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## (54) A method for adjunct control of the free volume between the outer shell and the inner shoe in an article of sport footwear.

(57) To take up clearance due to the free volume between the outer shell (2) and the inner shoe (3) of an article of sport footwear, an auxiliary padding (4) is fitted over the inner shoe (3) so as to intervene between the shoe and the shell, a resin in a flowable state is injected into an injection chamber (5) defined inside the auxiliary padding (4) so as to become molded to the pattern thereof and fill at least in part any free volume existing between the shell and the shoe, and the injected resin is allowed to cure.

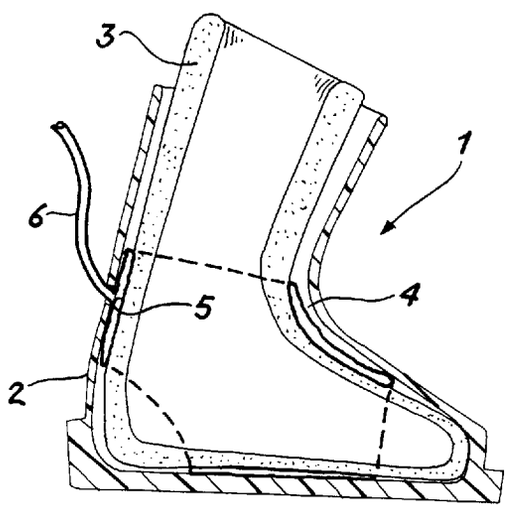


Fig. 1

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This invention relates to a method for adjunct control of the free volume between the outer shell and the inner shoe in an article of sport footwear, and to an article of footwear, such as a skiing or skating boot and the like, with adjunct control of the free volume between the outer shell and the inner shoe in accordance with the method.

The construction of footwear provided with an outer shell which encloses a padded inner shoe is accepted practice with certain articles of sport footwear, specifically skiing, climbing, and skating boots, although not limited thereto.

The inner shoe padding is designed to allow the inner shoe to adapt itself to the user's foot morphology so as to properly match its shape at least in some critical areas of the boot/foot fit. Accordingly, the inner shoe is to act as a soft compliant structure intervening between the foot and the boot shell, while the much stiffer structure of the latter provides support for the foot.

However, there exist definite limitations to the inner shoe deformability, whereby the inner shoe may misfit a foot of unusual shape and proportions, or its padding material may fail in highly stressed areas thereof.

As a result, a new boot may not fit tightly around the user's foot, in the former case, or may undergo in use a deterioration of its original performance features due to local padding compression, in the latter case. Understandably, these are but two instances of typical problems encountered with footwear of this kind, and more may actually appear which are all tied to the accuracy of fit of the padding and that of the attendant support afforded to the user's foot. Basically, a free volume develops between the inner shoe and the outer shell which adversely affects the tight fit and comfort to be expected from the boot. Notice that the term "free volume" encompasses here those spaces and interstices where the inner shoe and outer shell are held apart as well as areas between the shoe and the shell where the compressive state of the padding falls below predetermined optimum values.

There have been several prior proposals for adapting or modifying the inner shoe to fit different foot morphologies, such as the provision of padded inserts removably inserted between the shell and the shoe or being associated with the latter in areas regarded to be critical to efficient clamping of the foot inside the boot. While such expedients do achieve a closer fit of the boot to the user's foot, their effectiveness is only partial because the inserts, being formed to standard designs by the footwear maker, cannot ensure thorough filling of the aforementioned free volume in areas of the boot which are critical to the foot clamping feature. To attenuate the problem, a range of padded inserts are usually provided which differ in overall shape, density, and load capacity of the padding material. This leads, however, to the need for an inventory of different items which is apt to complicate the manufacture of such footwear articles and increase their overall cost.

It is the object of this invention to provide a method and an article of sport footwear which can ensure optimum adaptation of the inner shoe and outer shell to meet specific user's demands under any of the above-outlined circumstances.

This object is achieved by a method for adjunct control of the free volume between the outer shell and inner shoe of an article of sport footwear, characterized in that it comprises the steps of:

fitting an auxiliary padding over the inner shoe such that it is interposed between said shoe and shell, said auxiliary padding having a resin injection chamber defined therein;

injecting said resin in a flowable state into said injection chamber to mold said auxiliary padding such that it will at least partly fill said free volume between the outer shell and the inner shoe; and

allowing said resin to cure.

In accordance with the invention, an article of sport footwear, such as a skiing or skating boot and the like, incorporating adjunct control of the free volume between the outer shell and the inner shoe by the above-outlined method, comprises an outer shell and a padded inner shoe inserted into said shell, and is characterized in that it comprises an auxiliary padding fitted over the inner shoe to intervene between the inner shoe and the outer shell, said padding having an injection chamber defined therein for a resin in a flowable state, capable of subsequent curing into said auxiliary padding to at least partly fill the free volume between the outer shell and the inner shoe.

To make the invention more clearly understood, an exemplary embodiment thereof will now be described with reference to the accompanying drawings, in which:

Figure 1 illustrates a first step of the method according to the invention as applied to a ski boot shown in longitudinal section;

Figure 2 is a perspective view of a detail of the ski boot shown in Figure 1;

Figure 3 is a sectional view of the boot in Figure 1 taken during a second step of the inventive method; and

Figure 4 is a sectional view of a detail of this invention.

With reference to the drawing views, generally shown at 1 is a ski boot having an outer shell 2, typically made of a plastics material, and a padded inner shoe 3. The shell 2 and shoe 3 are quite conventional both in shape and construction.

As a rule a free volume, dependent on the user's foot shape or on the boot use, develops between the shell 2 and the shoe 3 in certain areas thereof, whereby the inner shoe is held off the corresponding shell wall or is inadequately compressed thereagainst

while in use.

The user can initially control that free volume by so pulling the conventional fastening means (not shown because foreign to this invention) provided as to tighten the boot shell against the inner shoe. However, the action of this first adjustment is applied to the shell as a whole, to generally tighten it down onto the inner shoe and is, therefore, comparatively inaccurate.

But with the method of this invention, the effectiveness of that adjustment can be improved when supplemented by adjunct control specifically of the free volume between the outer shell and the inner shoe.

This additional ajustment is accomplished by providing an auxiliary padding 4, in the typical form and arrangement of an ankle support, which is fitted over the inner shoe, as shown in Figure 2, so as to intervene between the shoe and the shell 2.

The auxiliary padding 4 is bag-shaped and comprises two walls 4a,b sealed to each other all around their periphery so as to define an injection chamber 5 therebetween. Said walls are substantially impervious to resins in a flowable state for injection into the chamber 5 through a thin tube 6 leading to said chamber from outside the boot 1.

The next step of the inventive method provides for the boot to be donned, fastening it as desired onto the user's foot, and injecting through the tube 6 a resin in a flowable state, which resin will then expand and cure after a time selected to be reasonably short. The cured resin inside the auxiliary padding 4 is indicated at 10. Suitable resins are, for example, polyurethane or silicone or the like resins having appropriate compositions for injection in a flowable state and optional expansion before curing. On completion of the curing step, the tube 6 is cut off close to the shell 2.

In this way, the auxiliary padding 4 can be molded to at least partly fill the free volume between the outer shell and the inner shoe.

Notice that the shoe 3 is unattached to the auxiliary padding 4 at toe 7 and heel 8 areas thereof, because in these areas, the auxiliary padding is formed with openings whose edges are denoted by 7a and 8a. These openings are effective to promote blood circulation to the foot toes and heel by avoiding too constrictive an action on the foot in such areas. Indicated at 9 is an additional opening through which the auxiliary padding 4 can be fitted over and removed from the inner shoe 3.

It should be further noted that the auxiliary padding can be taken out of the inner shoe 3, and hence of the boot 1, after the resin 10 has been injected and cured. This is simply performed by taking out the inner shoe through the boot entry opening 9, and conversely, replacing it into the auxiliary padding. This allows the boot fit to be reiterately modified to suit in the course of the boot service life and/or to meet specific foot clamping requirements, as may be the case where the boot is used for contest purposes.

The method of this invention, the boot obtained thereby, and the auxiliary padding employed may undergo changes and modifications within the same inventive concept. For example, the tube 6, which in the embodiment described is passed through the outer shell 2, could be passed between the shell and the inner shoe. Also, portions of the auxiliary padding may be left out of the injection chamber and/or the auxiliary padding may be made to a pattern other than that shown herein.

Another variation, previously mentioned in connection with the drawings of the above embodiment, could provide an auxiliary padding having the walls 4a,b arranged to define a sealed bag-shaped enclosure, again in the form of an ankle support, into whose chamber 5 a compressible fluid, preferably air, would be introduced. In this case, the enclosure would be pre-filled with air under a desired pressure at the manufacturing stage and the tube 6 omitted.

## Claims

**1.** A method for adjunct control of the free volume between the outer shell (2) and the inner shoe (3) in an article of sport footwear, characterized in that it comprises the steps of:

fitting an auxiliary padding (4) over the inner shoe such that it is interposed between said shoe and shell, said auxiliary padding having a resin injection chamber (5) defined therein;

injecting said resin (10) in a flowable state into said injection chamber to mold said auxiliary padding such that it will at least partly fill said free volume between the outer shell and the inner shoe; and

allowing said resin to cure.

**2.** An article of sport footwear, such as a skiing or skating boot and the like, incorporating adjunct control of the free volume between the outer shell and the inner shoe by the method of Claim 1, comprising an outer shell (2) and a padded inner shoe (3) inserted into said shell, characterized in that it comprises an auxiliary padding (4) fitted over the inner shoe (3) to intervene between the inner shoe and the outer shell, said padding having an injection chamber (5) defined therein for a resin (10) in a flowable state, capable of subsequent curing into said auxiliary padding to at least partly fill the free volume between the outer shell and the inner shoe.

**3.** An article of sport footwear according to Claim 2, wherein said auxiliary padding (4) is substantially in the form of an ankle support and said injection chamber (5) is defined between two juxtaposed walls (4a,b) thereof.

**4.** An article of sport footwear according to Claim 3, wherein said walls (4a,b) are substantially impervi-

ous to said resin (10).

**5.** An article of sport footwear according to Claim 2, wherein said auxiliary padding has openings (7a,8a) in the toe and heel areas of the inner shoe.

**6.** An article of sport footwear according to Claims 2 , 3, 4 or 5, wherein said auxiliary padding carries a thin tube (6) open into said injection chamber (5) and accessible from outside said shell for injecting said resin into said injection chamber.

**7.** An article of sport footwear according to one or more of Claims 2 to 6, wherein said resin is a type liable to expand when injected into said injection chamber.

**8.** An article of sport footwear according to one or more of Claims 2 to 7, wherein said auxiliary padding (4) is fitted removably over said inner shoe (3).

**9.** An article of sport footwear according to one or more of Claims 2 to 8, wherein said injection chamber (5) affects substantially all of said auxiliary padding (4).

**10.** Auxiliary padding for controlling the free volume between the outer shell and the inner shoe of an article of sport footwear, comprising an injection chamber (5) defined between juxtaposed walls (5a,b) thereof.

**11.** Auxiliary padding for controlling the free volume between the outer shell and the inner shoe of an article of sport footwear, comprising a sealed enclosure (4), substantially in the form of an ankle support, on whose interior at least one chamber (5) pre-filled with a fluid is defined.

**12,** Auxiliary padding according to Claim 11, wherein said fluid is a gaseous fluid.

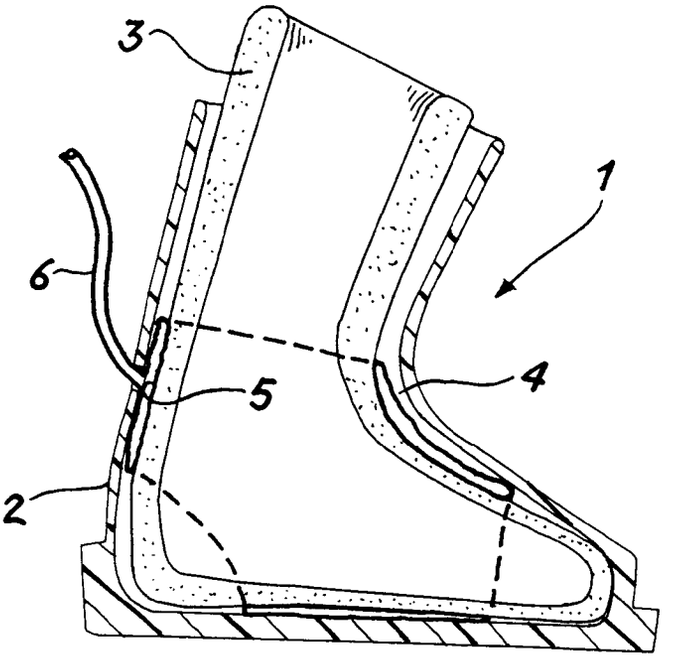


Fig. 1

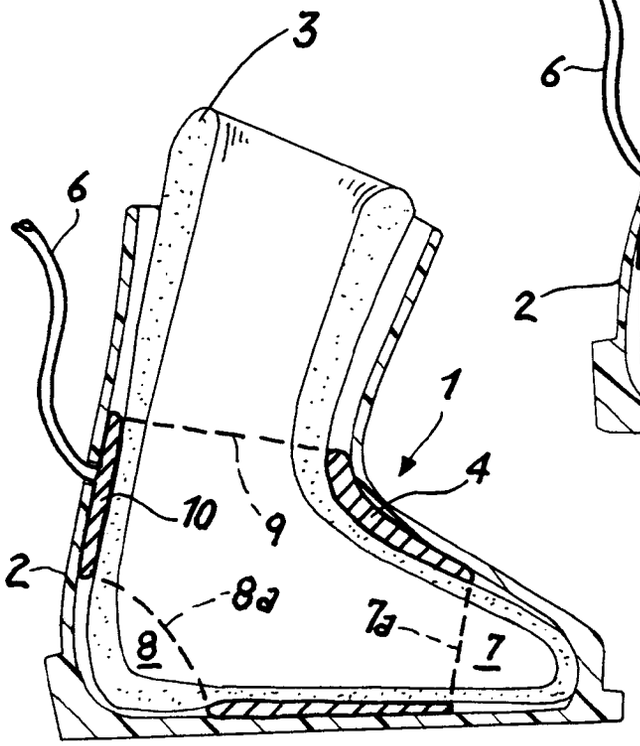


Fig. 3

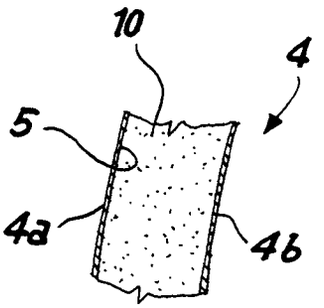


Fig. 4

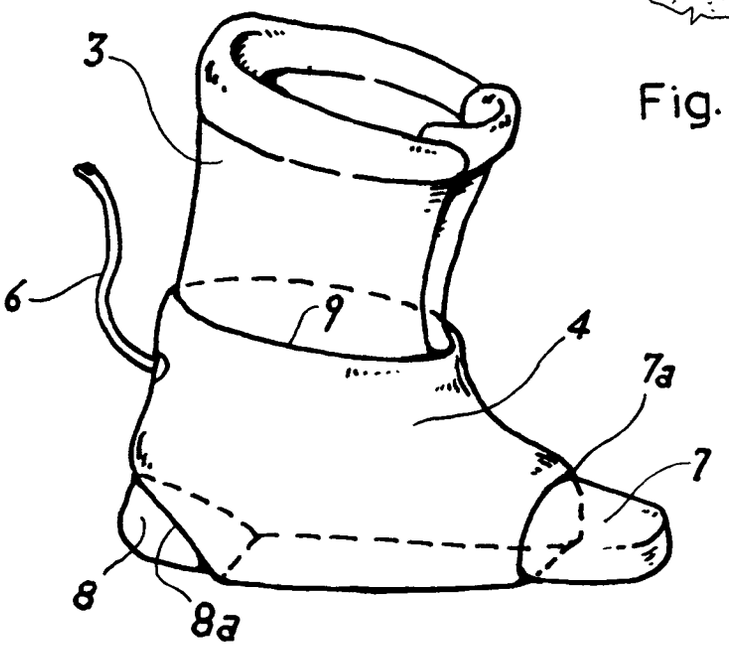


Fig. 2

European Patent Office

# EUROPEAN SEARCH REPORT

Application Number
EP 93 11 1779

## DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (Int.Cl.5) |
|---|---|---|---|
| X | US-A-3 834 044 (R. MCAUSLAND)<br>* the whole document * | 1-6,10 | A43B1/00<br>A43B5/04 |
| X | CH-A-506 260 (Y. THUILLARD)<br>* the whole document * | 1-6,10 | |
| X | CH-A-506 961 (PLASTIGUM)<br>* the whole document * | 1-6,10 | |
| A | FR-A-2 630 894 (YAMAHA)<br>* the whole document * | 1,2 | |
| A | US-A-3 377 721 (R. JOHNSON)<br>* the whole document * | 1,2 | |
| A | US-A-5 067 257 (S. COOMER)<br>* the whole document * | 1,2 | |
| A | FR-A-2 204 106 (HANSON)<br>* the whole document * | 1,2 | |

TECHNICAL FIELDS SEARCHED (Int.Cl.5)

A43B

The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| THE HAGUE | 12 November 1993 | DECLERCK, J |

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