rear end thereof, and having a lower side surface (**122***a*) in contact with a lower surface of the insole (**110**) and formed parallel to the ground surface and an upper side surface (**122***b*) configured to form a predetermined angle ($\alpha$) with respect to the lower side surface (**122***a*); an outsole (**130**) having a tread (**132**) adhered to a lower surface of the midsole (**120**) and configured to prevent slippage thereof; a foldable resilient member (**140**) having a support section (**142**) configured to support a lower side surface (**122***a*) of the tunnel portion (**122**), and a pivot section (**144**) configured to support an upper side surface (**122***b*) of the tunnel portion (**122**), wherein the pivot section (**144**) is resiliently folded by an applied load; a sealing member (**150**) installed to seal the tunnel portion (**122**); and an air channel (**160**) having one end in communication with the sealed tunnel portion (**122**) and the other end disposed at a front side of the insole (**110**).

**[0008]** In addition, in the functional shoe having cushioning and air circulation functions according to the present invention, the foldable resilient member (**140**) includes: a pivot shaft (**145**); the support section (**142**) and the pivot section (**144**) hinged by the pivot shaft (**145**); and a resilient section (**146**) having a torsional coil spring (**146***a*) inserted into the pivot shaft (**145**), a first extension unit (**146***b*) extending from the torsional coil spring (**146***a*) to support the support section (**142**), and a second extension unit (**146***c*) extending from the coil spring (**146***a*) to support the pivot section (**144**). Here, the foldable resilient member (**140**) may be a flat spring in which the support section (**142**) and the pivot section (**144**) are integrally formed.

**[0009]** Further, in the functional shoe having cushioning and air circulation functions according to the present invention, a discharge check valve (**162**) is installed at one end of the air channel (**160**), and a suction check valve (**164**) is installed at one side of the sealing member (**150**). Here, the suction check valve (**164**) may be installed at one end of the air channel (**160**), and the discharge check valve (**162**) may be formed at one side of the sealing member (**150**).

**[0010]** Furthermore, in the functional shoe having cushioning and air circulation functions according to the present invention, the midsole (**120**) is curved such that a front side and a rear side are spaced apart from the ground surface.

**[0011]** In addition, in the functional shoe having cushioning and air circulation functions according to the present invention, the midsole (**120**) has at least one high elastic or solid reinforcement member (**170**) configured to maintain a shape of the midsole (**120**) and prevent a fracture of the foldable resilient member (**140**) from a front side of the midsole (**120**).

**[0012]** Further, in the functional shoe having cushioning and air circulation functions according to the present invention, the insole (**110**) contains an inorganic material of emitting far-infrared light, or is anion-treated.

### Advantageous Effects

**[0013]** As described above, the functional shoe having the cushioning and air circulation functions according to the present invention has a foldable resilient member, and thus,

impact absorption efficiency can be improved to provide good landing comfort. At the same time, the inside of the shoe can be actively air-circulated to remarkably improve air circulation efficiency, and thus, the inside of the shoe can be maintained at a comfortable state to improve wearing comfort.

**[0014]** In addition, since the foldable resilient member according to the present invention has a simple structure, durability and production efficiency of the shoe can be remarkably improved.

**[0015]** Further, effective walking through natural rolling movement becomes possible, and wearing comfort can be maximized through discharge of far-infrared light or anion from the insole.

## DESCRIPTION OF DRAWINGS

**[0016]** The above and other aspects and advantages of the present invention will become apparent and more readily appreciated from the following description of exemplary embodiments, taken in conjunction with the accompanying drawings of which:

**[0017]** FIG. **1** is a side view showing major parts of a functional shoe having cushioning and air circulation functions according to an embodiment of the present invention, while an insole, a midsole and an outsole are cut;

**[0018]** FIG. **2** is an exploded perspective view showing a foldable resilient member of FIG. **1**; and

**[0019]** FIG. **3** is a perspective view showing another example of the foldable resilient member.

**[0020]**

<Description of Major Reference Numerals>

| | |
|---|---|
| 100: functional shoe having cushioning and air circulation functions | |
| 102: leather uppers | |
| 110: insole | 120: midsole |
| 122: tunnel portion | 130: outsole |
| 132: tread | 140', 140": foldable resilient member |
| 142, 142": support section | 144, 144": pivot section |
| 145: pivot shaft | 145a: pivot shaft fixing member |
| 146: resilient section | 146a: torsional coil spring |
| 146b: first extension unit | 146c: second extension unit |
| 150: sealing member | 160: air channel |
| 162: discharge check valve | 164: suction check valve |
| 170: elastic reinforcement member | |

## MODE FOR INVENTION

**[0021]** Reference will now be made in detail to the embodiments of the present invention, examples of which are illustrated in the accompanying drawings. However, it will be apparent to those skilled in the art that the following embodiments can be readily understood and modified into various types, and the scope of the present invention is not limited to the embodiments. Like elements are designated by like reference numerals throughout the specification as possible even though they are shown in the other drawings.

**[0022]** First, a configuration of a functional shoe having cushioning and air circulation functions according to an embodiment of the present invention will be described with reference to the accompanying drawings.

**[0023]** FIG. **1** is a side view showing major parts of the functional shoe having cushioning and air circulation functions according to the embodiment of the present invention, while an insole, a midsole and an outsole are cut, and FIG. **2** is an exploded perspective view showing a foldable resilient member of FIG. **1**. As shown in FIG. **1**, a functional shoe **100** having cushioning and air circulation functions according to an embodiment of the present invention generally includes an insole **110**, a midsole **120**, an outsole **130**, a foldable resilient member **140**, a sealing member **150** and an air channel **160**.

**[0024]** The insole **110** is a sole that comes in contact with the sole of a wearer. Leather uppers **102** are adhered to an edge of an upper surface of the insole **110**. In addition, the insole **110** may be adhered to an upper surface of the midsole **120**, or may be exchangeably disposed on the upper surface of the midsole **120**.

**[0025]** Meanwhile, the insole **110** contains an inorganic material that emits a far-infrared light. Far-infrared light is generally well-known to penetrate the human body to show effects such as improvement of blood circulation through thermal action, sterilization action, prevention and improvement of diabetic diseases, or the like. Moreover, effects such as deodorization, dehumidification, air cleaning, and so on, are also well-known. Such an inorganic material that emits far-infrared light may include natural barley stone such as MgO, $SiO_2$ or $ZrO_2$, ceramic, charcoal, jade, germanium, and so on. Such a far-infrared light emitting material may be formed of a fiber, which may be used to manufacture the insole **110**.

**[0026]** In addition, the insole **110** may be anion-treated to emit an anion. An anion is known to ionize and alkalize mineral elements such as calcium, sodium or potassium contained in blood, accomplishing effects such as purification of blood, improvement of blood circulation, activation of cells, fatigue recovery, pain relief, and so on.

**[0027]** The midsole **120** is disposed between the insole **110** and the outsole **130**, and formed of a material such as polyurethane or synthetic rubber having a cushioning function itself. As shown in FIG. **1**, the midsole **120** has a tunnel portion **122** opened at a rear end thereof. The tunnel portion **122** has a lower side surface **122***a* formed parallel to the ground surface, and an upper side surface **122***b* configured to form a predetermined angle $\alpha$ with respect to the lower side surface **122***a*. Here, the predetermined angle $\alpha$ of the tunnel portion **122** may be 10° to 30°.

**[0028]** Meanwhile, as shown in FIG. **1**, the midsole **120** is curved such that a front side and a rear side are spaced apart from the ground surface to enable rolling movement of the shoe **100**.

**[0029]** In addition, the midsole **120** has a reinforcement member **170** formed therein and configured to maintain a shape of the midsole **120**. The midsole **120** is repeatedly deformed to reduce elasticity thereof, and thus, recovery capability is also decreased. Accordingly, the reinforcement member **170** may be formed of a high elastic material such as synthetic rubber, or a solid material such as solid synthetic resin may be inserted into the midsole **120** to improve recovery capability. According to the embodiment, as shown in FIG. **1**, the reinforcement member **170** includes a first reinforcement member **170***a* longitudinally formed in the midsole **120**, and a second reinforcement member **170***b* formed under the tunnel portion **122**. The first reinforcement member **170***a* reinforces a front side of the midsole **120**, and the second reinforcement member **170***b* supports and reinforces the foldable resilient member **140**. As described above, the reinforcement members **170***a* and **170***b* doubly reinforce the midsole **120**, and thus, a fracture phenomenon in which a central portion of the midsole **120**, i.e., a front side of the

tunnel portion **122**, is fractured, is prevented. As a result, upon rolling movement of the shoe **100**, a shape of the midsole **120** is uniformly maintained to enable smooth rolling movement.

**[0030]** The outsole **130** is a portion that comes in contact with the ground surface, and is adhered to a lower surface of the midsole **120**. Here, the outsole **130** includes a tread **132** having a plurality of grooves and protrusions, preventing slippage thereof.

**[0031]** The foldable resilient member **140** is inserted into the tunnel portion **122** to absorb impact due to a load of the walker. According to the embodiment of the present invention, as shown in FIGS. **1** and **2**, the foldable resilient member **140** includes a plate-shaped support section **142** configured to support the lower side surface **122***a* of the tunnel portion **122**, and a plate-shaped pivot section **144** configured to support the upper side surface **122***b* of the tunnel portion **122**. Then, the support section **142** and the pivot section **144** are hinged by a pivot shaft **145**. Here, the pivot shaft **145** is fixed to a pivot shaft fixing member **145***a*. In addition, the pivot shaft **145** is disposed such that a resilient section **146** is disposed between the support section **142** and the pivot section **144**. As shown in FIG. **2**, the resilient section **146** is constituted by a pair of torsional coil springs **146***a*, and a first extension unit **146***b*) and a second extension unit **146***c* having a "C" shape and extending from the torsional coil springs **146***a*, respectively. The first extension unit **146***b* and the second extension unit **146***c* form the predetermined angle $\alpha$ and support the support section **142** and the pivot section **144**, respectively. Here, since the support section **142** supports the lower side surface **122***a* of the tunnel portion **122** formed parallel to the ground surface, the pivot section **144** is folded with respect to the relatively fixed support section **142**. Accordingly, in the foldable resilient member **140**, when the load is applied to the upper surface of the pivot section **144**, the pivot section **144** is resiliently folded by resiliency of the resilient section **146**.

**[0032]** On the other hand, as shown in FIG. **3**, the foldable resilient member **140** may be a flat spring **140"** in which a support section **142"** and a pivot section **144"** are integrally formed. That is, the flat spring **140"** is resiliently folded by elasticity of a portion thereof to which the support section **142"** and the pivot section **144"** are connected.

**[0033]** As described above, the foldable resilient member **140** may be designed by adjusting an elastic modulus of the torsional coil springs **146***a* and the flat spring **140"** in consideration of wearing comfort or impact absorption efficiency of the shoe **100**. The foldable resilient member **140** has a simple structure to enable easy manufacture. In addition, since the foldable resilient member **140** is largely deformed by the predetermined angle $\alpha$, impact absorption efficiency can be remarkably improved in comparison with the conventional art.

**[0034]** The sealing member **150** is manufactured using an elastic material to be formed in a thin film shape, acting to seal the tunnel portion **122**. As shown in FIG. **1**, the sealing member **150** is inserted into the tunnel portion **122** while completely surrounding an outer edge of the foldable resilient member **140**. On the other hand, the tunnel portion **122** can also be sealed by attaching the sealing member **150** to the tunnel portion **122** into which the foldable resilient member **140** is inserted.

**[0035]** The air channel **160** functions to bring the tunnel portion **122** in communication with air in the shoe **100**. According to the embodiment, the air channel **160** uses a hose. In addition, one end of the air channel **160** is disposed at the front side of the insole **110** to be in communication with the inside of the shoe **100**, and the other end is in communication with the tunnel portion **122** through a through-hole **143** formed in the support section **142** of the foldable resilient member **140**.

**[0036]** Check valves **162** and **164** are small valves using a thin film, which function to flow air in one direction. According to the embodiment of the present invention, as shown in FIG. **1**, the discharge check valve **162** is installed at one end of the air channel **160** disposed at the front side of the insole **110**, and the suction check valve **164** is installed at one side of the sealing member **150**. As air is continuously supplied into the inside of the shoe **100** through a pumping action of the tunnel portion **122**, the inside of the shoe **100** is ventilated.

**[0037]** On the other hand, the suction check valve **164** may be installed at one end of the air channel **160**, and the discharge check valve **162** may be installed at one side of the sealing member **150**. As the air in the shoe **100** is continuously suctioned and discharged to the outside, the inside of the shoe **100** is ventilated.

**[0038]** Hereinafter, an operation of the functional shoe **100** having cushioning and air circulation functions according to the embodiment of the present invention will be described with reference to the accompanying drawings.

**[0039]** First, the cushioning function and rolling movement of the present invention will be described.

**[0040]** When a walker wears the shoes **100** according to the embodiment of the present invention and walks, the rear side of the shoe **100** first comes in contact with the ground surface. Here, the load of the walker is applied to the heel, and the foldable resilient member **140** inserted into the tunnel portion **122** is resiliently folded to effectively absorb impact applied to the heel, remarkably improving landing comfort. Here, the midsole **120** and the outsole **130** of the shoe **100** have a curved shape spaced apart from the ground surface at the front and lower sides thereof, enabling soft landing and providing a wide landing area to reduce impact applied to the heel.

**[0041]** Next, the load of the walker after the landing is moved to the ball of the foot. Then, as the outsole **130** of the shoe **100** performs rolling movement along the ground surface, the impact still not absorbed in the foldable resilient member **140** is continuously distributed and absorbed. In addition, since the load of the wearer is gradually moved toward the ball of the heel along the curved surface of the outsole **130**, smooth and natural walking becomes possible. The resilient member **140** folded in this process is spread again by a resilient recovering force to generate a repulsive force, and thus, the foot of the walker is pushed forward. As a result, effective walking becomes possible.

**[0042]** Next, the air circulation function of the present invention will be described.

**[0043]** When the walker wears the shoes **100** according to the embodiment of the present invention and walks, the foldable resilient member **140** is folded upon landing, and simultaneously, the tunnel portion **122** of the midsole **120** is contracted. Here, the air in the tunnel portion **122** is pumped to be supplied into the shoe **100** through the discharge check valve **162** via the air channel **160**. Then, when the load applied to the foldable resilient member **140** is released, the foldable resilient member **140** is spread to the original state, and the tunnel portion **122** is expanded to the original state. Here, air is introduced through the suction check valve **164** installed at one side of the sealing member **150**. As the above processes are repeated, fresh external air is continuously introduced into

the shoe **100**, and thus, air circulation can be effectively performed to accomplish pleasant wearing comfort. In addition, in an opposite case in which the suction check valve **164** is installed at one end of the air channel **160** and the discharge check valve **162** is installed at one side of the sealing member **150**, wet air in the shoe **100** is continuously suctioned to be discharged to the outside, and the air in the shoe **100** is circulated.

**[0044]** Meanwhile, the insole **110** effectively performs deodorization, dehumidification, and an antibacterial function through air circulation and effective discharge of far-infrared light in the shoe **100**, further improving wearing comfort. In addition, foot health of the wearer such as improvement of blood circulation, prevention and improvement of diabetic diseases, and pain relief, can be enhanced through far-infrared light and anion discharged from the insole **110**.

**[0045]** The foregoing description concerns an exemplary embodiment of the invention, is intended to be illustrative, and should not be construed as limiting the invention. The present teachings can be readily applied to other types of devices and apparatuses. Many alternatives, modifications, and variations within the scope and spirit of the present invention will be apparent to those skilled in the art.

**1**. A functional shoe having cushioning and air circulation functions, comprising:

an insole (**110**) having an upper surface to which leather uppers (**102**) are adhered;

a midsole (**120**) including a tunnel portion (**122**) formed at a rear end thereof, and having a lower side surface (**122***a*) in contact with a lower surface of the insole (**110**) and formed parallel to the ground surface and an upper side surface (**122***b*) configured to form a predetermined angle ($\alpha$) with respect to the lower side surface (**122***a*);

an outsole (**130**) having a tread (**132**) adhered to a lower surface of the midsole (**120**) and configured to prevent slippage thereof;

a foldable resilient member (**140**) having a support section (**142**) configured to support a lower side surface (**122***a*) of the tunnel portion (**122**) and a pivot section (**144**) configured to support an upper side surface (**122***b*) of the tunnel portion (**122**), wherein the pivot section (**144**) is resiliently folded by an applied load;

a sealing member (**150**) installed to seal the tunnel portion (**122**); and

an air channel (**160**) having one end in communication with the sealed tunnel portion (**122**) and the other end disposed at a front side of the insole (**110**).

**2**. The functional shoe having cushioning and air circulation functions according to claim **1**, wherein the foldable resilient member (**140**) comprises:

a pivot shaft (**145**);

the support section (**142**) and the pivot section (**144**) hinged by the pivot shaft (**145**); and

a resilient section (**146**) having a torsional coil spring (**146***a*) inserted into the pivot shaft (**145**), a first extension unit (**146***b*) extending from the torsional coil spring (**146***a*) to support the support section (**142**), and a second extension unit (**146***c*) extending from the coil spring (**146***a*) to support the pivot section (**144**).

**3**. The functional shoe having cushioning and air circulation functions according to claim **1**, wherein the foldable resilient member (**140**) is a flat spring in which the support section (**142**) and the pivot section (**144**) are integrally formed.

**4**. The functional shoe having cushioning and air circulation functions according to claim **1**, wherein a discharge check valve (**162**) is installed at one end of the air channel (**160**), and a suction check valve (**164**) is installed at one side of the sealing member (**150**).

**5**. The functional shoe having cushioning and air circulation functions according to claim **1**, wherein a suction check valve (**164**) is installed at one end of the air channel (**160**), and a discharge check valve (**162**) is formed at one side of the sealing member (**150**).

**6**. The functional shoe having cushioning and air circulation functions according to claim **1**, wherein the midsole (**120**) is curved such that a front side and a rear side are spaced apart from the ground surface.

**7**. The functional shoe having cushioning and air circulation functions according to claim **1**, wherein the midsole (**120**) has at least one high elastic or solid reinforcement member (**170**) configured to maintain a shape of the midsole (**120**) and prevent a fracture of the foldable resilient member (**140**) from a front side of the midsole (**120**).

**8**. The functional shoe having cushioning and air circulation functions according to claim **1**, wherein the insole (**110**) contains an inorganic material of emitting far-infrared light or is anion-treated.

**9**. The functional shoe having cushioning and air circulation functions according to claim **2**, wherein a discharge check valve (**162**) is installed at one end of the air channel (**160**), and a suction check valve (**164**) is installed at one side of the sealing member (**150**).

**10**. The functional shoe having cushioning and air circulation functions according to claim **3**, wherein a discharge check valve (**162**) is installed at one end of the air channel (**160**), and a suction check valve (**164**) is installed at one side of the sealing member (**150**).

**11**. The functional shoe having cushioning and air circulation functions according to claim **2**, wherein a suction check valve (**164**) is installed at one end of the air channel (**160**), and a discharge check valve (**162**) is formed at one side of the sealing member (**150**).

**12**. The functional shoe having cushioning and air circulation functions according to claim **3**, wherein a suction check valve (**164**) is installed at one end of the air channel (**160**), and a discharge check valve (**162**) is formed at one side of the sealing member (**150**).

**13**. The functional shoe having cushioning and air circulation functions according to claim **6**, wherein the midsole (**120**) has at least one high elastic or solid reinforcement member (**170**) configured to maintain a shape of the midsole (**120**) and prevent a fracture of the foldable resilient member (**140**) from a front side of the midsole (**120**).

* * * * *