Sports footwear having a custom fitting device

The present invention refers to sports footwear having a custom fitting device (4) comprising a plurality of expandable bladders (5, 6) arranged within the footwear (1) at a respective plurality of regions of the wearer’s foot; an actuation unit (7) can be associated to the footwear (1) in fluid communication with the bladders (5, 6) by means of suitable connection means (10, 11) to actuate the selective expansion of the bladders (5, 6); the bladders (5, 6) and the connection means (10, 11) are integrally formed on a support element (14) made in one piece at least partly wrapping the wearer’s foot and fastened to the footwear (1).
Description

[0001] The present invention refers to a sports footwear, such as, for example, a ski or snowboard boot, an ice or roller skate, a mountaineering shoe or a motorcycle boot, having a custom fitting device comprising a plurality of expandable bladders arranged within the footwear. The expansion of the bladders can be obtained by means of a pneumatic system, through which air or any other suitable gas is pumped to inflate the bladders, or by injecting polyurethane or silicone foam.

[0002] Custom fitting pneumatic devices have been known over the years in the sports footwear industry, and in particular in the ski boots industry; for example, US 4,232,459 discloses a ski boot comprising an air chamber arranged between the shell and the inner boot connected, by means of a delivery circuit and a release circuit, to a pump incorporated in the boot.

[0003] A drawback of this solution in which a single air chamber is provided lies in the poor efficiency in holding the wearer's foot firm during sports activity: actually, when the foot is subjected to external dynamic stresses, the air contained within the chamber flows towards the lower pressure areas; thus, the reaction of the air chamber is not enough to counter the movement of the foot caused by the external stresses.

[0004] US 6,655,050, on which the preamble of claim 1 is based, discloses a snowboard boot incorporating, between the shell and the inner boot, several air chambers separated and independent from each other and arranged in different areas of the foot; the various areas can be inflated separately by means of an external pump, available to the wearer, which can be applied in succession at the air inlet opening of each chamber; this solution allows the wearer to adjust the pressure of each air chamber independently with respect to the other and according to the contingent needs.

[0005] However, such known solution reveals some drawbacks: a first drawback lies in the fact that the pump can be easily lost by the user given that it is separate from the footwear; furthermore, the pump can be a hindrance to the sports activity if kept in the pocket after use.

[0006] Another drawback lies in the difficulty related to positioning and mounting each air chamber within the shoe: actually, each air chamber should be constrained to the shell to prevent removal thereof when removing the inner boot.

[0007] In the end, prior art solutions are either inefficient or unpractical, and thus scarcely applicable, or they are complex in terms of construction, and hence disadvantageous from an economical point of view.

[0008] The aim of the present invention is to overcome the previously outlined drawbacks of the prior art, by providing a sports footwear having a custom fitting device capable of efficiently holding the foot firm in the footwear during sports activity.

[0009] Within the previously described aim, an object of the present invention is to provide a sports footwear having a custom fitting device that is easy to obtain and economically advantageous.

[0010] Another object of the present invention is to provide a custom fitting device that can be positioned and mounted within the footwear in an extremely simple, quick and easy manner.

[0011] Another object of the present invention is to provide a sports footwear having a custom fitting device that can be used by the wearer in an easy and practical manner.

[0012] Last but not least, an object is to provide a sports footwear having a custom fitting device obtainable at competitive costs and by using known equipments, machinery and tools.

[0013] The aim, objects and advantages indicated above as well as others that will be more apparent hereinafter, are reached by a sports footwear having a custom fitting device as defined in claim 1.

[0014] Further characteristics of the invention will be illustrated further in the description of a particular, but not exclusive, embodiment illustrated purely by way of non-limiting example in the attached claims, wherein:

- figures 1 and 2 show, according to a partly cross-sectional perspective view, a sports footwear having a custom fitting device according to the present invention respectively during the steps of expansion and contraction of a first expandable bladder;
- figures 3 and 4 show, according to a partly cross-sectional perspective view, the footwear illustrated in the previous figures respectively during the steps of expansion and contraction of a second expandable bladder;
- figure 5 represents a plan development of the custom fitting device according to the previous figures.

[0015] With reference to the previously mentioned figures, a sports footwear, such as, for example, a ski boot, comprising a shell or upper 2 and a cuff 3 internally containing a padded lining or a removable inner boot (not illustrated) is indicated with reference number 1.

[0016] A custom fitting device, generally indicated with reference number 4, which allows customising the fitting to the particular anatomy of the wearer’s foot or to specific technical-sports requirements thereof, is interposed between the shell or upper 2 and the lining or inner boot.

[0017] The custom fitting device 4 comprises a plurality of expandable bladders 5, 6 independent with respect to each other and arranged within the footwear 1 at different regions of the wearer’s foot.

[0018] With reference to the embodiment illustrated by way of example in the attached figures, the custom fitting device 4 comprises at least one first expandable bladder 5 arranged approximately at the upper and lateral region of the forefoot and at least one second expandable bladder 6, independent from the first bladder 5, arranged around the malleolar region.

[0019] Preferably, the custom fitting device 4 will be
obtained according to a substantially symmetric configuration, and thus the first bladder 5 can at least partly wrap both sides of the foot and the second bladder 6 can at least partly surround both sides of the malleolar regions.

[0020] An actuation unit, generally indicated with reference number 7, can be associated to the sports footwear 1, and possibly selectively release a fluid into the plurality of bladders 5, 6 with the aim of selectively expanding, and possibly contracting, the bladders; the actuation unit 7 is in fluid communication with the bladders 5, 6 through suitable connection means.

[0021] In the embodiment illustrated in the attached figures, in which the custom fitting device 4 is constituted by a pneumatic system for inflating the bladders, the actuation unit 7 comprises a first pump 8 and a second pump 9 respectively in communication with the first bladder 5 and with the second bladder 6 to convey air or any other suitable gas into the bladders; the connection means comprise a first tube 10 and a second tube 11, separate and independent from the first tube 10, which connect the first bladder 5 in fluid communication with the first pump 8 and, respectively, the second bladder 6 with the second pump 9 through suitable generally known check-valves.

[0022] The actuation unit further comprises a first release control 12 and a second release control 13 in fluid communication with the first bladder 5 and, respectively, with the second bladder 6 through the respective first tube 10 and second tube 11. The first release control 12 and the second release control 13 actuate the controlled release of air, or any other gas, from the bladders 5, 6 for the contraction of the bladders.

[0023] Advantageously, the actuation unit 7 is connected at the outer rear wall of the cuff 3 adjacent to the upper edge of the cuff 3 so as to allow the user a simple and easy access.

[0024] A peculiar characteristic of the present invention lies in the fact that the plurality of bladders 5, 6 and the relative tubes 10, 11 are integrally formed on a support element 14 made in one piece at least partly wrapping the wearer’s foot.

[0025] The support element 14 is obtained by superimposing two material sheets preferably thermoweldable, for example polyurethane, which are joined to each other along predefined lines or areas; in particular, upon defining the design and arrangement of the bladders 5, 6 and the tubes 10, 11 on the support element 14, the sheets are joined, preferably by means of thermowelding, at least at the peripheral areas of the bladders 5, 6 and the tubes 10, 11 and, preferably, also at the peripheral areas of the sheets so as to obtain a sufficiently compact assembly. Figure 5 illustrates the assembly of the custom fitting device 4 thus obtained, in which the support element 14 incorporates the first bladder 5, the second bladder 6, the first tube 10 and the second tube 11 therein; firstly, the latter are connected, passing through the cuff 3, to the actuation unit 7 arranged outside the cuff 3.

[0026] The areas indicated with A, B, C, D and E of the support element 14 are joined, preferably welded, to each other, and one or more of such areas can advantageously have an anti-slip knurled surface finishing so as to limit the movements of the custom fitting device 4 within the footwear 1, when the foot is fitted.

[0027] Furthermore, the bladders 5, 6 can be designed to be advantageously provided with further weldings within the bladders so as to obtain a three-dimensional distribution of the air or of the gas or a differentiation of the expansion, and thus of the thickness, of the bladders.

[0028] The flat support element 14 thus obtained is joined, for example by stitching or welding, at the edges indicated with F and G in figure 5 so as to allow shaping to wrap, at least partly, the wearer’s foot and thus acquire the volume of the footwear into which it is subsequently fitted and constrained; the support element 14 is preferably fastened onto the lateral inner walls of the shell or upper 2 at the lateral holes 15, 16 of the support element 14.

[0029] Furthermore, the support element 14 can be advantageously associated - at the edges indicated with H and J - for example by means of stitching or welding, to a base 17 also to allow fastening to the bottom, i.e. on the inner surface of the sole or insole, of the shell or upper 2, both to further reduce any movement of the support element during sports activity and to avoid interference when removing a possible removable inner boot.

[0030] The footwear having a custom fitting device according to the present invention operates as follows: upon fitting and closing the foot in the footwear 1, the wearer may adjust and customise the fitting, i.e. the inner volume of the footwear, to the foot thereof independently on the first and/or on the second bladder 5, 6 by actuating the first and/or, respectively, the second pump 8, 9, as schematically illustrated in figures 1 and 3; by so doing, the wearer can inflate the first and/or the second bladder 5, 6, up to the desired degree of expansion, so that the foot is suitably held firm in the footwear 1.

[0031] The wearer should simply operate on the first and/or on the second release control 13, 14 so as to cause partial or total release from the respective bladders, as schematically illustrated in figures 2 and 4, in order to reduce the pressure of one or the other bladder in a controlled manner, or to completely deflate the bladders to remove the foot from the footwear 1.

[0032] Thus, the description above shows how the present invention reaches the preset objects and advantages: actually, a sports footwear 1 having a custom fitting device 4 capable of efficiently and selectively holding, according to the different areas, the foot firm within the footwear during sports activity has been provided. In particular it is shown how the independence between the different bladders prevents the air (or the gas) from flowing into the lower pressure areas, hence guaranteeing the ideal stability of the firm holding.

[0033] The positioning of the foot within the footwear 1 can also be customised by making the lateral portions
of the first bladder 5 and/or of the second bladder 6 independently from each other; thus, the foot can be pushed against the inner wall or the outer wall of the shell or upper 2 to facilitate a wearer’s determined posture, for example the skier’s posture with respect to the ski.

Furthermore, the custom fitting device is extremely simple from a construction point of view, and thus economically advantageous, due to the method of construction thereof, by integrally forming the bladders 5, 6 and tubes 10, 11 on the support element 14, obtained in a single piece by superimposing and joining the second predetermined lines or areas of two superimposed material sheets having characteristics that allow thermowelding or analogous processes.

Another advantage of the present invention lies in the quick and easy positioning and mounting of the custom fitting device 4 within the footwear 1; actually, upon providing the support element 14 and joining at the edges F and G to confer it the volume shape suitable to be inserted into the footwear 1, and possibly joined to the base 17, fastening to the footwear is extremely simple, quick and immediate given that constraining the support element 14 to the inner walls of the footwear 1 and, possibly, also to the bottom thereof, is sufficient.

A further considerable advantage of the present invention lies in the practical and easy use of the custom fitting device 4 by the wearer, both due to the integration of the actuation unit 7 on the footwear 1, which prevents possible loss of the components required for operation thereof and the positioning thereof on the footwear, capable of allowing the user to comfortably operate on the actuation unit 7.

Obviously, the invention is susceptible to numerous modifications or variants without thereby departing from the scope of protection of the present invention as defined in claim 1.

For example the bladders 5, 6 can be filled independently with an expandable material, such as, for example, a polyurethane or silicone foam, which can be injected through the actuation unit 7 which in this case will simply comprise a pair of nozzles provided with a valve.

Lastly, the materials used to carry out the present invention, as well as the shapes and dimensions of the single components, may suitably vary according to the specific needs.

Claims

1. Sports footwear having a custom fitting device (4) comprising a plurality of expandable bladders (5, 6) arranged within said footwear (1) at a respective plurality of regions of the wearer's foot, an actuation unit (7) for actuating the selective expansion of said plurality of bladders (5, 6) being associated to said footwear (1), characterized in that said actuation unit (7) is in fluid communication with said plurality of bladders (5, 6) by means of suitable connection means (10, 11), said plurality of bladders (5, 6) and said connection means (10, 11) being integrally formed on a support element (14) made in one piece at least partly wrapping the wearer's foot and fastened to said footwear (1).

2. Sports footwear according to claim 1, wherein said support element (14) is formed by at least two material sheets superimposed and joined to each other at least at the peripheral areas of said plurality of bladders (5, 6) and said connection means (10, 11).

3. Sports footwear according to claim 2, wherein said at least two sheets are also joined to each other at the peripheral areas of said support element (14).

4. Sports footwear according to claims 2 or 3, wherein said at least two sheets are joined to each other at one or more internal areas of one or more bladders of said plurality of bladders (5, 6).

5. Sports footwear according to any of the preceding claims, wherein said support element (14), obtained flat and in which said plurality of bladders (5, 6) and said connection means (10, 11) are formed, is joined at at least two peripheral edges (F, G) to be shaped so as to at least partly wrap the wearer’s foot.

6. Sports footwear according to any of the preceding claims, comprising a shell or upper (2) and a cuff (3) and internally having a padded lining or a removable inner boot, said custom fitting device (4) being interposed between said shell or upper (2) and said padded lining or removable inner boot.

7. Sports footwear according to claim 6, wherein said support element (14) can be constrained to the lateral inner walls of said shell or upper (2).

8. Sports footwear according to claims 6 or 7, wherein said support element (14) can be constrained to the inner surface of the sole or of the insole of said shell or upper (2).

9. Sports footwear according to claim 8, wherein said support element (14) can be constrained to the inner surface of said sole or said insole by means of a base (17) to which said support element (14) can be associated.

10. Sports footwear according to any of the preceding claims, wherein said custom fitting device (4) comprises at least one first expandable bladder (5) arranged approximately at an upper and lateral region of the forefoot and at least one second expandable bladder (6), independent from said first bladder (5), arranged around a malleolar region.
11. Sports footwear according to claim 10, wherein said custom fitting device (4) is provided according to a substantially symmetric configuration, said first bladder (5) at least partly wrapping both sides of the forefoot and said second bladder (6) at least partly surrounding both sides of the malleolar regions.

12. Sports footwear according to any of the preceding claims, wherein said connection means comprise a first tube (10) and a second tube (11) separate and independent from said first tube (10), said actuation unit (7) comprises a first pump (8) and a second pump (9) in fluid communication respectively with said first bladder (5) and with said second bladder (6), said first tube (10) connecting said first bladder (5) in fluid communication with said first pump (8) and said second tube (11) connecting said second bladder (6) in fluid communication with said second pump (9).

13. Sports footwear according to claim 12, wherein said actuation unit (7) further comprises a first release control (12) and a second release control (13) in fluid communication with said first bladder (5) and, respectively, with said second bladder (6) through said first tube (10) and, respectively, second tube (11), said first release control (12) and second release control (13) being adapted to actuate the controlled release of fluid from said first bladder (5) and second bladder (6).

14. Sports footwear according to claim 1, wherein said custom fitting device (4) comprises a system for filling said plurality of bladders (5, 6) by injecting an expandable material through said actuation unit (7) and along said connection means (10, 11), said actuation unit comprising a pair of nozzles provided with a valve.

15. Sports footwear according to claim 1, wherein said sports footwear is an alpine ski boot or a touring ski boot or a snowboarding boot or an ice skate or a roller skate.
**DOCUOENTS CONSIDERED TO BE RELEVANT**

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<tr>
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**TECHNICAL FIELDS SEARCHED (IPC)**

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The present search report has been drawn up for all claims.

**Place of search**

Munich

**Date of completion of the search**

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**Examiner**

Vesin, Stéphane
This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on 10-05-2011.

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