(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
24 June 2004 (24.06.2004)

PCT

(10) International Publication Number
WO 2004/052134 A1

(51) International Patent Classification[7]: A43B 5/04

(21) International Application Number:
PCT/IT2002/000781

(22) International Filing Date:
11 December 2002 (11.12.2002)

(25) Filing Language: English

(26) Publication Language: English

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(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZM, ZW.

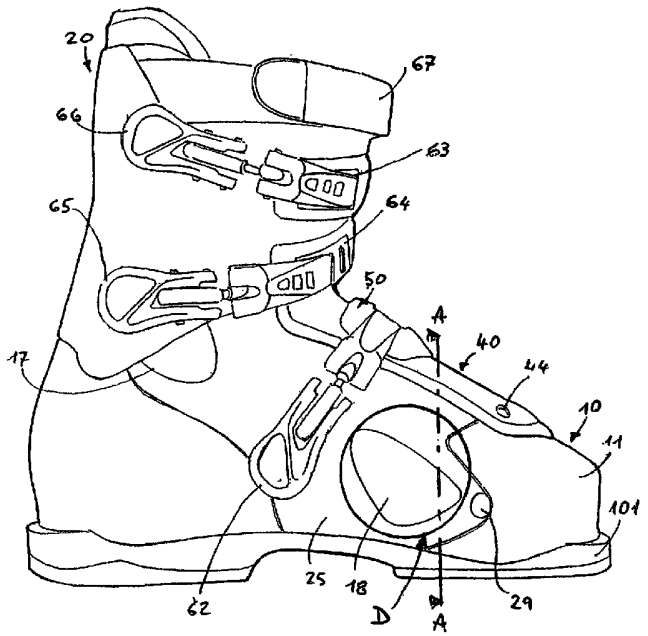
(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declaration under Rule 4.17:
— *of inventorship (Rule 4.17(iv)) for US only*

Published:
— *with international search report*

[Continued on next page]

(54) Title: SPORT FOOTWEAR HAVING A RIGID SHELL TO IMPROVE THE USER'S COMFORT



(57) Abstract: Sports footwear, such as a ski boot or the like, in which the shell (10) and the legpiece (20) are made of rigid plastic materials. The shell (10), and possibly also the legpiece (20), are provided with a plurality of windows or through-perforations (14, 16) located at least in correspondence of the malleoli and the metatarsus, both on the outer side and the inner side of the wearer foot. In correspondence of said windows or through-perforations (14, 16; 320) there are used materials that are softer than the materials used to make the shell (10) and the legpiece (20).

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SPORT FOOTWEAR HAVING A RIGID SHELL TO IMPROVE THE USERS COMFORT

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DESCRIPTION

The present invention refers to sports footwear provided with a rigid shell.

Some sorts of sports footwear, among which ski boots or downhill skiing are certainly those having the broadest diffusion on the marketplace, are largely known to comprise a shell and a legpiece that is usually joined in an articulated manner with the shell, both of which are made of rigid plastic materials and may be fitted with a removable inner shoe that is at least partially made with the use of softer materials. The actual purpose of such a kind of construction is in fact to prevent the feet from being able to move inside the footwear when practicing a sports activity, e.g. during skiing, further to ensuring not only an adequate protection in the case of accidents, but also a sufficient heating effect.

Notwithstanding the lot of efforts made and the great attention devoted by footwear manufacturers, these kinds of footwear are still giving rise to a number of inconveniences, such as in particular those deriving from the pressure exerted against the feet in correspondence of bony protuberances thereof, i.e. both physiological prominences, such as the malleoli, and prominences that may have been growing with the age of the wearers, e.g. in correspondence of the upper side of the feet. These inconveniences sometimes turn into feelings of real pain, with the result that the wearers may well come to the ultimate decision to avoid wearing the concerned footwear any longer and, therefore, to stop practicing the related sport activity.

The Applicant is well aware of the fact that sports footwear articles are largely known in the art, which have been specially developed in view of ensuring enhanced comfort to the wearers.

For example, EP-A-996 344 discloses a footwear for in-line skates which - in view of holding the foot of the wearer at an ideal temperature, such as in practice a temperature situated anywhere between 28°C and 35°C - is provided with first openings in the rigid portions thereof (i.e. shell and legpiece) and second openings, provided in an aligned arrangement with said first openings, in the outer surface of the soft portion (inner shoe) of the footwear. The said soft portion has in fact a composite structure, which includes, as a part thereof, a textile or fibrous material that, within the range of ideal temperature values, is capable of giving off and taking in heat through said openings. In correspondence of said first openings use may further be made of a net or a vapour-permeable material in order to facilitate transpiration of the foot. Apart from the fact that the distribution of the above-mentioned openings is actually aimed at privileging the thermal comfort of the foot, so that a

presence of such openings also in correspondence of the afore cited bony protuberances must not be taken for granted, this prior-art footwear does by no means ensure any adequate protection to the foot in the case of bumps, shocks and the like, which on the contrary is a basic pre-requisite of all kinds of footwear where shell and legpiece are made of rigid plastic materials, such as ski boots.

Also known from FR-A-2 788 410 is a removable inner shoe for ski boots, which features pre-indentations or yielding lines provided in a more or less circular configuration in correspondence of the "sensitive parts" of the foot, such as in correspondence of the malleoli and the upper side of the foot. In this way, when buying the footwear these pre-indented lines can be caused to undergo the action of a cutting tool (eg. a knife) in view of adapting the inner shoe of the boot to the actual anatomic morphology of the foot of the wearer. It can however be readily appreciated that such kind of operations, in order to be able to be carried out in a proper and correct manner without damaging the remaining portions of the inner shoe, must be performed by adequately skilled persons and are in all cases quite ill-accepted by footwear retailers.

It therefore is a main object of the present invention to provide a sports footwear able to provide a maximum extent of protection to the foot even in the case of severe bumps against rigid bodies (for example, possible stones concealed in snow) or penetration of the boot by sharply pointed objects (for instance, the tip of a ski pole), while at the same time featuring an optimised construction in view of saving the wearer from having to suffer the afore mentioned inconveniences, without requiring any kind of action to be taken by more or less skilled persons in view of being adapted to the anatomical morphology of the foot of the wearer.

A footwear made in accordance with the features recited in the appended claims enables such and further objects to be fully obtained, as this shall be more readily appreciated from the following description, given by way of non-limiting example, of some embodiments illustrated in the accompanying drawings, in which:

- Figure 1 is an outer side view of a ski boot according to the present invention;
- Figure 2 is a view similar to the one shown in Figure 1, in which the ski boot is however shown from the inner side of the foot;
- Figure 3 is a simplified exploded and partially see-through view of the ski boot shown in Figures 1 and 2;
- Figure 4A is a cross-sectional view of the portion of the shell of the boot that is enclosed in the circle D of Figure 1, however in a different embodiment;
- Figure 4B is similar to Figure 4A, showing the same portion of the shell as it tries to be penetrated by a sharp-pointed body, such as for instance the tip of a ski pole;

– Figure 5 is a front view, i.e. from the outside of the foot, the same portion of the shell to which Figures 4A and 4 B also refer;

– Figure 6 is a view from the outer side of the foot of a removable inner shoe that is adapted for use in combination with the boot illustrated in the preceding Figures;

– Figure 7 is a partially cross-sectional view along the line A-A of Figure 1 of a footwear consisting of a boot as illustrated in Figures 1 to 3 and an inner shoe as illustrated in Figure 6.

With particular reference to Figures 1 to 3, a ski boot can be noticed to comprise two parts that are made of rigid plastic materials, i.e. a shell 10 - which includes a sole 101, a lower portion adapted to accommodate the foot and an upper portion extending well above the line of the malleoli - and a legpiece 20. Hinge means (not shown, owing to them being well known to those skilled in the art) join the legpiece 20 to the shell 10 in such a manner as to enable the former one to be articulated with respect to the latter one about a substantially horizontal axis. The shell 10 features a longitudinal window 12 (shown in Figure 3), which extends from the tip portion 11 up to the upper free border 13.

This window 12, which allows for the foot to be introduced in the boot, is adapted to be closed with a tongue 40 having the approximate shape of a "L" which, according to a feature of the invention, is at least partially made of two different co-injected plastic materials, of which the inner one is soft (for example, foamed open-cell polyurethane) and the outer one is not only rigid, but also impermeable in order to prevent water and snow from seeping through into the footwear (for example, polypropylene). According to another feature of the invention, the rigid portion of the tongue 40 is provided with a window 46, which is occupied by a bulging portion of the above cited soft material in correspondence of the starting point of the instep, further to two front perforations 42 and 44 for a couple of rivets (not shown for sake of simplicity) for fixing it to the lower portion of the shell 10 in the proximity of the tip portion 11 - see Figure 3.

A strip 50 of flexible plastic material, which is in the approximate shape of a downward curved rectangle and is provided near one of its short sides with three perforations 52, 54, 56 for attachment (by means of rivets, not shown) to the lower portion of the shell 10, is adapted to extend transversally above the tongue 40, namely above said window 46. This strip 50 is in turn provided with a window 58 and a further perforation 59 for the attachment (by means of a further rivet, not shown) of a rack 61 which, jointly with a corresponding buckle 62 - shown in Figure 1 - forms the first one of the conventional fastening means of the boot. The other two conventional fastening means of the boot are constituted by two further racks 63, 64 which, as disclosed in the international patent application PCT/IT01/00341 by the same Applicant, are attached to a panel 22 hinged on to

the inner side of the upper portion of the shell 10 - see Figure 2 - and are adapted to co-operate with corresponding buckles 65, 66, and by a strap 67 that winds all around the legpiece 20 so as to tighten it against the calf of the wearer.

The following description refers mainly to the exploded view of Figure 3, which illustrates the outer side of the boot, but also applies *mutatis mutandis* to the inner side of the same boot further to the cross-sectional view of Figure 7.

According to a major feature of the invention, the shell 10 is provided with through-perforated windows in a roughly ovoidal shape, namely a window 14 in correspondence of the outer malleolus and a window 16 in correspondence of the outer side of the metatarsus. Above these windows, there is applied from the outside a soft padding 15 supported by a protective shield 25 which ensures the attachment thereof to the shell 10 and forms a sort of sandwich structure with the padding 15.

According to this preferred embodiment of the invention, the above-mentioned soft padding 15 forms a first panel in the approximate shape of a "L" with two outward facing bulging portions 17, 18 exactly in correspondence of the inner malleolus and the inner side of the metatarsus. The soft padding 15 is made by a thermoforming technique and may for instance consist of an inner layer of polyethylene, an intermediate layer of polyvinyl chloride and an outer layer (much thinner than the other two layers) of polyurethane. In turn, the support shield 25, which is of rigid shock-proof material, such as for instance rigid polyurethane and is also made by a thermoforming technique, forms a second panel that is substantially in the same shape as, but larger than the first one, and is provided with two windows 27 and 28 that are so shaped and sized as to be able to exactly and tightly accommodate the bulging portions 17 and 18 when the padding 15 and the shield 25 are joined together. In order to bring about such a joining, namely to obtain the said sort of sandwich structure, use may be made of welding techniques, or equally well-known adhesive bonding techniques, to be applied at least along the whole of the outer periphery of the padding 15 and of the windows 27 and 28. Use can of course be made also of other well-known joining techniques, such as co-injection moulding.

Such a sandwich structure consisting of the soft padding 15 and the rigid shield 25 is rigidly attached to the outer surface of the shell 10, with the result that said bulging portions 17 and 18 of the padding 15 are exposed to view and arranged in correspondence of the outer malleolus and the outer side of the metatarsus of the wearer, respectively, as this has already been discussed above - see Figure 1. Such an attachment calls for the lower folded edge 23 of the shield 25 to be inserted into a longitudinal receptacle 100 located immediately above the sole 101 of the shell 10 - see Figure

7 - in correspondence of the plantar arch of the foot, and is carried out under utilization of a few rivets (not shown, for sake of simplicity) engaging corresponding perforations which are distributed along the periphery of the shield 25, such as the one indicated at 29 and shown in Figures 1 and 3,.

Figure 2 can be noticed to show the inner side of the ski boot where the rigid shield 125 features two windows 127 and 128 that are so shaped and sized as to be able to exactly and tightly accommodate the bulging portions 117 and 118 - arranged in correspondence of the inner malleolus and the inner side of the metatarsus of the wearer, respectively - of the soft padding 115 provided therebelow. The construction characteristics of the shield 125 and the padding 115, as well as the methods used to join the same together so as to obtain that sort of sandwich structure, are those already described in connection with the shield 25 and the padding 15. The shield 125 is furthermore attached to the outer surface of the shell 10 by means of a few rivets (not shown) engaging corresponding perforations such as the ones indicated at 126 and 129.

All windows provided in the shell 10 are preferably sealed with thin plates or disks of impermeable material, such as for instance polyvinyl chloride reinforced with a textile mesh, in order to prevent any water and snow from being able to seep through into the footwear. Only one of these sealing disks is visible in the accompanying drawing, i.e. the disk indicated at 21 which is applied to the outer surface of the shell 10 in correspondence of the window 16 - see Figure 7.

In the embodiment illustrated in Figures 4A, 4B and 5 - where those parts that are substantially unchanged with respect to the embodiment shown in Figures 1 to 3, such as for instance the padding and the shield joined together, are omitted for sake of simplicity - the shell 310 is provided, instead of at least one of the windows such as the ones indicated at 14 and 16, with zones having a reduced thickness, such as at 314, where is provided a narrow opening 320 which may be in a tripod-like configuration - as shown in Figure 5 - or in a different configuration, such as a cross-like or an asterisk-like configuration. Also said opening 320 is sealed by means of a plate 330 of impermeable material which preferably overlaps, as this is shown in the Figures, the step forming between the thinner zone 314 where the opening 320 is provided, and the remaining of the shell 310. In the case of a bump, a shock or an attempted penetration of the aperture 320 by the tip T of a ski pole (see Figure 4B), the plate 330 (and even the overlying padding in the worst cases) may even break open, but the foot is anyway protected by the deflection of the shell 310 towards the interior of the boot, which is allowed for by the reduced thickness of said zone 314 and the conformation of the aperture 320 itself. On the other hand, the zone 314 of reduced thickness is also effective in enabling the shell 310 to feature such a minimum extent of elasticity as required in view of avoiding any possible discomfort and similar inconveniences to the foot of the wearer.

Figures 6 and 7 illustrate a removable inner shoe 200 which, in a *per se* known manner, is used as a part of at least some models of ski boots. The inner shoe 200, which has such a height as to protrude above the free upper border of the legpiece 20, comprises a vamp 202, a lining 204 and a padding 206 arranged in between. All these parts of the inner shoe 200 are conventionally made of materials that are less rigid than the materials used to make the shell 10 and the legpiece 20; for example, the vamp 202 is made up of mutually joined layers of polyethylene and polyvinyl chloride.

According to a feature of the present invention, also the inner shoe 200 is provided with windows on a level with the metatarsus - such as for instance the one indicated at 210 in Figure 7 - as well as on a level with the two malleoli, namely both on the outer side and the inner side of the foot of the wearer. In these windows there are accommodated corresponding inserts, such as those indicated at 220 and 222 respectively, which are applied on to the vamp 202 by means of sewing seams 211 and 213 - see Figure 6. The said inserts are made of a material that may also be of the same type as the one used to make the vamp 202, but anyway featuring such elasticity properties as to allow for an expansion of the foot.

From the description given above it quite clearly appears that the presence – right from the manufacture of the ski boot – of soft materials in correspondence of the windows provided in the shell, and possibly also in the legpiece, as well as in the tongue and the inner shoe is effective in preventing the wearer from suffering any discomfort or inconvenience at his/her malleoli, metatarsus and possibly also at his/her instep, in line with the above mentioned object of the invention.

It will be appreciated that the invention, within the scope defined by the appended claims, may be embodied also in a number of different forms and variants, such as for instance by providing variously sized and shaped apertures and windows, even in correspondence of a same zone of the shell, and possibly also the legpiece, or by replacing the shields with narrow frames of rigid shockproof material around paddings that are slightly larger than the windows themselves.

It will be further appreciated that the present invention also applies to sports footwear without an inner shoe.

* * * * * * *

CLAIMS

1. Sports footwear, such as a ski boot or the like, in which the shell (10), and possibly also the legpiece (20), which are made of rigid plastic materials, are provided with a plurality of windows or through-apertures (14, 16; 320), in correspondence of which use is made of materials that are softer than the materials used to make the shell (10) and the legpiece (20), **characterized in that** said apertures (14, 16; 320) are located at least in correspondence of the malleoli and the metatarsus, on the outer side and/or the inner side of the footwear.

2. Sports footwear according to claim 1, **characterized in that** said apertures (320) are provided in correspondence of zones (314) in which the shell (310) and possibly also the legpiece have a reduced thickness.

3. Sports footwear according to claim 1 or 2, **characterized in that** said softer materials are used to make at least a padding (15) on the outer side and/or a padding (115) on the inner side of the foot of the wearer, said paddings (15, 115) being preferably made in the form of multi-layer parts of different plastic materials.

4. Sports footwear according to claim 3, **characterized in that** each one of said paddings (15, 115) is joined to a piece (25, 125) of the footwear that is made of rigid shockproof materials, so as to be attached on to the corresponding exposed surface of the shell (10), and possibly also the legpiece (20).

5. Sports footwear according to claim 4, **characterized in that** each one of said paddings (15, 115), together with the associated piece (25, 125) made of rigid shockproof materials in the form of a shield, form a sort of sandwich structure extending from one to the other of the zones corresponding to said windows (14, 16) of the shell (10), and possibly also the legpiece (20), the paddings (15, 115) being provided with bulging portions (17, 18, 117, 118), facing outwards with respect to the foot of the wearer, which are accommodated in corresponding windows (27, 28, 127, 128) of the said piece (25, 125) that is made of rigid shockproof materials.

6. Sports footwear according to claim 4, **characterized in that** each one of said paddings is in the form of a a cushion and the associated piece made of rigid shockproof materials is in the form of a frame located in correspondence of one of said windows (14, 16) of the shell (10) and, possibly,

also the legpiece (20).

7. Sports footwear according to claims 5 or 6, **characterized in that** said paddings (15, 115) are joined to the associated pieces (25, 125) made of rigid shockproof materials by means of *per se* known welding or adhesive-bonding techniques.

8. Sports footwear according to claims 5 or 6, **characterized in that** said said paddings (15, 115) are joined to the associated pieces (25, 125) made of rigid shockproof materials by means of *per se* known techniques, such as for example co-injection moulding.

9. Sports footwear according to claim 4, **characterized in that** rivets or similar fastening means are used to attach said pieces (25, 125) of the footwear made of rigid shockproof materials on to the corresponding exposed surface of the shell (10), and possibly also the legpiece (20).

10. Sports footwear according to claim 9, **characterized in that** at least said pieces (25, 125) of the footwear made of rigid shockproof materials have a lower folded edge for the insertion into a longitudinal receptacle (100) situated immediately above the sole (101) of the shell (10), in correspondence of the plantar arch of the wearer foot.

11. Sports footwear according to any of the preceding claims, **characterized in that** on the exposed surface of the shell (10), and possibly also the legpiece (20), in correspondence of said windows or apertures (14, 16; 320) there is applied a sealing piece (21; 330) in order to prevent any water and snow from being able to seep through into the footwear.

12. Sports footwear according to claim 11, **characterized in that** said sealing part (21) consists of a thin plate in the form of a disk or the like of waterproof material, which is adhesive-bonded or welded on to the shell (10) and possibly also the legpiece (20).

13. Sports footwear according to any of the preceding claims, where a longitudinal aperture (12) that extends from the zone of the tip portion (11) to the upper free border (13) of the shell (10) is provided) and is adapted to be closed with the aid of a tongue (40), **characterized in that** said tongue (40) is made of at least two materials of differing rigidity, the softer one being in all cases the one provided on the innermost side of the tongue.

14. Sports footwear according to claim 13, **characterized in that** the rigid portion of said tongue (40) is provided with a window (46) in correspondence of the starting point of the instep of the wearer foot.

15. Sports footwear according to any of the preceding claims, which also includes a removable inner shoe (200), **characterized in that**, in correspondence of the malleoli and the metatarsus, on both the outer and the inner side of the wearer foot, said inner shoe (200) is provided with windows (210) that are filled with inserts (220, 222) that have such elasticity properties as to allow for the expansion of the foot.

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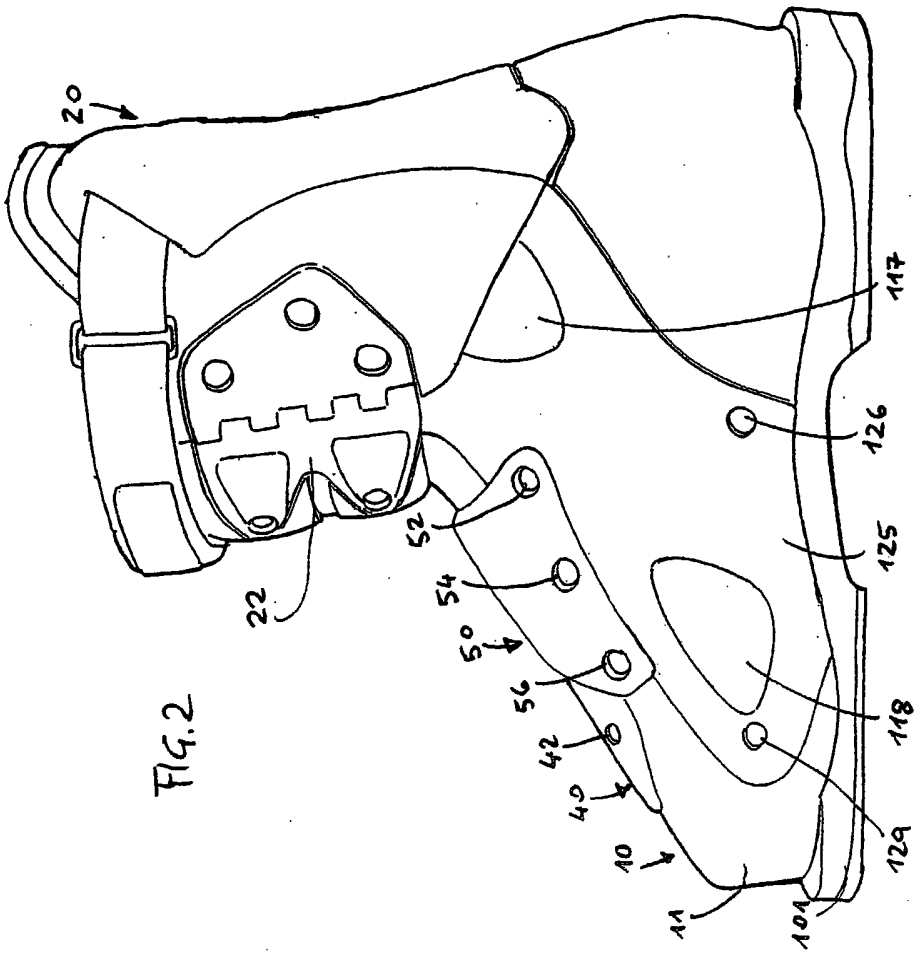
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FIG.2

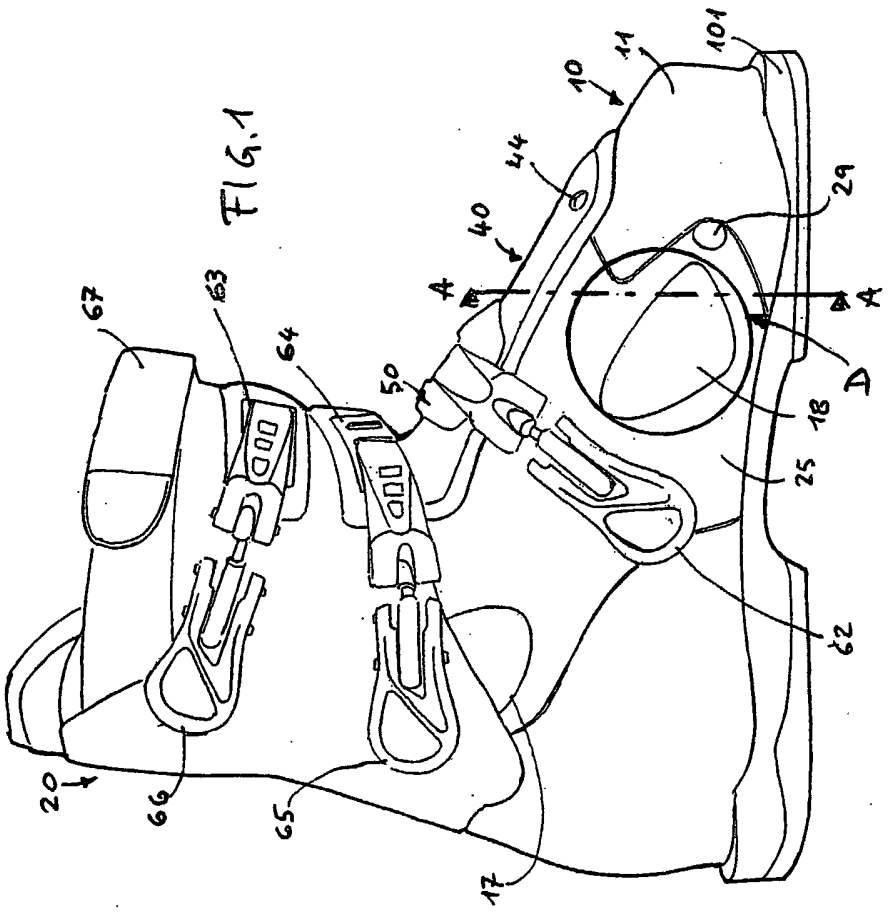
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FIG.1

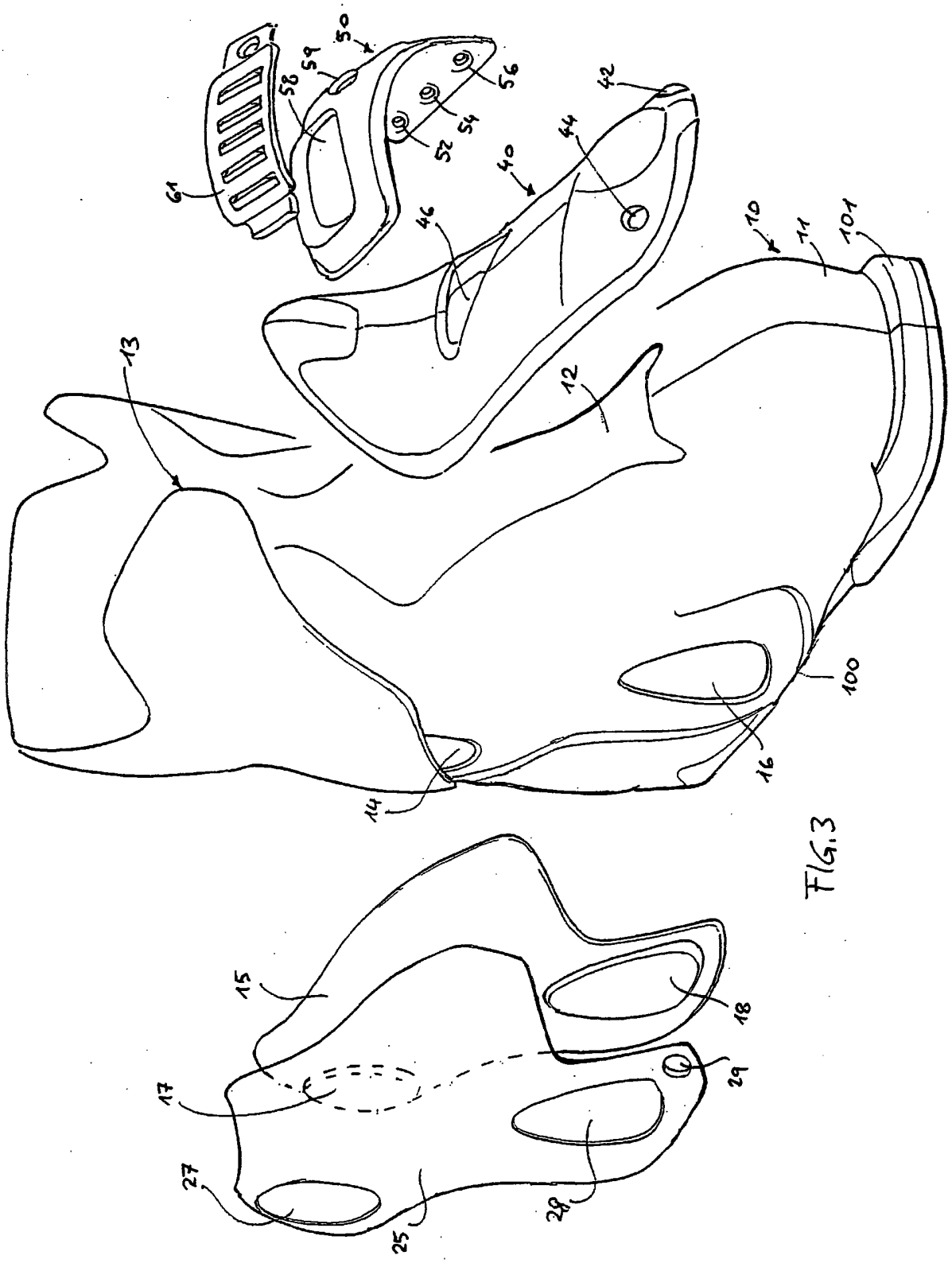
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FIG.3

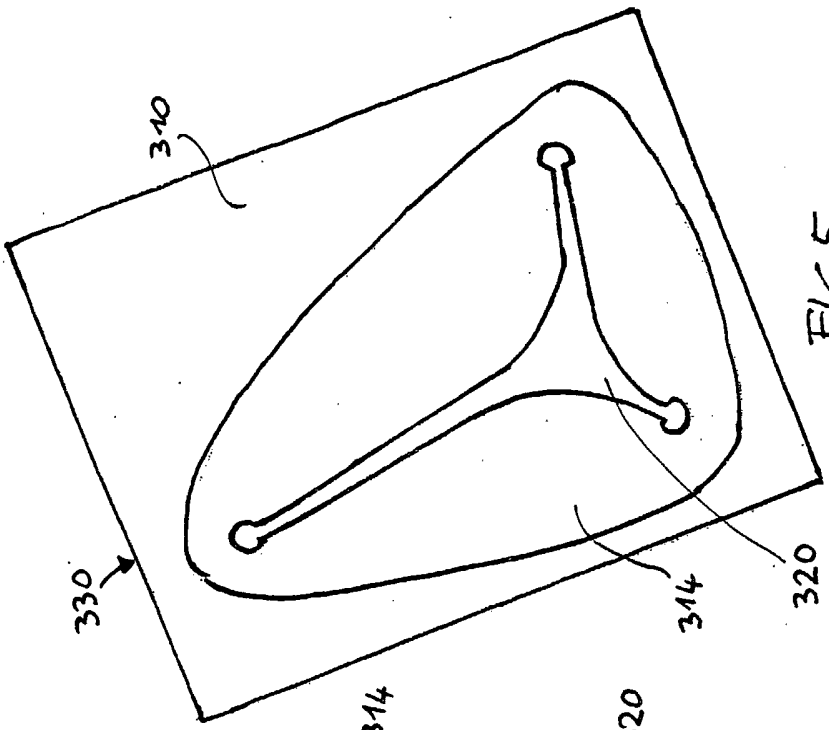

FIG. 5

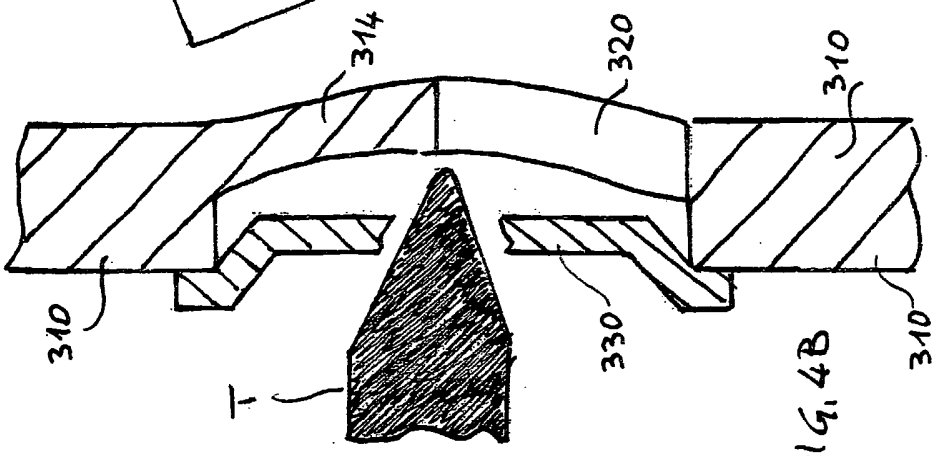

FIG. 4B

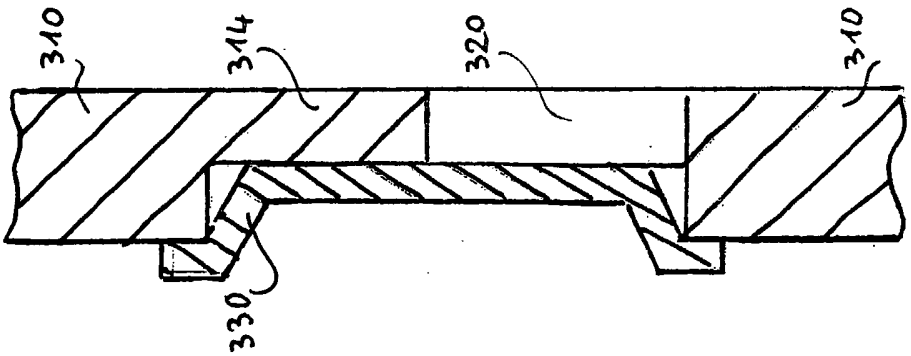

FIG. 4A

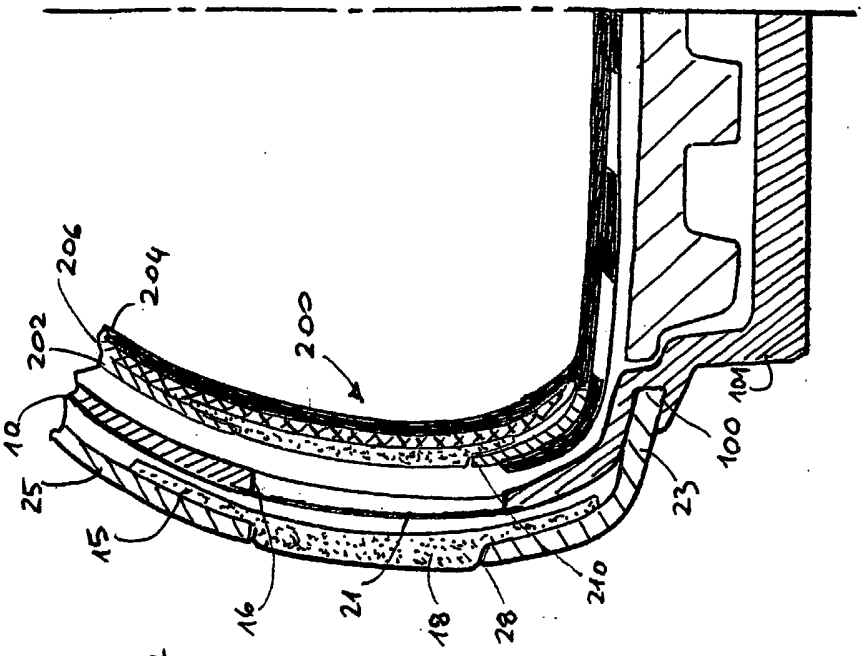
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FIG.7

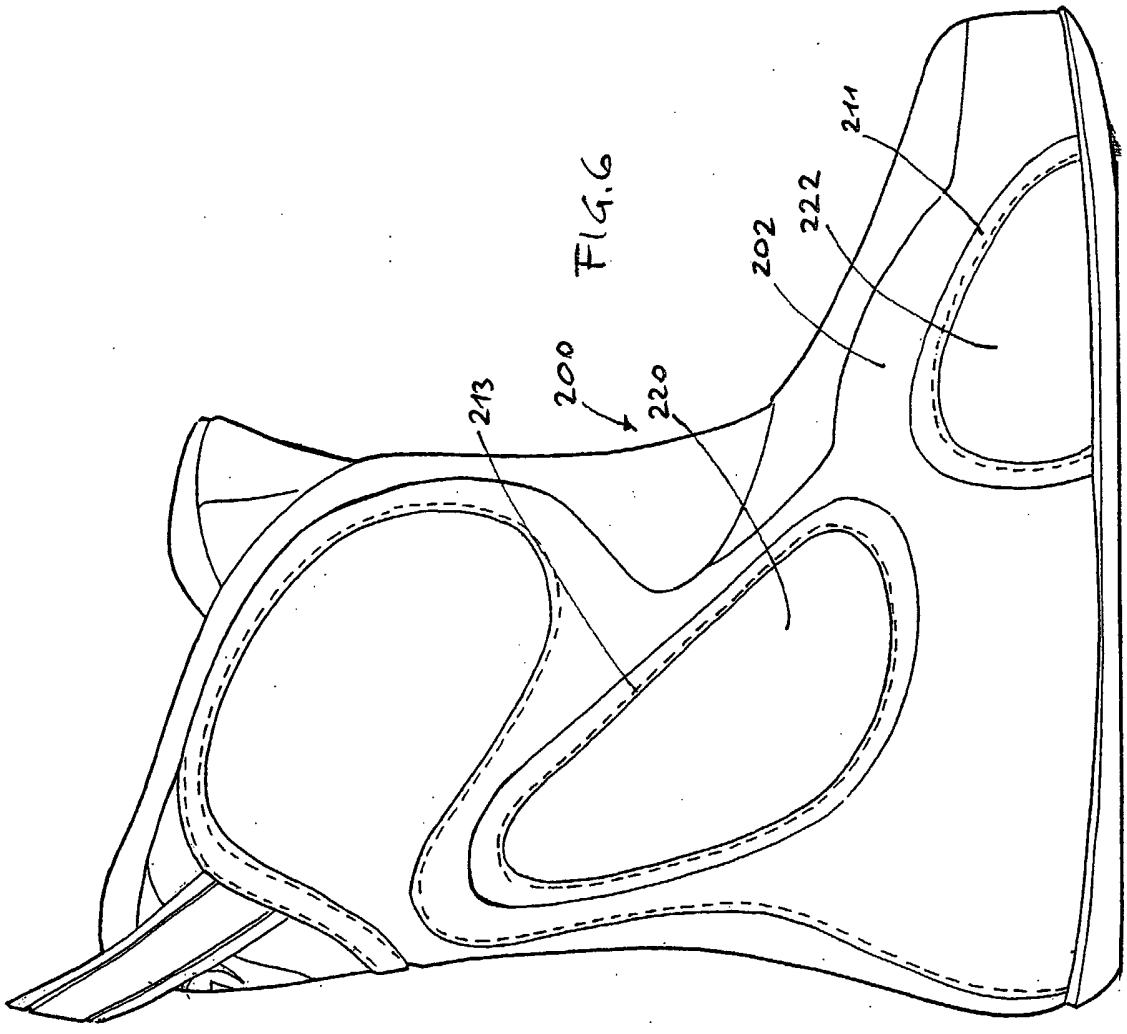
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FIG.6

INTERNATIONAL SEARCH REPORT

Internat Application No
PCT/IT 02/00781

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A43B5/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 A43B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 645 101 A (NORDICA SPA) 29 March 1995 (1995-03-29) column 10, line 28-32 -column 11, line 34-46; figures 14-18 ---	1,3,4, 11,15
A	EP 0 916 273 A (LANGE INT SA) 19 May 1999 (1999-05-19) column 2, line 54-58; figures ---	1
A	WO 02 087371 A (BENETTON SPA ;CAERAN FRANCESCO (IT)) 7 November 2002 (2002-11-07) page 5, line 15-21; claim 1; figures ---	1
A	EP 0 941 675 A (LANGE INT SA) 15 September 1999 (1999-09-15) column 2, line 49-52; figures ---	1
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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
25 July 2003	04/08/2003

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INTERNATIONAL SEARCH REPORT

Internal Application No
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