



EUROPEAN PATENT APPLICATION

(43) Date of publication:
10.06.2015 Bulletin 2015/24

(51) Int Cl.:
A43B 5/04 (2006.01) A43B 13/14 (2006.01)

(21) Application number: **14196672.1**

(22) Date of filing: **05.12.2014**

(84) Designated Contracting States:
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO
PL PT RO RS SE SI SK SM TR**
Designated Extension States:
BA ME

(71) Applicant: **Calzaturificio S.C.A.R.P.A. S.p.A.**
31011 Asolo (IT)

(72) Inventor: **Parisotto, Davide**
31010 Casella D'Asolo (IT)

(74) Representative: **Bellemo, Matteo et al**
Studio Torta S.p.A.
Via Viotti, 9
10121 Torino (IT)

(30) Priority: **06.12.2013 IT TV20130204**

(54) **Ski boot**

(57) A ski boot (1) comprising a rigid shell (2) which is shaped so as to accommodate the foot of the user and has a lower part structured so to couple/bind in a rigid and stable, though easily releasable, manner to a ski binding device, and a rigid cuff (3) which is shaped so as to enclose the ankle of the user and is hinged on the shell (2) so as to be able to rotate about a rotation axis (R) substantially perpendicular to the midplane of the boot (P) and locally substantially coincident with the articulation axis of the ankle of the user; the lower part of the shell (2) incorporating the front sole (11) being shaped substantially like the bowl of a spoon, so as to define a front ground-resting surface (18) with an arched profile at least orthogonally to the midplane of the boot (P).

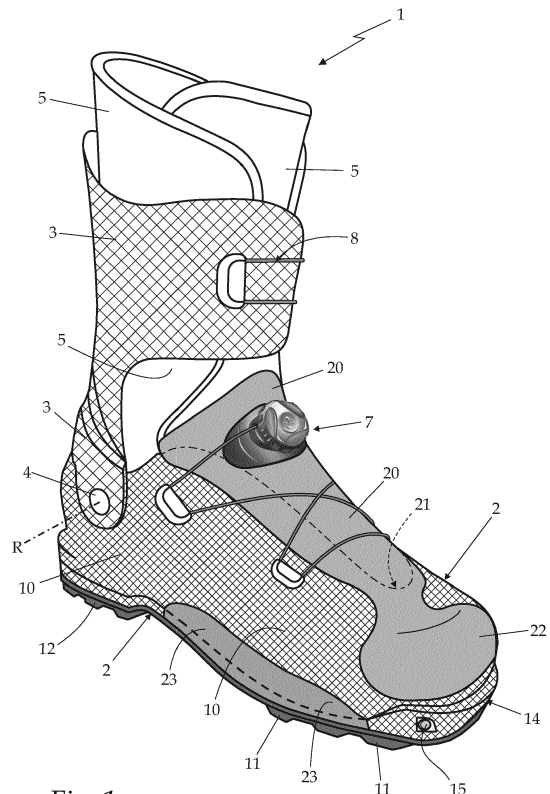


Fig. 1

Description

[0001] The present invention relates to a ski boot.

[0002] More in detail, the present invention relates to a mountaineering ski boot, use to which the following disclosure will explicitly refer without however losing in generality.

[0003] As is known, more recent mountaineering ski boots basically consist of a rigid shell made of plastic material and which is shaped so as to accommodate the foot of the skier, and is provided on the bottom with a front sole and a rear heel made of non-slip elastomeric material; and of a rigid tubular cuff made of plastic material and which is substantially C-shaped so as to embrace the lower section of the skier's leg from behind, and is hinged to the upper part of the shell so as to rotate about a transversal reference axis which is substantially perpendicular to the midplane of the boot, and is also locally substantially coincident with the articulation axis of the ankle.

[0004] The above-mentioned mountaineering ski boots are also provided with an inner liner made of soft and thermal insulating material, which is inserted into the shell and the cuff, and is shaped so as to accommodate and protect both the foot and the lower section of the skier's leg; and with a series of manually-operated closing members that are located both on the shell and on the cuff, and are structured so as to selectively close/tighten the shell and the cuff to immobilize the skier's leg stably inside the liner.

[0005] Finally, mountaineering ski boots are generally also provided with a manually-operated cuff locking device which is usually located in the area immediately above the heel of the boot, straddling the shell and the cuff, and is structured so as to be able to selectively and alternatively, rigidly lock the cuff to the shell in a given tilted position; or to unlock/release the cuff completely from the shell so as to allow the cuff to freely swing on the shell.

[0006] The lower part of the rigid shell is instead specifically structured so as to couple in a rigid and stable, though easily releasable, manner with the toe-piece and with the heel-piece of a mountaineering ski binding device, which is in turn structured to be rigidly fixed on the back of a downhill ski or the like.

[0007] More in detail, the toe-piece and the heel-piece of the mountaineering ski binding device are structured so as to allow the skier to raise the heel of the ski boot, when necessary, while always and in any case keeping the tip of the boot, or better the tip of the shell, firmly anchored to the ski.

[0008] Unfortunately, recent studies on the kinematics of the movement of the mountaineering ski boot on the ski highlight that the flat shape of the lower part of the shell incorporating the front sole does not adapt perfectly to the physiognomy of the sole of the foot, and furthermore may hinder the raising and lowering movement of the heel of the boot from the ski when the skier moves

on snowy surfaces with abundant fresh snow.

[0009] Aim of the present invention is to improve the kinematic interaction between the mountaineering ski boot and the mountaineering ski binding device, so as to increase the skier's performance without however significantly increasing the cost of the bindings and/or of the mountaineering ski boots.

[0010] In compliance with these aims, according to the present invention there is provided a ski boot as defined in claim 1, and preferably, though not necessarily, in any one of the claims dependent thereon.

[0011] The present invention will now be described with reference to the accompanying drawings, which illustrate a non-limiting embodiment thereof, in which:

- Figure 1 is a perspective view, with parts removed for clarity, of a mountaineering ski boot realized according to the teachings of the present invention;
- Figure 2 is an enlarged side view, with parts removed for clarity, of the shell of the mountaineering ski boot shown in figure 1; whereas
- Figures 3, 4 and 5 are three sectional views of the Figure 2 shell respectively cross-sectioned according to the sectional line A-A, the sectional line B-B and the sectional line C-C.

[0012] With reference to figures 1 and 2, numeral 1 indicates as a whole a ski boot, and in particular a ski boot specifically structured for practicing the sport of ski mountaineering.

[0013] The ski boot 1 basically consists of a rigid shell 2 made of plastic and/or composite material, which is shaped so as to accommodate the foot of the user, and has the lower part specifically structured/shaped so as to couple/bind in a rigid and stable, though easily releasable manner with a ski binding device of known type, which in turn is structured to be rigidly fastened to the back of a downhill ski or the like; and of a rigid cuff 3 made of plastic and/or composite material, which is shaped so as to enclose the ankle of the user, and is hinged on the upper part of shell 2 so as to freely swing about a transversal reference axis R which is locally substantially perpendicular to the vertical midplane of the boot (i.e. perpendicular to the plane of the sheet in figure 2), and is moreover locally substantially coincident with the articulation axis of the ankle of the user.

[0014] More in detail, in the example shown, the lower part of shell 2 is preferably specifically structured/shaped so as to couple/bind in a rigid and stable, though easily releasable, manner with the toe-piece and with the heel-piece of a known mountaineering ski binding device, which is in turn structured to be rigidly fixed on the back of a downhill ski or the like.

[0015] Cuff 3 instead is preferably fixed in freely rotatable manner to shell 2 by means of two lateral connection hinges 4 which are located on the inner and outer lateral sides of shell 2 and of cuff 3, aligned along axis R, so as to allow cuff 3 to freely swing both forwards and back-

wards on shell 2, while always remaining on a reference plane which is orthogonal to axis R and is substantially coincident with the midplane of the boot.

[0016] With reference to figure 1, the ski boot 1 preferably also comprises an inner liner 5 which is preferably made of soft and/or thermal insulating material, is accommodated inside shell 2 and cuff 3 preferably, though not necessarily, in removable manner, and is shaped so as to accommodate, envelope and protect the foot and the lower section of the leg of the user; and a manually-operated, mechanical boot closing system which is structured so as to be able to selectively close/tighten shell 2 and cuff 3 for immobilizing the leg of the user stably inside the ski boot 1, or better, the inner liner 5.

[0017] More in detail, in the example shown, the boot closing system preferably, though not necessarily, consists of two independent manually-operated closing members 7 and 8, which are located one on shell 2 and the other on cuff 3, and are structured so as to be able to selectively close /tighten 3, respectively, shell 2 and cuff for immobilizing the leg of the user stably inside the ski boot 1, or better, the inner liner 5.

[0018] With reference to figure 2, preferably the ski boot 1 is finally also provided with an automatic or manually-operated cuff locking device 9, which is preferably located in the area immediately above the heel of the boot, straddling shell 2 and cuff 3, and is structured so as to be able to, selectively and alternatively,

- rigidly lock cuff 3 to shell 2 in a given position in which cuff 3 is tilted forwards with respect to the vertical of shell 2 by a predetermined angle preferably, though not necessarily, ranging between 3° and 30°; or
- completely unlock/release cuff 3 from shell 2 so as to allow cuff 3 to freely swing on the shell about axis R, preferably both forwards and backwards.

[0019] With reference to the figures from 1 to 5, shell 2 instead basically consists of a substantially basin-shaped rigid casing 10 made of plastic or composite material, which is shaped so as to accommodate the foot of the user; and of a front sole 11 and a rear heel 12, which are preferably made of rubber or other elastomeric material, and are located on the lower wall 13 of rigid casing 10, respectively at the tarsal-phalangeal area and at the heel area of the sole of the foot.

[0020] More in detail, in the example shown, sole 11 and heel 12 are preferably attached in unmovable manner on the lower wall 13 of rigid casing 10, preferably by means of gluing.

[0021] The lower part of casing 10 is moreover specifically structured/shaped so as to couple/bind in a rigid and stable, though easily releasable, manner with the toe-piece and with the heel-piece, respectively, of the ski binding device or mountaineering ski binding device.

[0022] More in detail, with reference to figures 1 and 2, the rigid casing 10 is preferably provided, at front, with a substantially duckbill-shaped protruding tailpiece 14,

which protrudes cantilevered beyond the front edge of sole 11 thus substantially forming an extension of the lower wall 13 of the casing, and which is structured so as to couple in a known manner with the toe-piece of a mountaineering ski binding device.

[0023] Preferably, inside the protruding tailpiece 14 there is also embedded a transversal stiffening bar or insert 15 made of metal material, which is arranged substantially perpendicular to the midplane of the boot, and surfaces with the two ends outside casing 10 at the two lateral sides of protruding tailpiece 14.

[0024] Preferably shell 2 also comprises a coupling plate 16 made of metal material, which is rigidly attached to the rear part of rigid casing 10, immediately above the rear heel 12 and substantially straddling the midplane of the boot, and is structured so as to be able to couple in a known manner with the heel-piece of a mountaineering ski binding device.

[0025] With reference to the figures from 2 to 5, differently from currently known ski boots, the lower part of shell 2 incorporating the front sole 11 is shaped substantially like the bowl of a spoon, so as to define a front ground-resting surface 18 with an arched profile at least orthogonally to the midplane of boot P.

[0026] More in detail, the portion of lower wall 13 of rigid casing 10 that supports the front sole 11, i.e. the front portion of lower wall 13, and/or the front sole 11 are shaped substantially like the bowl of a spoon so as to define a front ground-resting surface 18 with an arched profile at least orthogonally to the midplane of boot P.

[0027] In the example shown, in particular, the front portion of lower wall 13 of rigid casing 10 and/or the front sole 11 are shaped substantially like the bowl of a spoon so as to define a front ground-resting surface 18 with an arched profile both parallel and orthogonally to the midplane of boot P.

[0028] With reference to figures 3, 4 and 5, at the midplane P of the boot and orthogonally to the same midplane P, the radius of curvature r of the front ground-resting surface 18 also ranges preferably, though not necessarily, between 100 and 3000 cm (centimetres).

[0029] Preferably, moreover the value of the radius of curvature r of the front ground-resting surface 18 increases progressively as the distance from the tip of the boot increases, i.e. from the protruding tailpiece of the rigid shell 10.

[0030] In the example shown, in particular, the portion of lower wall 13 of rigid casing 10 that supports the front sole 3, i.e. the front portion of lower wall 13, is preferably cambered substantially like the bowl of a spoon; whereas the front sole 11 has a nominal thickness s preferably substantially constant and a profile which matches the shape of the front portion of lower wall 13.

[0031] In addition, the front portion of lower wall 13 moreover has a preferably substantially constant thickness, and is preferably provided, at the midplane of boot P and orthogonally to the same midplane, with a radius of curvature r, which preferably, though not necessarily,

ranges between 100 and 3000 cm (centimetres).

[0032] Obviously, in a different embodiment, the front sole 11 may have a variable thickness which decreases as the distance from the midplane of boot P increases, so as to increase the bowl-shape of the front ground-resting surface 18 with respect to the one of the front portion of lower wall 13 of casing 10.

[0033] With reference to figure 1, the lower part of shell 2 incorporating the heel 12 is instead substantially flat, so as to define a rear ground-resting surface 19 which is substantially flat and is locally substantially perpendicular to the midplane P of the boot.

[0034] More in detail, the portion of lower wall 13 of rigid casing 10 that supports the rear heel 12, and/or the rear heel 12 are substantially flat, so as to define a rear ground-resting surface 19 which is substantially flat and is locally substantially perpendicular to the midplane P of the boot.

[0035] With reference to figures 1 and 2, preferably shell 2 in addition comprises an oblong-shaped flattened protective tongue 20, which is located to rest on the upper part of casing 10, to cover a longitudinal slit 21 extending along the upper wall of casing 10, more or less above the upper part of the instep of the user's foot, and is structured/ sized so as to allow the casing 10 to expand temporarily to facilitate the insertion and removal of the foot of the user from the liner 5.

[0036] More in detail, the protective tongue 20 is preferably arranged straddling the vertical midplane P of the boot, and extends grazing the upper part of casing 10, i. e. grazing the area of casing 10 immediately above the instep of the foot and possibly also the tibia-astragalus junction of the ankle, to cover the longitudinal slit 21.

[0037] In the example shown, in particular, casing 10 is preferably made of composite material, whereas the protective tongue 20 is preferably, though not necessarily, made of plastic material.

[0038] More in detail, in the example shown, casing 10 is preferably, though not necessarily, made of a composite material formed by one or more overlapping layers of carbon fibre and/or fibre glass and/or aramid fibre, which are conveniently braided and/or overlap each other and are embedded in an epoxy phenolic or polyester resin, preferably of the thermosetting type.

[0039] Front sole 11 and rear heel 12 instead are preferably made of rubber or other non-slip elastomeric material and are preferably, though not necessarily provided with a treaded profile.

[0040] Protective tongue 20 is instead preferably, though not necessarily, made of nylon (polyamide), PEBAX (polyester-amide) or similar plastic polymers.

[0041] Furthermore, with reference to the figures from 1 to 5, in the example shown, shell 2 additionally comprises a front protective cap 22 made of plastic material, which covers the outer surface of the tip of the composite material casing 10, and is fixed in unmovable manner to said casing 10 preferably by means of gluing.

[0042] Alternatively, the protective cap 22 may also be

made by injection moulding, directly on the tip of the composite material casing 10.

[0043] In the example shown, in particular, the protective cap 22 is preferably substantially cup-shaped, and preferably extends to cover the area of the tip of the composite material casing 10 which is above the protruding tailpiece 14.

[0044] Preferably, though not necessarily, the protective cap 22 is also made of nylon (polyamide), PEBAX (polyester-amide) or similar plastic polymers.

[0045] Additionally, the protective cap 22 is preferably also provided with a protruding tab which extends grazing the outer surface of the composite material casing 10 up to reach the upper part of shell 2 above the phalanx area of the foot, and then extends towards the longitudinal slit 21 up to reach the lower end of protective tongue 20 where joins the latter without interruption.

[0046] In other words, the protective tongue 20 is preferably made in one piece with protective cap 22.

[0047] With reference to the figures from 1 to 5, preferably shell 2 is finally provided, on the inner and outer lateral sides of the composite material casing 10, with two protective lateral bands 23 made of plastic material preferably, though not necessarily, of elastomeric type, which extend upwards starting from the lateral edges of sole 11, while continuing to graze the outer surface of the composite material casing 10, and are attached in unmovable manner to the composite material casing 10 preferably by means of gluing.

[0048] The two lateral bands 23 are moreover shaped so as to enclose/embrace the composite material casing 10 on opposite sides thereof, at the tarsal-phalangeal area of the foot and preferably up to the area of the arch of the sole, i. e. at front sole 11.

[0049] Preferably, though not necessarily, the two lateral protective bands 23 are made in one piece with the front sole 11.

[0050] With reference to figure 1, the rigid cuff 3 instead preferably consists of a substantially C-shaped composite material casing, so as to embrace the lower section of the user's leg from behind.

[0051] In the example shown, in particular, cuff 3 is preferably, though not necessarily, made of a composite material formed by one or more overlapping layers of carbon fibre and/or fibre glass and/or aramid fibre, which are conveniently braided and/or overlap each other and are embedded in an epoxy phenolic or polyester resin, preferably of thermosetting type.

[0052] As regards instead the boot closing system, in the example shown the closing members 7 and 8 preferably consist of two manually-operated winch closing devices, like the ones marketed by American company BOA TECHNOLOGY INC. These closing devices are already well-known in the field of sports footwear and are described and disclosed in detail for example, in Patent Applications US19970917056, WO1998US16314, JP20000507254, US20010956601, US20010099566, US19990337763, JP20010519784, WO2000US19440,

US19990388756, US20010993296, US20030459843, US20050263253, US20070841872, US20070842009, US20070841997, US20070842013, US20070842005, WO2005US39273 and US20040623341P, to which reference is directly made for any further details on the structure and/or operation thereof.

[0053] Finally with reference to figure 2, in the example shown, the cuff locking device 9 preferably comprises: a rigid rod 24, preferably made of metal material, which has the lower end hinged on shell 2 at the heel of the boot, so as to be able to freely rotate about a reference axis T locally substantially parallel to axis R (and therefore locally substantially perpendicular to the midplane of the boot), and extends upwards on the midplane of the boot up to reaching the portion of cuff 3 which is immediately above the heel of the boot; and a manually-operated mechanical locking member (not shown), which is rigidly fixed on cuff 3 immediately above the heel of the boot so as to be axially slidingly engaged by the end part of rod 24, and is structured to selectively prevent any relative movement between rod 24 and the locking member, so as to rigidly lock cuff 3 to shell 2.

[0054] Operation of the ski boot 1 is easily inferable from the above description, and therefore does not require further explanations.

[0055] The advantages resulting from the particular structure of the lower part of shell 2 are numerous. Firstly, experimental tests have indeed highlighted that the shape of the lower part of shell 2 like the bowl of a spoon, with the subsequent realization of a front ground-resting surface 18 with arched profile at least orthogonally to the midplane P of the boot, better adapts to the physiognomy of the sole of the foot, and allows the efficiency of the forward thrust of the skier to be improved.

[0056] Furthermore, the shape like the bowl of a spoon of the lower part of shell 2 prevents formation of a layer of compact snow between sole 11 and the underlying back of the downhill ski, with all the advantages this involves when the skier is to advance on snowy surfaces covered by a fresh layer of snow.

[0057] In addition, the use of a front sole 11 with ground-resting surface 18 shaped like the bowl of a spoon combined with a heel 12 provided with a ground-resting surface 19 which is substantially flat and is locally substantially perpendicular to the midplane P of the boot, allows the ski boots 1 to be used also for walking on hard flat surfaces.

[0058] In fact, when resting on hard flat surfaces such as, for example, a marble slab or sheet of ice, the front sole 11 with ground-resting surface 18 shaped like the bowl tends to rock and therefore does not transmit a sensation of stable support to the user. Instead, heel 12 with flat ground-resting surface 19 allows a stable support on the hard surface, thus opposing the rocking of the ski boot 1, and therefore it transmits a sensation of stable support on the ground to the user.

[0059] Again, in the case in which casing 10 is made of composite material, the presence of the front protective

cap 22 and/or of the protective lateral bands 23 allows to drastically reduce the breaking risks of shell 2 due to blows with sharp rocks and the like.

[0060] Finally, the front protective cap 22 is able to dampen the mechanical vibrations that the toe-piece of the ski binding device transmits to the composite material casing 10 during the use of the skis, with all the advantages that this involves for the duration of shell 2.

[0061] Lastly, it is clear that modifications and variants may be made to the above-described ski boot 1 without departing from the scope of the present invention.

[0062] For example, in a different not-shown and less sophisticated embodiment, the ski boot 1 may be provided, as a substitute for the two winch closing devices 7 and 8, with a series of lever closing buckles conveniently distributed on shell 2 and/or on cuff 3.

[0063] Furthermore, in a second less sophisticated embodiment, the rigid casing 10 could be made of plastic material, such as for example nylon (polyamide), PEBAX (polyester-amide) or similar plastic polymers. Similarly, the cuff 3 could be made of plastic material, such as for example nylon (polyamide), PEBAX (polyester-amide) or similar plastic polymers.

Claims

1. A ski boot (1) comprising a rigid shell (2) which is shaped so as to accommodate the foot of the user and has a lower part structured so to couple/bind in a rigid and stable, though easily releasable, manner to a ski binding device, and a rigid cuff (3) which is shaped so as to enclose the ankle of the user and is hinged on the shell (2) so as to be able to rotate about a rotation axis (R) substantially perpendicular to the midplane of the boot (P) and locally substantially coincident with the articulation axis of the ankle of the user;
the shell (2) in turn comprising a substantially basin-shaped rigid casing (10) which is shaped so as to accommodate the foot of the user, and a front sole (11) and a rear heel (12) which are located on the lower wall (13) of said rigid casing (10);
the ski boot (1) being **characterized in that** the lower part of the shell (2) incorporating the front sole (11) is shaped substantially like the bowl of a spoon, so as to define a front ground-resting surface (18) with an arched profile at least orthogonally to the midplane of the boot (P); **and in that** the lower part of the shell (2) incorporating the rear heel (12) is substantially flat, so as to define a rear ground-resting surface (19) which is substantially flat and locally substantially perpendicular to the midplane of the boot (P).
2. Ski boot according to Claim 1, **characterized in that** the portion of the lower wall (13) of the rigid casing (10) that supports the front sole (11), and/or said

front sole (11) are shaped substantially like the bowl of a spoon.

3. Ski boot according to Claim 2, **characterized in that** the portion of the lower wall (13) of the rigid casing (10) that supports the front sole (11), and/or said front sole (11) are shaped substantially like the bowl of a spoon so as to define a front ground-resting surface (18) with an arched profile both parallel and orthogonally to the centerline plane of the boot (P). 5
4. Ski boot according to Claim 1, 2 or 3, **characterized in that** the portion of the lower wall (13) of the rigid casing (10) that supports the front sole (11) is shaped substantially like the bowl of a spoon; and **in that** the front sole (11) has a substantially constant nominal thickness (s) and a profile which matches the shape of said portion of the lower wall (13). 10
5. Ski boot according to Claim 1, 2 or 3, **characterized in that** the portion of the lower wall (13) of the rigid casing (10) that supports the front sole (11) is shaped substantially like the bowl of a spoon; and **in that** the front sole (11) has a variable thickness which decreases as the distance from the centerline plane of the boot (P) increases. 15
6. Ski boot according to any one of the preceding claims, **characterized in that** the radius of curvature (r) of the front ground-resting surface (18) at the centerline plane of the boot (P), and orthogonally to it, ranges between 100 and 3000 centimetres. 20
7. Ski boot according to Claim 6, **characterized in that** the value of the radius of curvature (r) of the front ground-resting surface (18) increases as the distance from the tip of the boot increases. 25
8. Ski boot according to any one of the preceding claims, **characterized in that** the portion of the lower wall (13) of the rigid casing (10) which supports the rear heel (12), and/or the rear heel (12) are substantially flat. 30
9. Ski boot according to any one of the preceding claims, **characterized in that** the front sole (11) and the rear heel (12) are made of rubber or other elastomeric material and preferably have a treaded profile. 35
10. Ski boot according to any one of the preceding claims, **characterized in that** the front sole (11) and the rear heel (12) are fixed in unmovable manner on the lower wall (13) of the rigid casing (10). 40
11. Ski boot according to any one of the preceding claims, **characterized in that** the substantially basin-shaped rigid casing (10) is made of plastic or 45

composite material.

12. Ski boot according to any one of the preceding claims, **characterized in that** the rigid casing (10) is provided at front with a substantially duckbill-shaped protruding tailpiece (14), which cantilevered protrudes beyond the front edge of the sole (11) thus substantially forming an extension of the lower wall of the casing (13), and is structured so as to couple with the toe-piece of a mountaineering ski binding device; and **in that** the shell (2) also comprises a coupling plate (16) made of metal material, which is rigidly fixed on the rear part of the rigid casing (10), above the rear heel (12), and is structured so as to be able to couple with the heel-piece of a mountaineering ski binding device. 50
13. Ski boot according to any one of the preceding claims, **characterized by** also comprising an automatic or manually-operated cuff locking device (9) which is structured so as to be able to, selectively and alternatively, rigidly fix the cuff (3) to the shell (2) in a given position wherein the cuff (3) is tilted forwards by a predetermined angle with respect to the vertical of the shell (2); or to unlock/release the cuff (3) from the shell (2) so as to allow the cuff (3) to freely pivot on the shell (2) about said rotation axis (R). 55
14. Ski boot according to any one of the preceding claims, **characterized by** also comprising an inner liner (5) which is accommodated inside the shell (2) and the cuff (3), and is shaped so as to envelope and protect the foot and the lower section of the user's leg; and a manually-operated, mechanical boot closing system (7, 8) which is structured so as to be able to selectively close/tighten the shell (2) and the cuff (3) to immobilize the user's leg stably inside the ski boot (1). 60

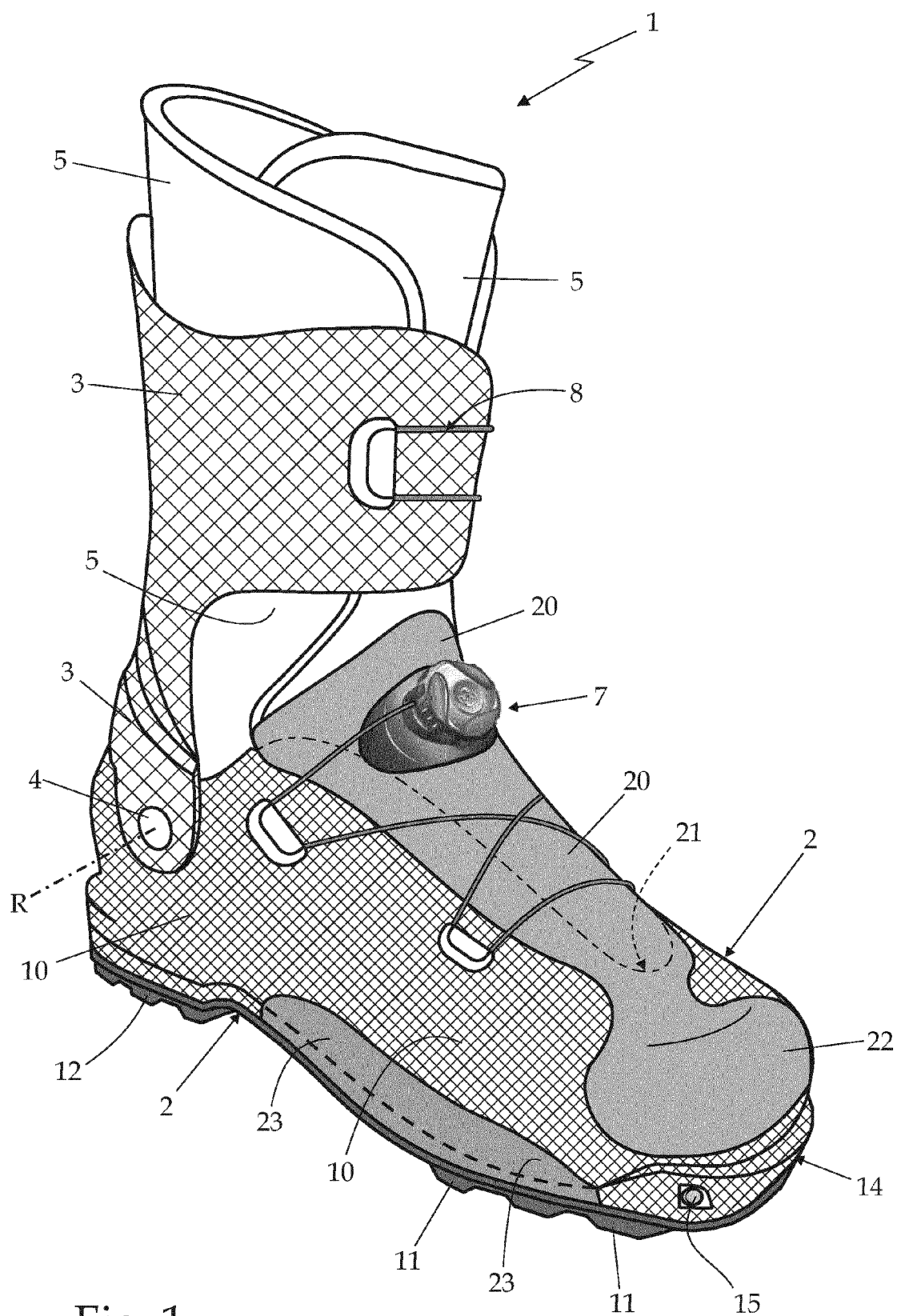


Fig. 1

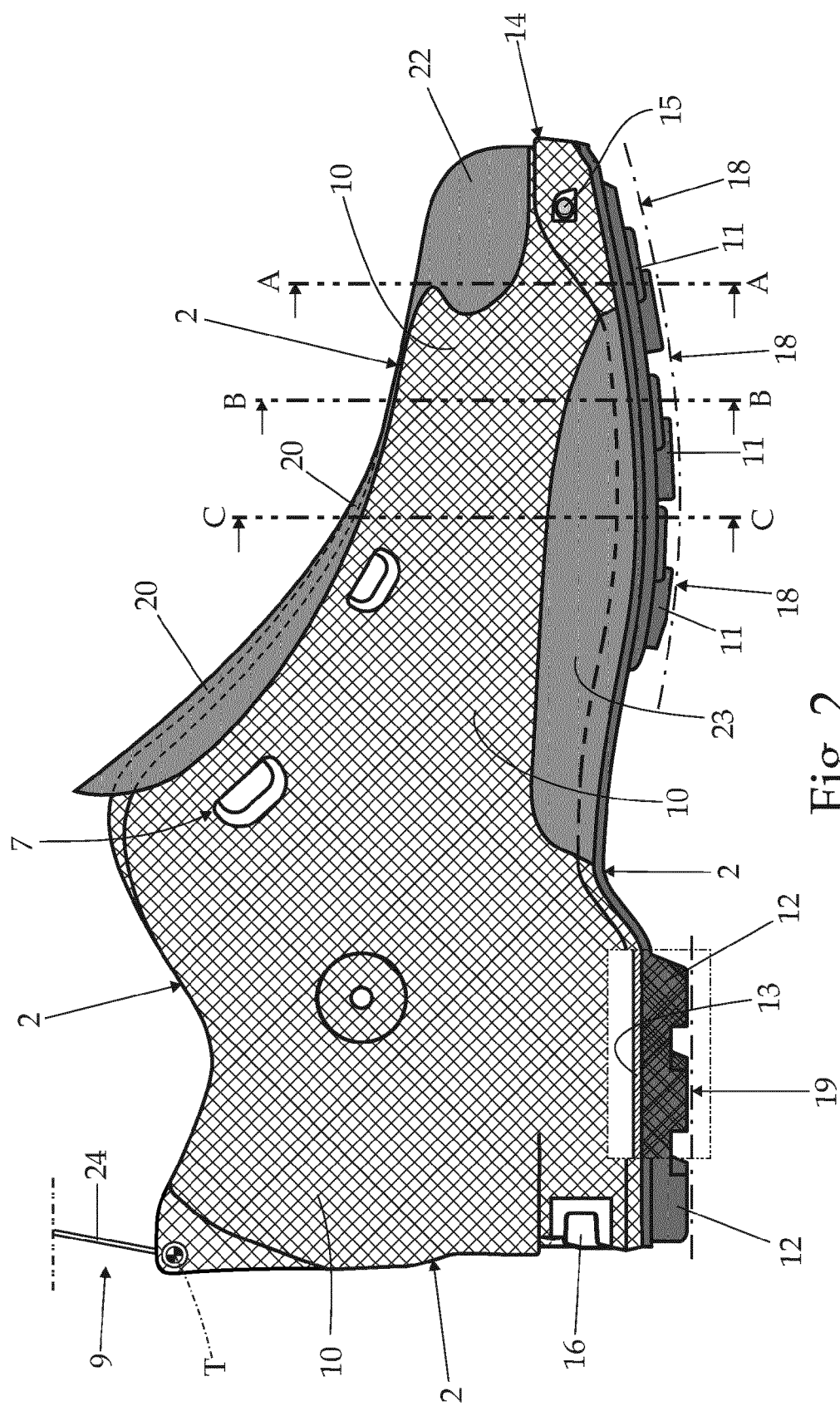


Fig. 2

Fig. 3

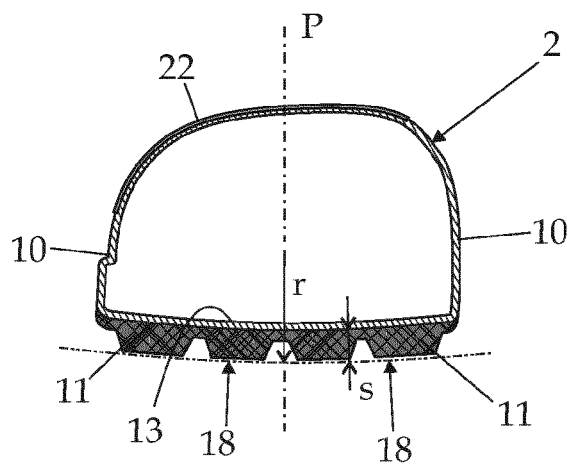


Fig. 4

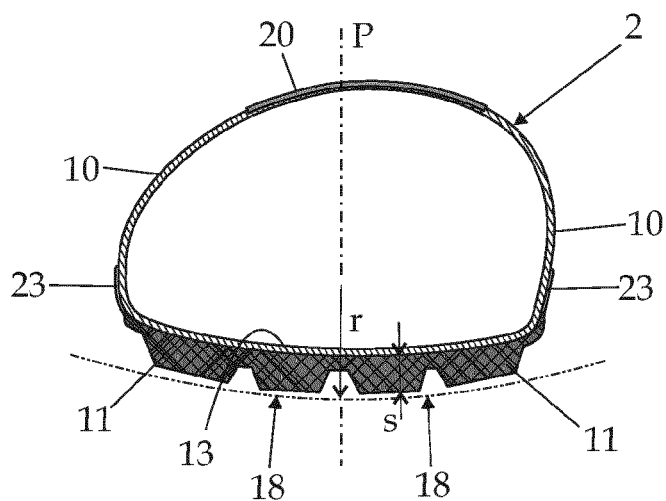
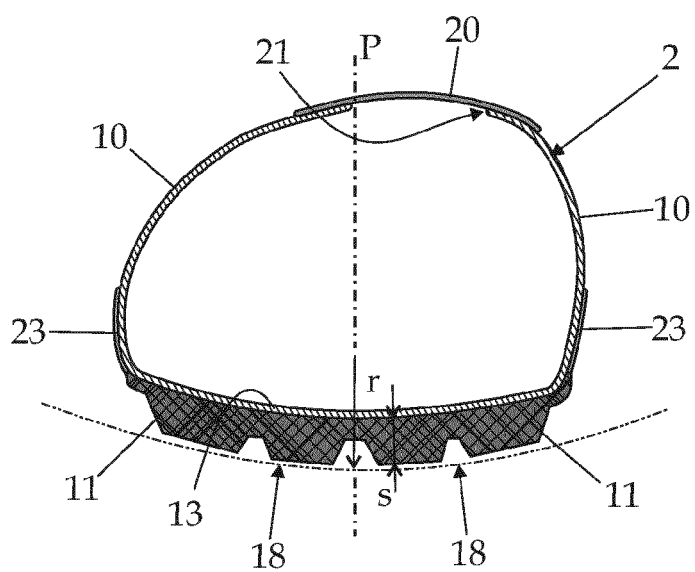


Fig. 5





EUROPEAN SEARCH REPORT

 Application Number
 EP 14 19 6672

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 4 811 504 A (BUNKE CLINTON R [US]) 14 March 1989 (1989-03-14) * the whole document *	1-14	INV. A43B5/04 A43B13/14
A	DE 20 2004 003747 U1 (JUNGHANS MANFRED [DE]) 21 October 2004 (2004-10-21) * the whole document *	1-14	
A	FR 2 793 660 A1 (COUTURIER JEAN FRANCOIS [CH]) 24 November 2000 (2000-11-24) * page 13, line 21 - page 14, line 17; figures 8a,8b,8c *	1-14	
A	US 4 722 144 A (BEERLI LOUIS [CH]) 2 February 1988 (1988-02-02) * the whole document *	1-14	
A	FR 2 376 636 A1 (GROSPIRON CHRISTIAN [FR]) 4 August 1978 (1978-08-04) * the whole document *	1-14	
			TECHNICAL FIELDS SEARCHED (IPC)
			A43B
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		17 April 2015	Cianci, Sabino
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 14 19 6672

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
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17-04-2015

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4811504 A	14-03-1989	CA 1306864 C	01-09-1992
		EP 0326304 A2	02-08-1989
		JP H01308501 A	13-12-1989
		US 4811504 A	14-03-1989

DE 202004003747 U1	21-10-2004	NONE	

FR 2793660 A1	24-11-2000	AT 250353 T	15-10-2003
		AU 4283500 A	05-12-2000
		CA 2373686 A1	23-11-2000
		DE 60005503 D1	30-10-2003
		DE 60005503 T2	24-06-2004
		EP 1178744 A2	13-02-2002
		FR 2793660 A1	24-11-2000
		JP 2002543902 A	24-12-2002
		US 6691434 B1	17-02-2004
		WO 0069297 A2	23-11-2000

US 4722144 A	02-02-1988	AT 395091 B	10-09-1992
		US 4722144 A	02-02-1988

FR 2376636 A1	04-08-1978	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 19970917056 A [0052]
- WO 1998US16314 A [0052]
- JP 20000507254 B [0052]
- US 20010956601 A [0052]
- US 20010099566 A [0052]
- US 19990337763 A [0052]
- JP 20010519784 B [0052]
- WO 2000US19440 A [0052]
- US 19990388756 A [0052]
- US 20010993296 A [0052]
- US 20030459843 A [0052]
- US 20050263253 A [0052]
- US 20070841872 A [0052]
- US 20070842009 A [0052]
- US 20070841997 A [0052]
- US 20070842013 A [0052]
- US 20070842005 A [0052]
- WO 2005US39273 A [0052]
- US 20040623341P A [0052]