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(54) **FLOW REGULATOR ADAPTABLE TO VENTILATING SYSTEMS INSIDE SHOES**

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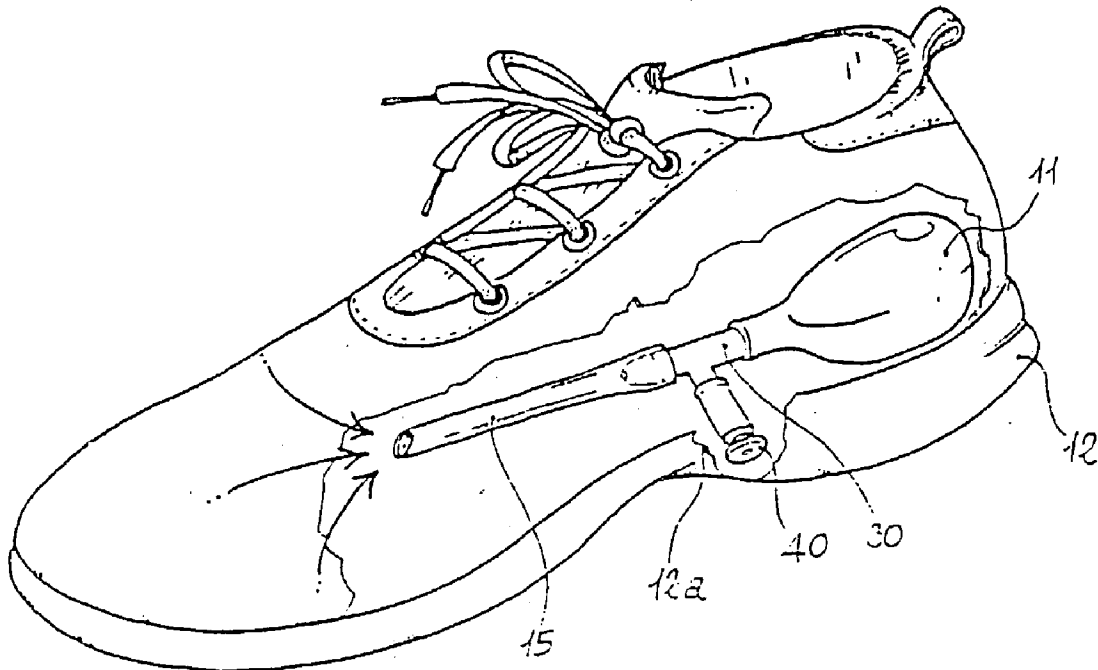
(57) **ABSTRACT**

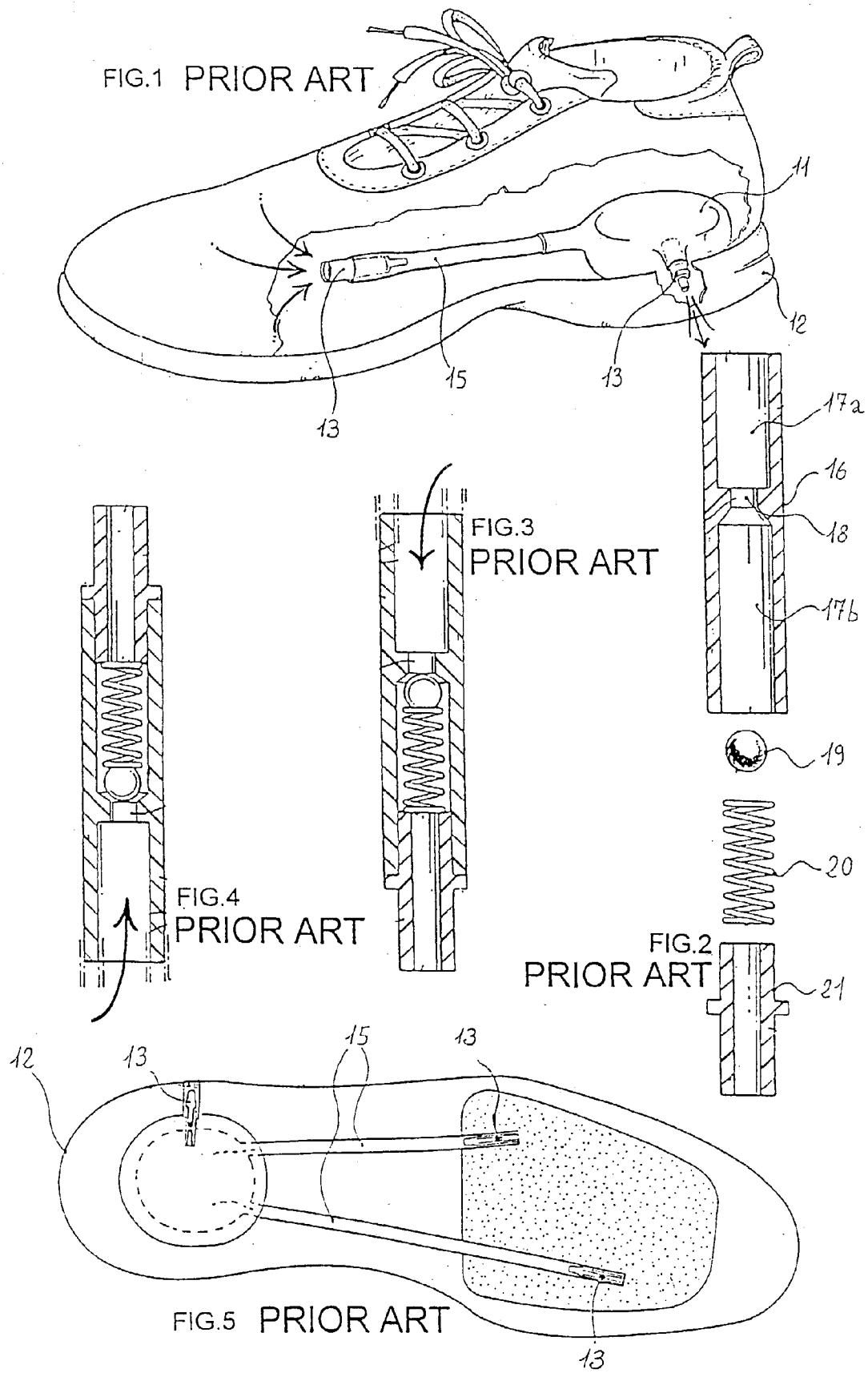
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A flow regulator formed by a three way valve and by an external adapter. The valve is joined to the pump located in the heel area of the shoe soles, as normally used in ventilating systems, and the adapter basically permits the adjustment of the whole system to a wide number of sizes.

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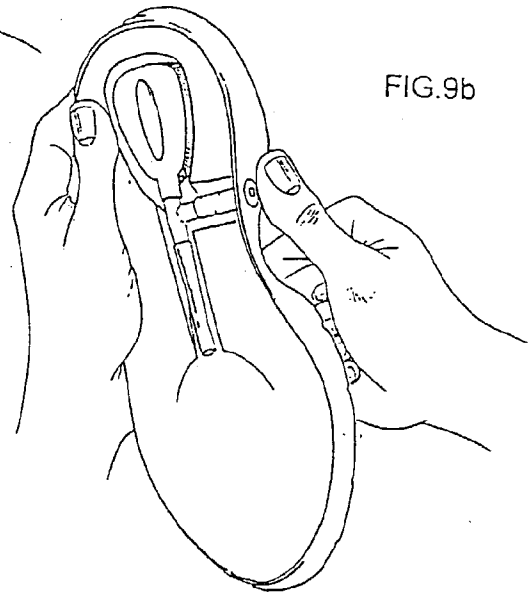
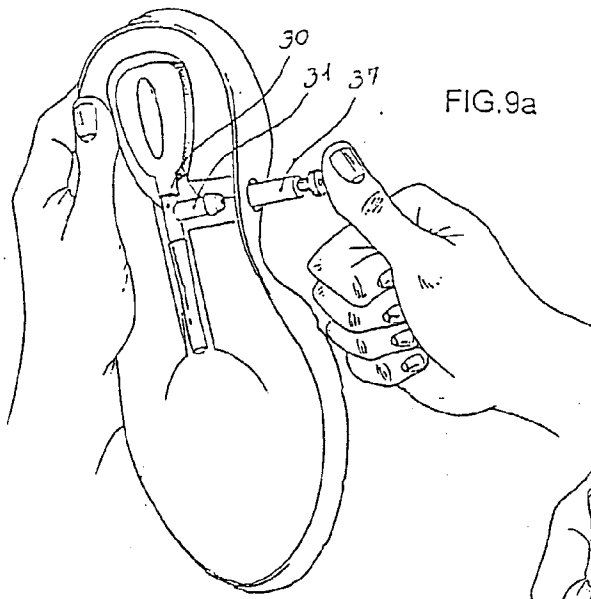
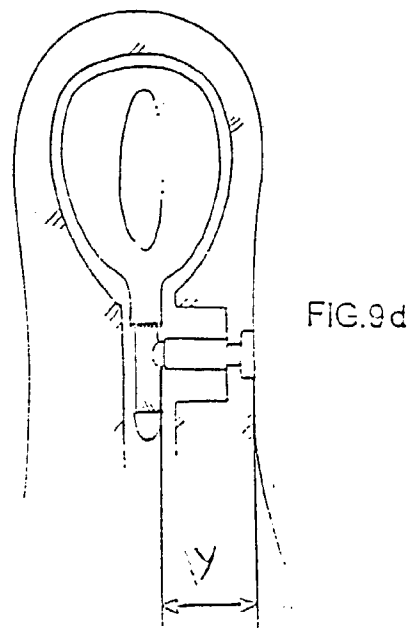
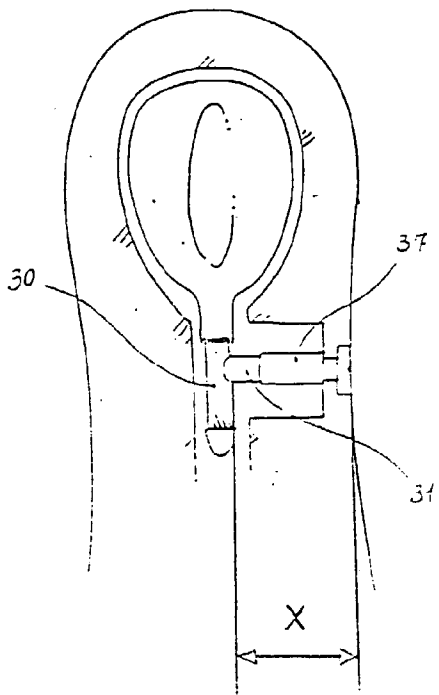
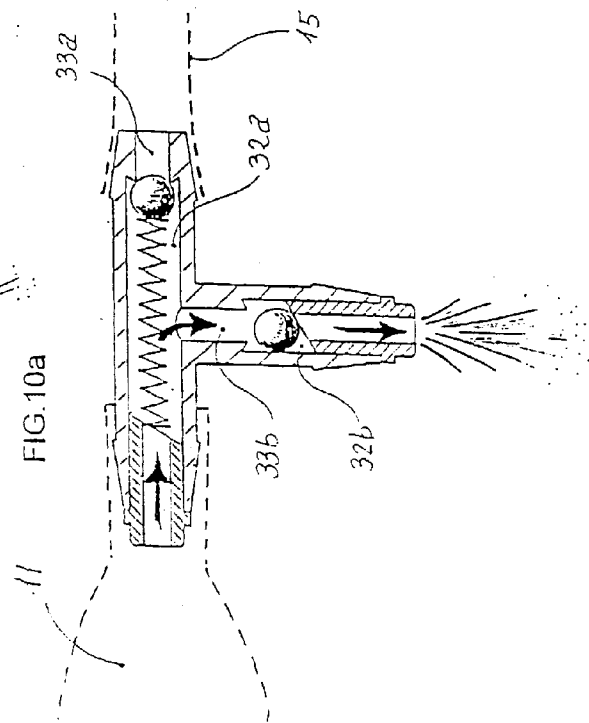
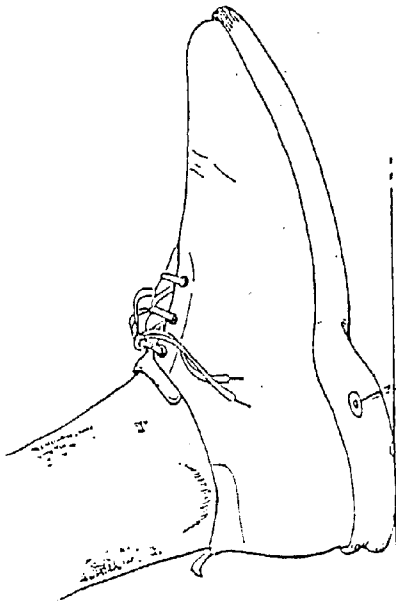
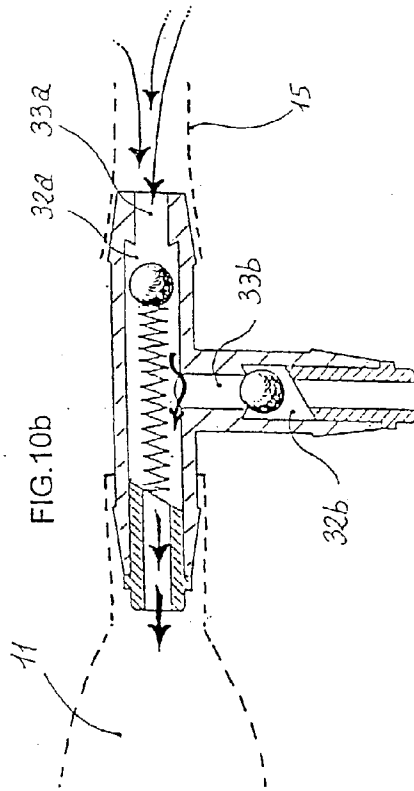
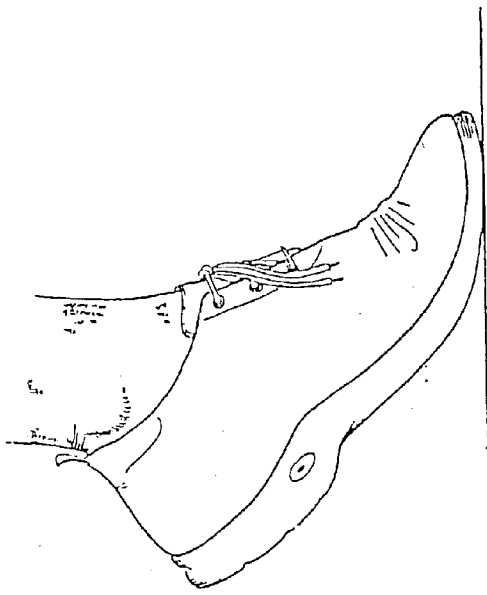


FIG. 9c





FLOW REGULATOR ADAPTABLE TO VENTILATING SYSTEMS INSIDE SHOES

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] Applicant claims priority under 35 U.S.C. §119 of Maltese Application No. 1798 filed Nov. 8, 2002.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The ventilation inside shoes is a subject very important in the shoe market. The producers are looking for new devices which can improve this matter, concentrating their efforts also to the reduction of the costs.

[0004] Following these targets many researches proposed a lot of patents generally addressed toward the use of the force of a pump situated in the heel area.

[0005] When the heel is pressed to the ground, during the impact phase of a step, the pump pushes the air therein externally the shoe and when the heel is raised, during the push-off phase, the pump sucks in air to replace the air previously forced onto the shoe.

[0006] This air has a one-way flow because all the present ventilating systems use a pump which has an inlet which includes a one-way valve allowing air into the pump and an outlet including a one-way valve allowing air into the shoe. The prior art does not mention anything about a device for the adaptation of these valves to various sizes.

[0007] 2. Description of The Prior Art

[0008] With references to the above Field of the Invention, among the patents which refer to these purposes, the most pertinent are the following:

[0009] Pearse UK Pat. Application—GB 2 262 024 A

[0010] Jung U.S. Pat. No. 5,068,981

[0011] Huang U.S. Pat. No. 5,341,581

[0012] Kwon U.S. Pat. No. 5,477,626

[0013] Fukuoka U.S. Pat. No. 5,505,01

[0014] Lee U.S. Pat. No. 5,515,622

[0015] Vecchiola U.S. Pat. No. 5,974,694

[0016] Yamamoto U.S. Ser. No. 09/685,121 (Application)

[0017] All these patents, as many other ones, could avoid the use of two or more one-way valves and work better using the flow regulator proposed by the present invention.

SUMMARY OF THE INVENTION

[0018] The objectives of the present invention are to provide an only three-way valve joined to an external adapter to a ventilation system inside a shoe.

[0019] The advantages of this invented valve can be resumed as follows:

[0020] A minor production cost because the system adopts a single valve instead of two or more.

[0021] A minor assembling cost for the same reason.

[0022] Better sealing of the whole ventilating system because each joint of a valve represents a possible critical point for the air seal.

[0023] An only one direct flow derived from the pumping device.

[0024] The adaptability of the three-way valve with a wide range of widths of soles using its external adapter.

BRIEF DESCRIPTION OF THE DRAWINGS

[0025] Other objects and features of the present invention will become apparent from the following detailed description considered in connection with the accompanying drawings. It should be understood, however, that the drawings are designed for the purpose of illustration only and not as a definition of the limits of the invention.

[0026] In the drawings, wherein similar reference characters denote similar elements throughout the several views:

[0027] **FIG. 1** is a side view of a shoe provided with a pump in the heel area joined to two one-way valves.

[0028] **FIG. 2** is a cross section of the components of a one-way valve.

[0029] **FIG. 3** is a cross section of a one-way valve positioned for the expulsion of the air.

[0030] **FIG. 4** is a cross section of a one-way valve positioned for the suction of the air.

[0031] **FIG. 5** is a top view of the sole portion provided with a pumping device joined to a one-way valve for the expulsion of the air and to two one-way valves for the suction of the air inside the shoe.

[0032] **FIG. 6** is an exploded view of the invented three-way valve.

[0033] **FIG. 7** is a top view of the assembled invented three-way valve.

[0034] **FIG. 8** is a side view of a shoe provided with a pumping device joined to the invented three-way valve which is joined to an external adapter.

[0035] **FIGS. 9a-9b-9c-9d** is the view of the movements made during the assembling for the adaptability of the three-way valve with the external adapter.

[0036] **FIG. 10a-10b** is the view of the air flow during the walking.

DETAILED DESCRIPTION OF THE INVENTION

[0037] With reference to the above drawings, **FIGS. 1-2-3-4-5** show the prior art, where, in **FIG. 1** a pump (11) is located into the heel area of a sole (12) and joined in the lateral side, through a pre-formed hole, to a one-way valve (13) inserted in the position of expulsion, as better shown in **FIG. 3**, and joined in the front side to a tube (15) where the other one-way valve (13) is inserted in the position of suction, as better shown in **FIG. 4**. The components of a standard one-way valve are shown in **FIG. 2**, where the body valve (16) has an internal hole (17a-17b) which has a narrowing (18). Into the longer part (17b) of this body valve

the following components are inserted : the ball (19), the spring (20) and the flat cap (21). The ball and the spring are-metallic.

[0038] FIG. 5 shows the top view of a sole (12) where the pump, for a better sucking effect, has two tubes (15) with the corresponding two one-way valves.

[0039] FIG. 6 shows the exploded view of the invented three-way valve, where the body valve is formed by a central part (30) which has an internal hole (32a) terminating with an orifice (33a) and a lateral part (31) which has an internal hole (32b) terminating with an orifice (33b). Into the internal hole (32a) of the central part(30) the ball (34), the spring (35) and the cap (36) are inserted. From the other side, the lateral part (31), the ball (34) and the cap (36) are inserted. In this three-way valve the two balls used are produced in rubber instead of iron like the prior art. It is easy to understand that a rubber ball closes the orifice very well because its surface adheres perfectly to the edge of the orifice making a perfect sealing. The sealing in this valve, as in every pneumatic device, is the most important factor.

[0040] In the same FIG. 6 another very important component is shown: the external adapter (37). This invented component is studied to adapt the three-way valve to various sizes of soles, which, clearly, have different distance between the lateral part (31) and the edge of the sole. The two caps (36), which obviously have an internal hole, have the internal top made with an inclined spout (36a) and is not flat like the other ones used in many applications of the prior art. In this case it is possible to avoid the use of the spring, specially in the lateral hole, (32b), for keeping the ball in the right position. The length of this cap is projected in order to allow a very little movement of the ball which, when is sucked, closes the hole (33b) and when is expelled touches the cap (36) but does not close its hole because its surface is inclined (36a) and the air can flow out. If this surface were flat the ball could close the hole and no air could flow.

[0041] The external adapter (37) obviously has a central hole (38a) for entering the lateral part (31) of the three-way valve and a smaller internal hole (38b) made into its head (40) which allows the air flow. The central hole (38b) has a diameter smaller than the diameter of the lateral part (31) in order to slide over it only with a pressure just to seal it.

[0042] This sliding movement makes the adaptation of the whole pumping system to various sizes of soles, as shown in FIGS. 9a-9b-9c-9d.

[0043] The hole pre-formed into the sole has three diameters: the external one (12c) lodges the head (40) of the adapter, the intermediate one (12b) lodges the collar (39) of the adapter and the internal one (12a) lodges the central body of the adapter. Once this adapter is inserted into the sole can not move.

[0044] The head of this adapter may be round (40a) or elliptic (40b).

[0045] The spring (35) inserted into the central part (32a) of the valve can be replaced by a plastic insert (41) whose length is shorter than the distance between the cap (36), when totally inserted, and the ball when is touching the orifice (33a). The work of the spring, as this plastic insert, is to allow a little movement of the ball for closing the mentioned orifice or for setting it open. The section of this

plastic insert can be triangular (41a), square (41b), pentagonal (41c) or a tube (41d), the important fact is that the air can circulate inside the central hole (32a) and the lateral hole (32b). FIG. 7 shows all the components assembled and FIG. 8 when located into the heel area. FIGS. 9a-9b show the insertion of the external adapter (37) into the lateral part, FIG. 9c its adaptation for big sizes long distances (x) between the edge of the sole and the central body (30) of the three-way valve, while FIG. 9d its adaptation for small sizes=short distance (y) between the edge of the sole and the central body (30) of the three-way valve.

[0046] At last FIG. 10a and 10b show the real effect of the three-way valve once inserted into the sole during the walking.

[0047] FIG. 10a shows what happens when the foot touches the ground: the pump (11) is compressed and therefore deflates pushing the air outside, this is possible because the air flow derived from the pump pushes the ball of the central hole (32a) to close the orifice (33a) and pushes the other ball of the lateral hole (32b) to open the orifice (33b) leaving free the air to go out.

[0048] FIG. 10b shows what happens when the foot raises from the ground: the pump, now uncompressed, inflates and therefore sucks the air internally the shoe through the tube (15), this is possible because through this sucking force the ball of the central hole (32a) is moved along it, setting free the orifice (33a) and the ball of the lateral hole (32b) is sucked closing the orifice (33b).

[0049] Accordingly, while a few embodiments of the present invention have been shown and described, it is to be understood that many changes and modifications may be made thereunto without departing from the spirit and scope of the invention as defined in the appended claims.

What is claimed is:

1) A flow regulator adaptable to ventilating systems inside shoes composed by a three-way valve and by an external adapter, said three-way valve is formed-by a central part (30) which has an internal hole (32a) terminating with an orifice (33a) and a lateral part (31) which has an internal hole (32b) terminating with an orifice (33b), into the internal hole (32a) of the central part (30) the ball (34), the spring (35) and the cap (36) are inserted, into the lateral part (31), the ball (34) and the cap (36) are inserted, said external adapter (37) which has a central hole for entering the lateral part (31) of the three-way valve and a smaller internal hole made into its head (40) which allows the air flow.

2) A flow regulator, according to claim 1 which is adaptable to various sizes of shoes through the external adapter (37) whose central hole has a diameter smaller than the diameter of the lateral part (31) of the three-way valve in order to slide over it only with a pressure just to seal it, this sliding movement makes the adaptation of the whole pumping system to various sizes of soles.

3) A flow regulator, according to claim 1, which is inserted into a sole which has a pre-formed hole made with three diameters: the external one (12c) lodges the head (40) of the adapter, the intermediate one (12b) lodges the collar (39) of the adapter and the internal one (12a) lodges the central body of the adapter, said position makes a joint which does not allow to the head (40) any movement.

4) A flow regulator, according to claim 1, where the spring inserted into the central hole (32a) of the three-way valve is replaced by a plastic insert (41) having the same dimension and the same function.

5) A flow regulator, according to claim 1, where the two caps (36) of the three-way valve, which obviously have an internal hole, have the internal top made with an inclined spout (36a) in this case it is possible to avoid the use of the spring for keeping the ball in the right position, its length allows very little movements of the ball which, when is

sucked, closes the hole (33b) and when is expelled touches the cap (36) but does not close its hole because its surface is inclined and the air can flow out.

6) A flow regulator, according to claim 1, where the two balls (34) of the three-way valve used for closing the orifice (33a) of the central hole (32a) and the orifice (33b) of the lateral hole (32b) are produced with rubber.

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