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(54) DEVICE FOR INTERNAL VENTILATION OF A SHOE

VORRICHTUNG ZUR INTERNEN BELÜFTUNG EINES SCHUHS

DISPOSITIF POUR LA VENTILATION INTERNE D'UNE CHAUSSURE

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Description

[0001] The present invention relates to a device for internal ventilation of a shoe, in particular a device which can be combined with an outsole and which allows the forced circulation of air inside a shoe.

[0002] Said invention also relates to a shoe containing a device for internal ventilation of a shoe.

[0003] At present, synthetic materials are widely used for the manufacture of sports shoes and walking shoes. These materials have made it possible to increase productivity and reduce manufacturing costs. Moreover, with these materials it has been possible to produce shoes which adapt better to the form of the foot and increase the comfort perceived by the user. Compared to natural materials, however, these synthetic materials are less breathable and therefore their use increases the problems associated with excessive and undesirable sweating of the foot. Components such as rubber outsoles, thermoformed insoles and water-repellent counters in fact thermally isolate the foot from the external environment, preventing almost entirely any exchange of heat between the inside and outside of the shoe. Consequently, it is not possible to disperse the heat which, as is known, is generated inside the shoe as a result of the movements performed by the foot when walking or running.

[0004] This heat results in an increase in temperature which in turn increases sweating of the foot and the relative humidity inside the shoe. Heat and high relative humidity are the cause of discomfort for the user since there is no longer a healthy and hygienically clean and dry environment inside the shoe. This discomfort is increased in the case of prolonged and particularly intense use of the shoe.

[0005] At present the market offers various devices and methods for favouring the circulation of air inside a shoe. These devices, however, although well-established, are not without drawbacks.

[0006] One of the technical solutions proposed consists in perforating the tread of an outsole and arranging a breathable membrane between the tread and insole or between the tread and midsole. The membrane, on the one hand, ensures impermeability of the sole and, on the other hand, allows the excess humidity which has formed inside the shoe to escape through the holes formed in the tread. The main disadvantage of this device consists in the fact that the holes formed in the tread, during the course of normal use of the shoe, may easily become blocked by substances present on the ground. Dirt, mud, dust, sand or similar substances may in fact obstruct the holes, limiting or preventing entirely any communication between the inside of the shoe and the external environment. It should be noted that, owing to the small diameter of the holes, it is difficult, if not impossible, for the user to free the holes from any external bodies. This operation, which can only be performed with the aid of pointed tools, could in fact damage the membrane. Another disadvantage consists in the fact that the membrane, at the point where the outsole of the foot flexes, over time may deteriorate until tearing occurs. The shoe, as a result, is no longer impermeable and water is able to pass through the outsole, wetting the user's foot.

[0007] Another technical solution proposed envisages the use of a pumping device which is positioned in a suitable seat formed inside the outsole. This device is able to suck out the hot and moist air present inside the shoe and expel it externally thereby ensuring a ventilated environment internally. The pumping device is operated by the movement of the user's foot performed when walking or running. Said device is composed of a suction chamber, situated in the region of the foot sole, and a pumping chamber, situated in the heel region, these being connected together by means of a duct. The air is sucked from inside the shoe by means of the suction chamber and via the duct is conveyed towards the pumping chamber which alternately sucks air from the duct and expels it externally. A first non-return valve is arranged between the suction chamber and the pumping chamber; a second non-return valve is arranged between the pumping chamber and the exterior. These valves ensure that the air flow is able to flow in one direction only, from the inside towards the outside of the shoe. One disadvantage of this device consists in the fact that the ventilation effect is limited. Since no fresh air is introduced into the shoe, the foot continues to remain inside an environment which is characterized by a relatively high temperature and relative humidity.

[0008] A further technical solution proposed envisages the use of a pumping device comprising a suction chamber, arranged in the heel zone, an inlet valve, an outlet valve, a duct and a plurality of grooves arranged on the sole zone. The pumping chamber has a channel which connects it to the outside of the shoe. When the user walks or runs, the air sucked in from the outside is conveyed, via the duct and the grooves, inside the shoe. The valves ensure that the air flow is able to flow in one direction only, from the outside towards the inside of the shoe. On rainy or wet days, however, it may happen that the air introduced inside the shoe is characterized by a degree of relative humidity which is slightly less than if not greater than the degree of humidity present in the shoe. Consequently, the user obtains only a marginal benefit, if no benefit at all fro.n the introduction of air inside the shoe. A similar ventilating device is disclosed in US 2006/0143943.

[0009] The object of the present invention is therefore to overcome the drawbacks of the prior art.

[0010] In particular, one aim of the present invention is to provide a device which ensures efficient ventilation of the shoe so as to avoid excessive and undesirable sweating of the foot.

[0011] Moreover, one aim of the present invention is to limit the relative humidity of the air introduced inside the shoe.

[0012] Moreover, one aim of the present invention is

to provide a device able to introduce a deodorizing or scented substance inside the shoe so as to eliminate the stale odour produced by excessive sweating.

[0013] Moreover, one aim of the present invention is to provide a device able to provide a benefit for the user, also when the user is resting, i.e. when the pumping device is not being operated by the movement of the foot.

[0014] A further aim of the present invention is to provide a shoe which is able to ensure efficient internal ventilation and in this way prevent excessive and undesirable sweating of the feet.

[0015] The abovementioned object and aims are achieved by a device for internal ventilation of the shoe according to claim 1 and by a shoe according to claim 9.

[0016] The characteristic features and further advantages of the invention will emerge from the description, provided hereinbelow, of a number of examples of embodiment, provided by way of a non-limiting example, with reference to the accompanying drawings in which:

- Figure 1 shows schematically a cross-sectional view of a shoe according to the invention;
- Figure 2 shows schematically a cross-sectional view of a device for internal ventilation of a shoe according to the invention;
- Figure 3 shows schematically the cross-section along the line III-III of Figure 2;
- Figure 4 shows schematically the cross-section along the line IV-IV of Figure 2;
- Figure 5 shows a perspective view of an embodiment of the device according to the invention;
- Figure 6 shows a perspective view of another embodiment of the device according to the invention;
- Figure 7 shows a cross-sectional view of a further embodiment of the device according to the invention.

[0017] The present invention relates to a device 20 for internal ventilation of a shoe 10, where shoe is understood as being any type of shoe, be it of the low or high type or designed for sporting use or walking.

[0018] The description of the device 20 and its individual components which will be provided below relates to a shoe 10 used correctly. In particular, "front" will be used to indicate the part of the device, or of its individual components, which is relatively closer to the toe zone of the foot, while "rear" will be used to indicate the part of the device, or of its individual components, which is relatively closer to the heel. Similarly, "upper" will be used to refer to the part of the device, or of its individual components, which is relatively distant from the ground, while "lower" will be used to indicate the part of the device, or of its individual components, which is relatively closer to the ground. Similarly, the references "upstream" and "downstream" will be understood as being relative to the inlet 12 of the device 20 (which will be described in detail further below): namely, "upstream" will indicate a position which is relatively close to the inlet 12, while "downstream" will indicate a position which is relatively far from the inlet 12, along the travel path defined for the air by the device 20.

[0019] With reference to Figures 1 and 2, the device 20 comprises a pumping unit 40 which is suitable for sucking in air from the outside towards the inside of the shoe 10; an input chamber 70 suitable for introducing the air sucked in by the pumping unit 40, inside the shoe 10; and a connecting channel 51 suitable for conveying the air sucked in by the pumping unit 40 towards the input chamber 70. The device 20 is also characterized in that it comprises hygroscopic means 36 suitable for reducing the degree of relative humidity of the air introduced inside the shoe 10.

[0020] The device 20 may be formed as a whole, by two half-shells, for example made of polyether polyurethane, and obtained by means of injection-moulding. These half-shells may then be welded together. Welding may be performed in a manner known per se, using a highfrequency brass electrode system, along the perimetral edge 52 thereof (see accompanying figures).

[0021] In other embodiments, the device 20 may be made using different methods, for example the individual components thereof, i.e. pumping unit 40, connecting channel 50, input chamber 70, may be made separately from each other and joined together by means of an interference fit, gluing and the like.

[0022] Below reference will be made to the embodiment of the device 20 comprising the two half-shells. This embodiment advantageously may prevent there being losses in pressure along the connections between the various components.

[0023] The pumping unit 40, with reference to the accompanying figures, is preferably positioned in the heel of the shoe 10 so as to be able to advantageously make use of the movements performed by the foot during walking or running, as described below. The pumping unit 40 may comprise, in accordance with Figures 1 and 2, an inlet 12, an inlet duct 14, a first non-return valve 16, a pumping chamber 18 and a second non-return valve 22.

[0024] The inlet 12 through which the device 20 communicates with the external environment may be arranged either along the line separating the outsole 80 and upper 90 or in a wall of the outsole 80 or also in the rear part of the upper 90 of the shoe 10. In particular, the rear part of the upper is that corresponding to the counter of the shoe. Figures 1 and 2 show a particular embodiment where the inlet 12 is arranged in the rear part of the upper 90 of the shoe 10.

[0025] An impermeable and breathable polyurethane membrane may be arranged in the region of the inlet 12. A membrane of this type is marketed by W. L. Gore & Associates under the trademark Gore-Tex®. This membrane allows the air to flow from the outside towards the inside of the shoe and prevents water from passing from outside to inside.

[0026] A filter (not shown in the accompanying drawings) may also be associated with the inlet 12. This filter prevents the accumulation of impurities such as dirt, dust

and/or mud blocking up the inlet 12 so as to adversely affect operation of the device 20. Said filter, moreover, prevents the impurities from being able to penetrate inside the shoe 10. The inlet 12 may have a surround which is made of rigid or semi-rigid material of any kind. This surround, will be visible on the shoe, may also be used to provide an aesthetic pattern on the shoe itself. The accompanying figures show a particular embodiment of the inlet 12 with an associated triangular-shaped surround.

[0027] An inlet duct 14 may be arranged downstream of the inlet 12. This duct 14 has the function of connecting the inlet 12 to a first non-return valve 16 of the pumping unit 40. The duct 14 ensures that the air supplied from outside the shoe 10, via the inlet 12, is directed towards the first non-return valve 16. Said valve 16, in a manner know per se, allows the air to flow only in the direction indicated by the arrow X in Figure 1. A pumping chamber 18 may be situated downstream of the non-return valve 16. Said pumping chamber 18, in the embodiments of the device illustrated in the accompanying figures, has an oblong form and is positioned in the heel of the shoe 10. This pumping chamber 18 may vary its form alternately from a compressed condition to a rest condition, creating internally a vacuum such as to draw air from outside the shoe 10 and vice versa. The compressed condition occurs when the user rests the weight of his/her body on the heel, while the rest condition occurs when the user rests the weight of his/her body on the metatarsus and toes of the foot.

[0028] In accordance with one embodiment (see Figure 7), a sponge 42 made of expanded polyether polyurethane material or similar materials with an open-cell structure may be inserted inside the pumping chamber 18. This sponge 42, consequently, allows the air to flow inside the pumping chamber 18 and may perform at the same time a cushioning function. The sponge 42 in fact is able to dampen the impacts which affect the heel of the foot whenever the heel of the shoe 10 rests on the ground.

[0029] The pumping chamber 18 may be replaced by a battery-operated pump of suitable power and size.

[0030] A second non-return valve 22 is arranged downstream of the pumping chamber 18. This second valve 22, in a manner known per se and in a manner similar to that performed by the first non-return valve 16, allows the air to flow from the pumping chamber 18 into a connecting channel 50 in one direction only, defined by the arrow X in Figure 1.

[0031] This channel 50 allows the air expelled from the pumping chamber 18 and flowing through the second non-return valve 22 to reach the input chamber 70.

[0032] The connecting channel 50 may be made of polyether polyurethane or similar materials.

[0033] According to the invention, a Venturi tube 60 is inserted inside the connecting channel 50 (see Figures 1 and 2). This Venturi tube 60, which has a form known per se, comprises a converging portion 26, a portion with a constant cross-section 28 and a diverging portion 30. Along the converging portion 26 the Venturi tube passes from an initial cross-section A_1, to an end cross-section A_2 where $A_1 > A_2$; the portion with a constant cross-section has a cross-section equal to A_2; the diverging portion 30 passes from an initial cross-section A_2 to an end cross-section A_3 where $A_2<A_3$. The Venturi tube 60 has the function of increasing the pressure of the air flow inside the connecting channel 50. This allows easier expulsion of the air present inside the input chamber 70 in the manner which will be described below.

[0034] In a further embodiment, a small tank (not shown in the accompanying figures) containing a scented or deodorizing substance may be associated with the Venturi tube 60. The vacuum created within the air flow along the portion with a constant cross-section 28 may be used to suck the scented substance from the tank.

[0035] The connecting channel 50, in a further embodiment of the device 20, may have one or more holes along its upper surface.

[0036] In this way, if a perforated shank is associated with the device 20, part of the air sucked in from the outside by means of the pumping unit 40 and flowing inside the connecting channel 50, may be introduced inside the shoe 10 in the region of the foot arch.

[0037] An input chamber 70 is situated downstream of the connection channel 50. This input chamber 70 has the function of introducing inside the shoe 10 the air received from the connecting channel 50. In one embodiment of the device 20, said input chamber 70 is situated in the front zone of the foot sole. Said chamber is formed by two oblong-shaped half-shells.

[0038] The input chamber 70 may have at least one opening 34 along its upper surface. The air accumulated inside the input chamber 70 is introduced, via this opening 34, into the inside of the shoe 10. In one embodiment, with reference to the accompanying figures, there is a plurality of openings 34 along the upper surface of the input chamber 70. This ensures that there is no sensation of discomfort on the part of the user. The presence of a single large-size opening could in fact be felt by the foot. The plurality of openings 34 is preferably arranged in the region of the toes of the foot where the sweating is usually greater.

[0039] The device 20 according to the invention comprises hygroscopic means 36 suitable for reducing the degree of relative humidity of the air introduced inside the shoe 10.

[0040] These hygroscopic means 36 may consist of salts, silica gel, grains of rice, wood shavings or similar substances. Said means, when they come into contact with the moist air sucked in from the outside of the shoe 10 by means of the suction unit 40, are able to absorb or adsorb the water molecules which are present in the air flow, reducing the relative degree of humidity thereof.

[0041] These hygroscopic means 36, in one embodiment, consist of wood shavings. Wood, in addition to possessing the advantage of being a natural element, unlike

salts and silica gel, does not lose all of its hygroscopic power during use of the shoe and therefore does not have to be replaced. Moreover, the wood may be soaked with scented and/or deodorizing substances which are then released into the air flow directed towards the inside of the shoe.

[0042] The hygroscopic means 36, in order to prevent their dispersion inside the device 20, may be conveniently contained inside a mesh (not shown in the figures) or other container.

[0043] In one embodiment (see accompanying figures), the hygroscopic means 36 are contained inside the input chamber 70. The air sucked in by the suction unit 40 flows along the connecting channel 50, enters into the input chamber 70 and, before being introduced inside the shoe 10 through the openings 34 present on the upper surface of the input chamber 70, comes into contact with the hygroscopic means 36.

[0044] In a further embodiment (not shown in the accompanying figures) the hygroscopic means 36 may be inserted inside the connecting channel 50. In this case the degree of relative humidity of the air flow which passes through the connecting channel 50 is reduced. If the upper surface of the connecting channel 50 has openings, the dehumidified air may be partly introduced into the region of the foot arch and partly directed, as described above, inside the input chamber 70. If further hygroscopic means 36 are present inside the input chamber 70, the air flow sucked in from the outside will undergo, prior to being introduced inside the shoe 10, a further reduction in its degree of relative humidity in the region of the input chamber 70.

[0045] Below the operating principle of the device 20 according to the invention will be briefly described, with reference to the various stages which make up the walking cycle, where "walking cycle" is understood as meaning the set of movements which occurs between two successive instants where the foot makes initial contact with the ground.

[0046] In a manner known per se, the walking cycle may be divided up into four stages:

- heel contact: stage where the heel of the foot propelled forwards makes contact with the ground;
- full contact: stage where the foot rests completely on the ground and the other foot starts to lift from the ground;
- heel lift: stage where the heel of the supporting foot is lifted from ground and the other foot touches the ground;
- toe lift: stage where the toes are lifted from the ground, following which the weight of the body is transferred forwards.

[0047] In accordance with the four stages described above, the operating principle of the device 20 according to the invention may be broken down into the following stages:

- ventilation
- empty rest condition
- suction
- full rest condition

[0048] The ventilation stage occurs at the same time as the heel contact stage.

[0049] When the heel of the foot propelled forwards comes into contact with the ground, the pumping chamber 18 is compressed by the weight of the user's body, reaching the compressed condition and expelling all the air which has been stored inside it. The air flows through the connecting channel 50 and reaches the input chamber 70.

[0050] The first non-return valve 16 prevents the air contained inside the pumping chamber 18 from being expelled outside of the shoe 10.

[0051] The second non-return valve 22 prevents the air from flowing back from the connecting channel 50 into the pumping chamber 18, in the opposite direction to the direction indicated by X in Figure 1.

[0052] The air flow expelled from the pumping chamber 18 comes into contact with the hygroscopic means 36 which may be located, as described above, inside the connecting channel 50 or inside the input chamber 70 or inside both the components of the device 20.

[0053] The air, which following contact with the hygroscopic means 36 has a smaller degree of relative humidity than when it was introduced into the device 20, is introduced inside the shoe 10 in the direction indicated by Y in Figure 1.

[0054] The empty rest condition occurs at the same time as the full contact stage. The entire device 20 is compressed by the weight of the user's body. The pumping chamber 18 remains in the compressed condition and there is no flow of air inside the device 20.

[0055] The suction stage occurs at the same time as the heel lift stage.

[0056] When the user raises the heel, the pumping chamber 18 ceases to be compressed and starts to expand until it reaches the rest condition again.

[0057] Expansion of the pumping chamber 18 produces inside it a vacuum which allows air to be sucked from the outside.

[0058] The air sucked in through the inlet 12 flows into the inlet duct 14 and, via the first non-return valve 16, reaches the pumping chamber 18.

[0059] The latter reacquires its oblong shape which it had before being compressed by the force exerted by the foot of the user and reaches the rest condition.

[0060] The full rest condition occurs at the same time as the toe lift stage when the user is walking or running.

[0061] The pumping chamber 18 is in the rest condition and has accumulated inside it the air which will be expelled during the next ventilation stage.

[0062] The air flow ceases inside the device 20.

[0063] The full rest condition occurs whenever the user, although wearing shoes, does not operate the pump-

ing device by means of movement of the foot. This situation occurs, for example, when the user is sitting. In this case, in fact, the pumping chamber is in the rest condition. Any compression caused by the weight of the user's foot is negligible and does not result in operation of the pumping unit 40.

[0064] In this case, the presence of the hygroscopic means 36 may, even in the absence of an air flow from the outside towards the inside of the device 20, help reduce the degree of relative humidity present inside the shoe 10.

[0065] Via the openings 34 formed in the input chamber 70 or in die connecting channel 50, in fact, the inside of the shoe 10 communicates with the device 20 and consequently the hygroscopic means 36 may absorb or adsorb the water molecules present inside the shoe 10.

[0066] As described above, according to the invention, a Venturi tube 50 is inserted inside the connecting channel 50.

[0067] With reference to the ventilation stage, the insertion of a Venturi tube 60 allows an increase, along the converging portion 26, of the speed of the air flow. The air sucked in flows more rapidly inside the connecting channel 50 and reaches the input chamber 70. The reduction in the time it takes the sucked-in air flow to travel along the connecting channel 50 has the effect that introduction of air inside the shoe 10 occurs before the next suction stage starts and consequently the propulsive force exerted by compression of the pumping chamber 18 by the user's foot ceases.

[0068] Moreover, insertion of a Venturi tube 60 allows, along the diverging portion 30, an increase in the pressure of the air flow.

[0069] Consequently, since the Venturi tube 60 is positioned close to the input chamber 70, the introduction of the sucked-in air inside the input chamber 70 is facilitated.

[0070] Moreover, a small tank containing a scented or deodorizing substance may be associated with the Venturi tube 60. The vacuum created within the air flow along the portion with a constant cross-section 28 may be used to suck from the tank this scented substance which is mixed with the air flow sucked from the outside.

[0071] Consequently, the inside of the shoe 10 is able to be supplied with an air flow which, in addition to having, following contact with the hygroscopic means 36, a degree of relative humidity which is less than that when sucked in, may also be scented and/or deodorized.

[0072] According to one embodiment of the device 20, a sponge 42 is inserted inside the pumping chamber 18.

[0073] This sponge 42 on the one hand performs a cushioning function, damping the impact acting on the user's heel whenever the foot is rested on the frond, and on the other hand allows more rapid expansion of the pumping chamber 18 with regard to the suction stage.

[0074] In this way, even in the case where the user is running and consequently the succession of the various operating stages of the device 20 is accelerated, the pumping chamber 18 may expand completely, reaching its rest condition. If the pumping chamber 18 were to be compressed before reaching its rest condition, inside the connecting channel 50 there could be an air flow winch is smaller than that permitted by the capacity of the pumping chamber 18, with a consequent reduction in the efficiency of the device 20.

[0075] As will be clear to the person skilled in the art, the introduction inside the shoe of an air flow with a low degree of relative humidity allows the environment inside the shoe to be kept ventilated and hygienically clean and dry.

[0076] Moreover, a further advantage of some embodiments of the present invention consists in the fact of being able to introduce a flow of scented air inside the shoe. It is thus possible to eliminate or at least reduce the stale odour which may exist inside a shoe.

[0077] A further positive effect consists in the fact that, even in the absence of movement, i.e. without compression and discharging of the pumping chamber by the user, the hygroscopic means present inside the device and communicating with the inside of the shoe via the openings described above may dehumidify the air inside the shoe, ensuring a high degree of comfort.

Claims

1. Device (20) for internal ventilation of a shoe (10), comprising:

an air inlet (12), a first non-return (16), a second non-return valve (22)
- a pumping device (40) suitable for sucking in and ejecting air
- an input chamber (70) suitable for introducing into the shoe (10) the air sucked in by the pumping device (40)
- at least one connecting channel (50) suitable for conveying the air sucked in by the pumping device (40) towards the input chamber (70), **characterized in that** the device comprises
- hygroscopic means (36) suitable for reducing the degree of relative humidity of the air introduced into the shoe (10), and **in that**

said at least one connecting channel (50) comprises a Venturi tube (60).

2. Device (20) according to claim 1, wherein said hygroscopic means (36) are contained inside the input chamber (70).

3. Device (20) according to any one of the preceding claims, wherein said hygroscopic means (36) consist of wooden shavings soaked with a scented and/or deodorizing substance.

4. Device (20) according to any one of the preceding claims, wherein said hygroscopic means (36) are selected from the group comprising: silica gel, salts, grains of rice.

5. Device (20) according to any one of the preceding claims, wherein the pumping device (40) comprises an inlet (12); a filter and/or a membrane being associated with said inlet (12).

6. Device (20) according to claim 5, wherein a tank containing a scented or deodorizing substance is associated with said Venturi tube (60).

7. Device (20) according to any one of the preceding claims, comprising a sponge (42) made of materials with an open-cell structure, said sponge being inserted inside a pumping chamber (18).

8. Device (20) according to any one of the preceding claims, **characterized in that** it is formed as a whole by two half-shells of thermoplastic materials; said half-shells being made by means of injection moulding and being welded together along their perimetral edge (52).

9. Shoe (10) containing a device (20) for internal ventilation of a shoe according to any one of the preceding claims.

Patentansprüche

1. Vorrichtung (20) für eine Innenbelüftung eines Schuhs (10), mit:

einem Lufteinlass (12), einem ersten Ein-Wege-Ventil (16), einem zweiten Ein-Wege-Ventil (22)

- einer Pumpvorrichtung (40), die zum Ansaugen und Ausstoßen von Luft geeignet ist
- einer Eingabekammer (70), die zum Einführen der durch die Pumpvorrichtung (40) angesaugten Luft in den Schuh (10) geeignet ist
- zumindest einem Verbindungskanal (50), der zum Fördern der durch die Pumpvorrichtung (40) angesaugten Luft zu der Eingabekammer (70) geeignet ist,

dadurch gekennzeichnet, dass die Vorrichtung Folgendes aufweist

- eine hygroskopische Einrichtung (36), die zum Reduzieren eines relativen Feuchtigkeitsgrads der in den Schuh (10) eingeführten Luft geeignet ist, und dass der zumindest eine Verbindungskanal (50) eine Venturiröhre (60) aufweist.

2. Vorrichtung (20) gemäß Anspruch 1, wobei die hygroskopische Einrichtung (36) im Inneren der Eingabekammer (70) enthalten ist.

3. Vorrichtung (20) gemäß einem der vorherigen Ansprüche, wobei die hygroskopische Einrichtung (36) aus Holzspänen besteht, die mit einer parfümierten und/oder deodorierenden Substanz imprägniert sind.

4. Vorrichtung (20) gemäß einem der vorherigen Ansprüche, wobei die hygroskopische Einrichtung (36) aus der Gruppe bestehend aus: Kieselgel, Salzen, Reiskörnern ausgewählt ist.

5. Vorrichtung (20) gemäß einem der vorherigen Ansprüche, wobei die Pumpvorrichtung (40) einen Einlass (12); einen Filter und/oder eine Membran aufweist, die mit dem Einlass (12) verknüpft ist.

6. Vorrichtung (20) gemäß Anspruch 5, wobei ein Tank, der eine parfümierte oder deodorierende Substanz enthält, mit der Venturiröhre (60) verknüpft ist.

7. Vorrichtung (20) gemäß einem der vorherigen Ansprüche, mit einem Schwamm (42), der aus Materialien mit einer offenen Zellenstruktur geschaffen ist, wobei der Schwamm im Inneren einer Pumpenkammer (18) eingefügt ist.

8. Vorrichtung (20) gemäß einem der vorherigen Ansprüche, **dadurch gekennzeichnet, dass** sie insgesamt durch zwei Halbschalen eines thermoplastischen Materials ausgebildet ist; wobei die Halbschalen mittels Spritzgießen geschaffen und entlang ihrer perimetralen Kante (52) aneinander geschweißt sind.

9. Schuh (10), der eine Vorrichtung (20) für eine Innenbelüftung eines Schuhs gemäß einem der vorherigen Ansprüche aufweist.

Revendications

1. Dispositif (20) pour la ventilation interne d'une chaussure (10), comprenant :

- une entrée d'air (12), un premier clapet anti-retour (16), un second clapet anti-retour (22),
- un dispositif de pompage (40) conçu pour aspirer et éjecter de l'air,
- une chambre d'entrée (70) conçue pour introduire dans la chaussure (10) l'air aspiré par le dispositif de pompage (40),

- au moins un canal de jonction (50) conçu pour acheminer l'air aspiré par le dispositif de pompage (40) vers la chambre d'entrée (70),
caractérisé en ce que le dispositif comprend
- des moyens hygroscopiques (36) conçus pour réduire le degré d'humidité relative de l'air introduit dans la chaussure (10), et **en ce que**

ledit au moins un canal de jonction (50) comprend un tube de venturi (60).

2. Dispositif (20) selon la revendication 1, dans lequel lesdits moyens hygroscopiques (36) sont contenus à l'intérieur de la chambre d'entrée (70).

3. Dispositif (20) selon l'une quelconque des revendications précédentes, dans lequel lesdits moyens hygroscopiques (36) sont constitués de rabotures de bois imprégnées d'une substance parfumée et/ou désodorisante.

4. Dispositif (20) selon l'une quelconque des revendications précédentes, dans lequel lesdits moyens hygroscopiques (36) sont choisis dans le groupe constitué par : gel de silice, sels, grains de riz.

5. Dispositif (20) selon l'une quelconque des revendications précédentes, dans lequel le dispositif de pompage (40) comprend une entrée (12) ; un filtre et/ou une membrane étant associés à ladite entrée (12).

6. Dispositif (20) selon la revendication 5, dans lequel un réservoir contenant une substance parfumée ou désodorisante est associé audit tube de venturi (60).

7. Dispositif (20) selon l'une quelconque des revendications précédentes, comprenant une éponge (42) constituée de matériaux ayant une structure à alvéoles ouverts, ladite éponge étant insérée à l'intérieur d'une chambre de pompage (18).

8. Dispositif (20) selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'**il est formé dans son ensemble par deux demi-coques en matériau thermoplastique ; lesdites demi-coques étant réalisées par un procédé de moulage par injection et étant soudées ensemble le long de leur bord périmétral (52).

9. Chaussure (10) contenant un dispositif (20) pour la ventilation interne d'une chaussure selon l'une quelconque des revendications précédentes.

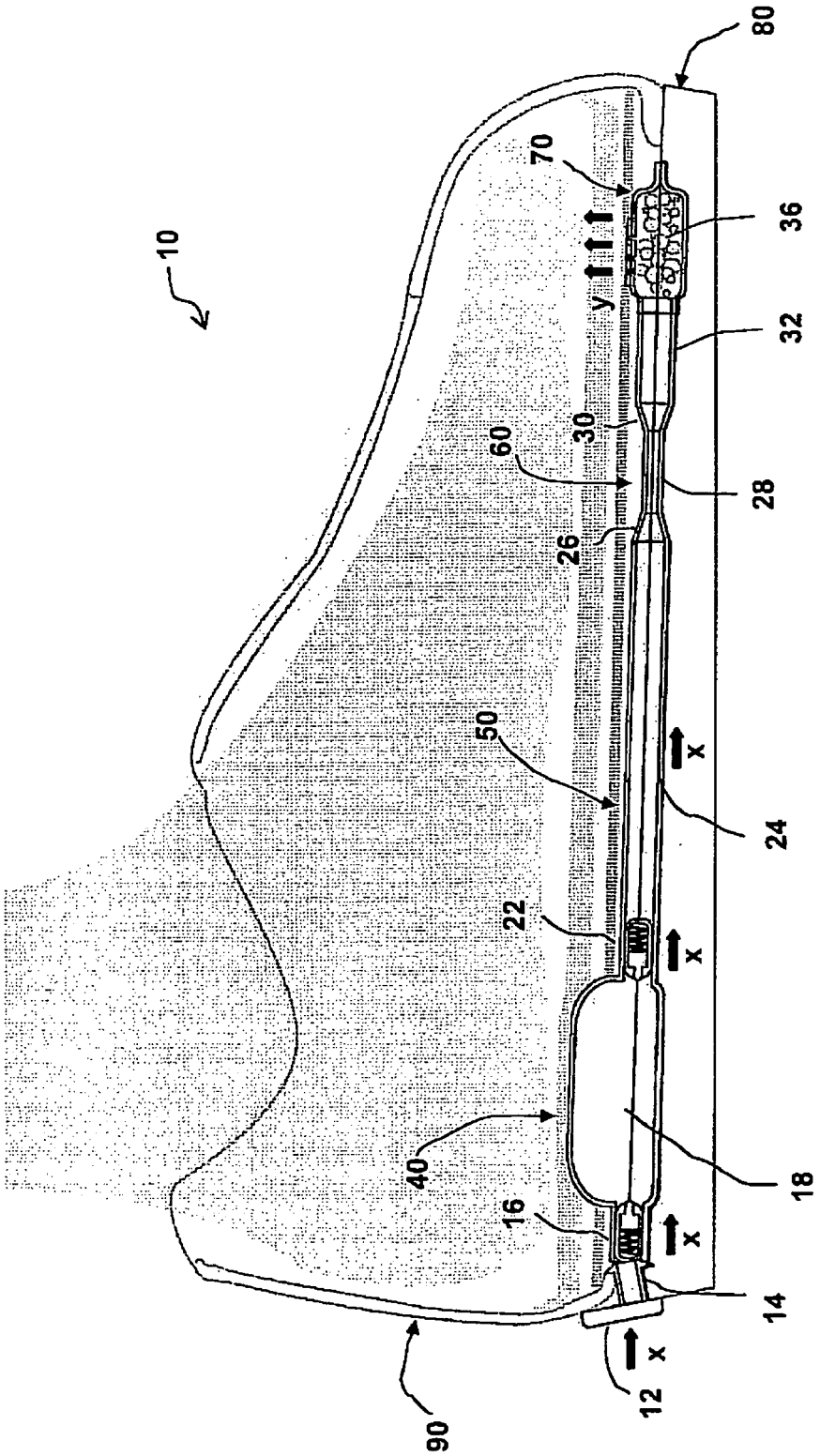

Fig. 1

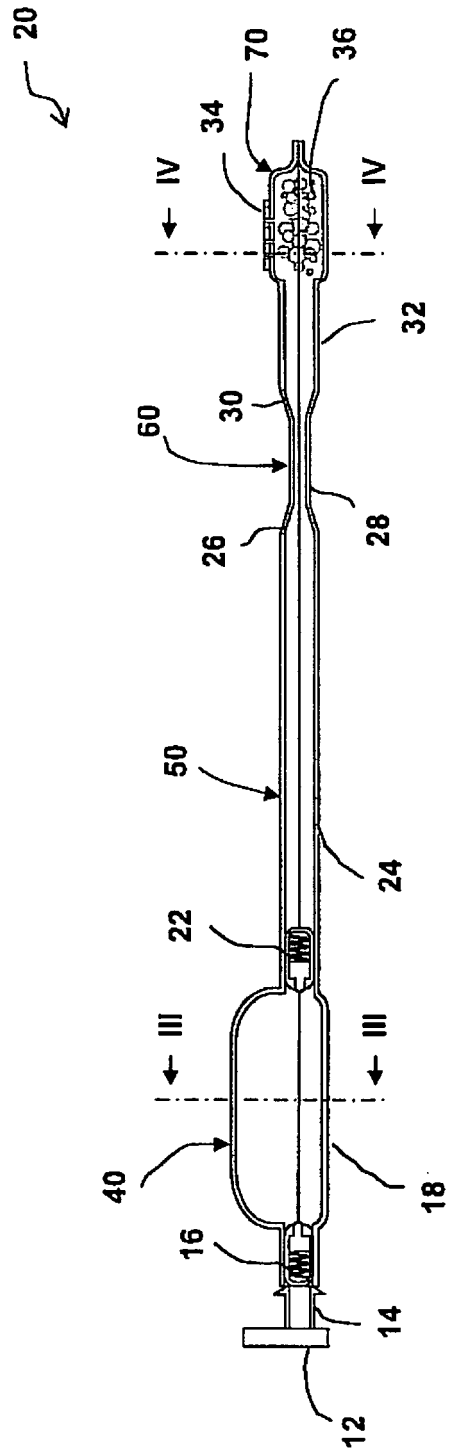

Fig. 2

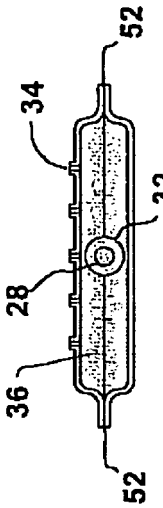

Fig. 4

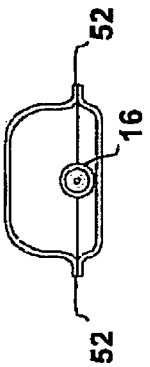

Fig. 3

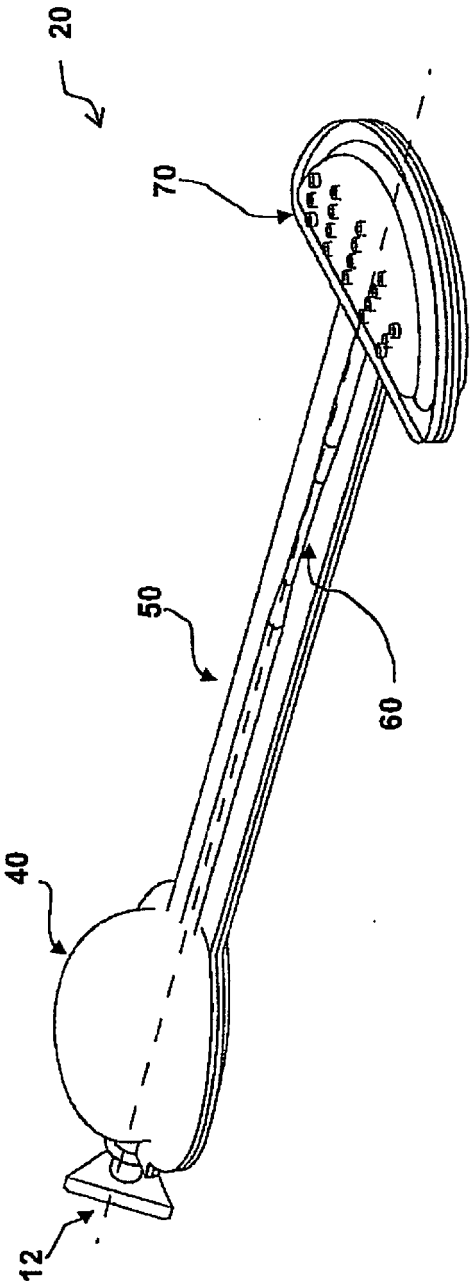

Fig. 5

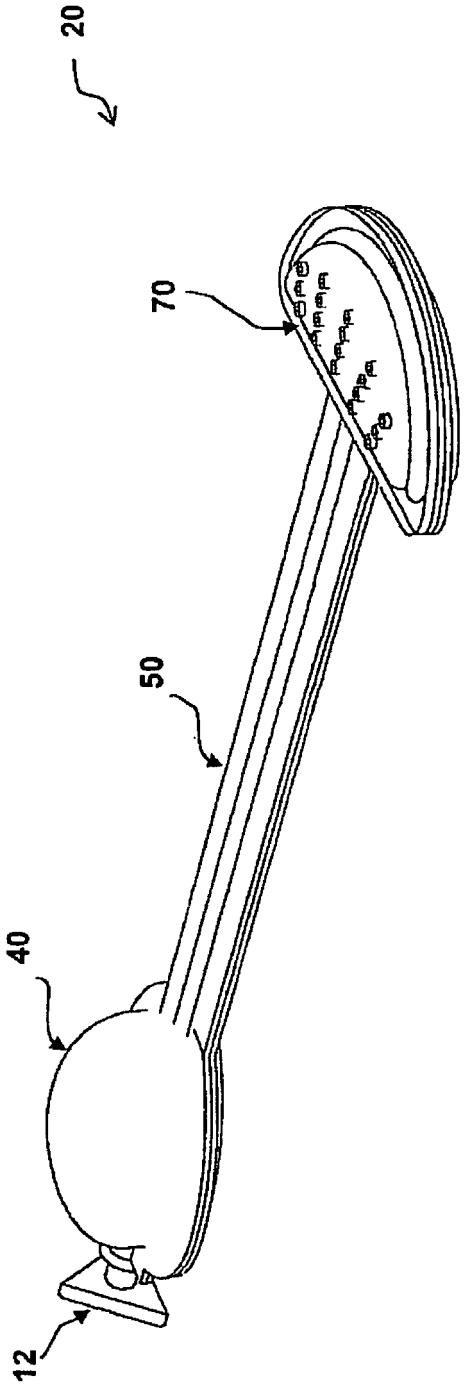

Fig. 6

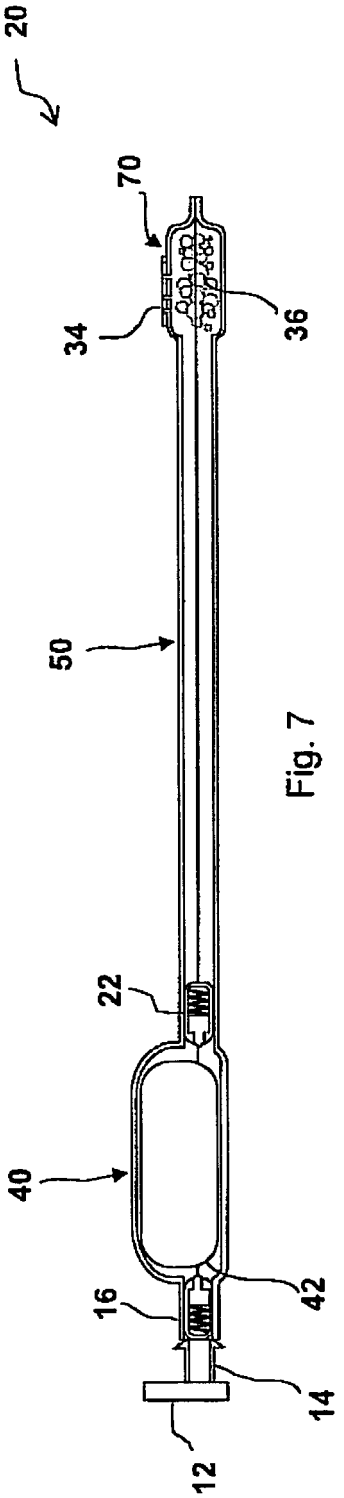

Fig. 7

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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