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(54) **Sole structure for sports shoe**

(57) The present invention refers to a sole structure for sports footwear comprising a stiffening element (9) and an outsole formed by one or more portions (12, 13) suitable to hold, preferably in a removable manner, the stiffening element (9); the sole structure (1) also includes a midsole (2) provided with a plurality of centering elements (3) projecting from the midsole (2), and the stiff-

ening element (9) is provided with a plurality of openings (10) corresponding and countershaped to the plurality of centering elements (3), so that the plurality of openings (10) matingly cooperates with the plurality of centering elements (3) to prevent a relative movement between the stiffening element (9) and the midsole (2) on a plane defined by the midsole (2).

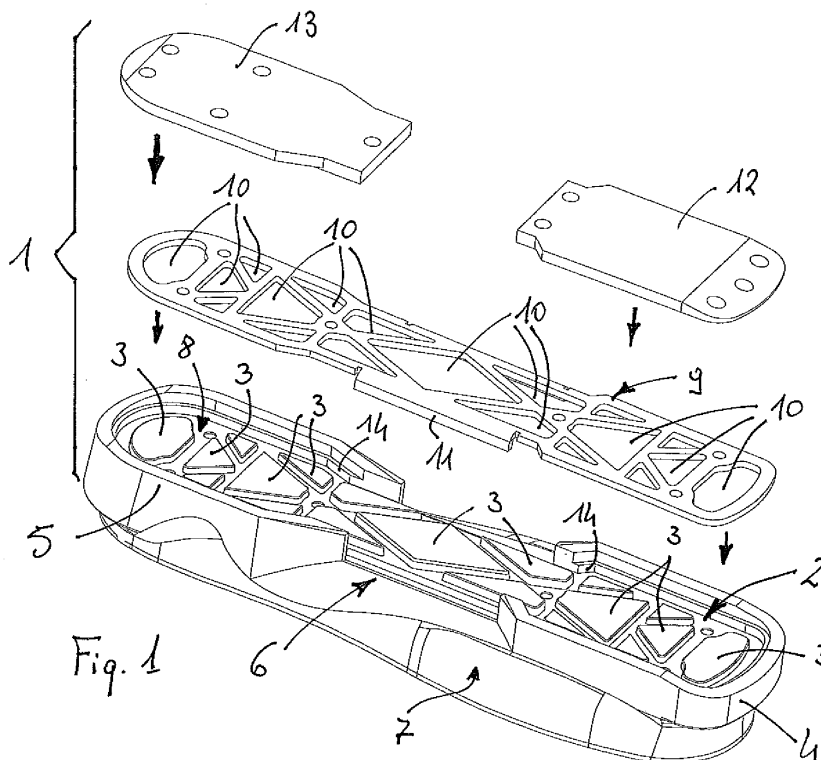


Fig. 1

Description

TECHNICAL FIELD OF INVENTION

[0001] The present invention refers to a sole structure for sports footwear, such as ski or snowboard boots, mountaineering boots, in-line roller or ice-skating boots, cycling shoes, motorcycling boots, and any other application in the sports footwear field that requires the use of a sole that is essentially rigid with respect to torsion along the longitudinal axis.

STATE OF THE ART

[0002] In footwear used in sports activities that require a precise and immediate transmission of the force from the foot to the sports equipment controlled by the user or, inversely, the perception of the sensations coming from the rest point on the ground to the user, a particularly important requirement is the torsional stiffness of the sole along the longitudinal axis to guarantee precision and immediacy of reaction, without delays that could compromise the performance of the athlete or his/her safety. Sports activities in which the requirement of torsional stiffness is particularly important include, by way of example, the following:

- skiing, snowboarding or skating, in which the control and management of the sports equipment are carried out through the sole of the ski boot or of the skating boot, which has the task of transmitting to the sports equipment the forces applied by the user's leg;
- mountaineering, in which the sole must transmit to the climber the sensations of stability or hold of the foot support point;
- cycling or motorcycling, in which the sole must interact in a precise and safe manner with the pedal to control the thrust on the pedal or to activate the gear shift or the brake.

[0003] One known way of stiffening the sole is the application, inside or outside the sole, of wood inserts, steel plates, carbon-fibre or Kevlar® elements.

[0004] Patent application EP 0 672 365 discloses a ski boot to which is screwed, on the underside of the sole, a stiffening element consisting of an insert of carbon fibre or aluminium alloy, which has the task of increasing the torsional stiffness of the sole along its longitudinal axis to improve the transmission of forces from the foot to the ski.

[0005] US Patent 6,119,374 discloses a sole of a ski boot provided with an adjustable stiffening device that includes a rigid element accommodated in a lowered seat recessed into the sole.

[0006] A drawback found in the known solutions consists of the fact that the stiffening element is inserted or fastened externally or internally on the sole and accom-

modated in suitable recesses formed in covering elements forming part of the sole, such as a heel and a toe screwed to the boot as exemplified in Patent application EP 0 672 365, or in a recessed seat formed internally on the sole as shown in US Patent 6,119,374. This entails the fact that clearances remain between the footwear and the stiffening element caused by the existing space between the walls of the seat and the edges of the stiffening element, which give rise to noticeable relative movements between the stiffening element and the sole, thereby reducing the precision and the immediacy of transmission of the forces exerted.

[0007] Another drawback of the known solutions lies in the limited longitudinal extension of the stiffening element, that substantially involves the central part of the sole and extends only minimally in the heel-end and toe-end regions. These regions are particularly critical since, in the case of skiing, snowboarding and skating, they represent the connecting interface to the sports equipment, ski or skate; in the case of motorcycling, they act on the gear shift pedal or on the brake pedal, while in cycling the toe-end supports the coupling interface with the pedal and is therefore the part that imparts power to the thrust on the pedal. It would therefore also be desirable to increase the torsional stiffness of these end regions of the sole, where the main torsional stresses originate.

SUMMARY OF THE INVENTION

[0008] The main objective of the present invention is thus to overcome the drawbacks of the known art mentioned above by devising a sole structure for sports footwear having a higher capacity of resistance to torsional deformations, in particular along the longitudinal axis of the sole.

[0009] In the scope of the above objective, a purpose of the present invention is to considerably improve the precision and rapidity of transmission of force between the user's foot and the sports equipment or the ground, eliminating, or considerably reducing, the relative movements between a sole stiffening element and the sole itself.

[0010] Another purpose of the present invention is to devise a sole structure for sports footwear in which the increased torsional stiffness substantially involves the whole extension of the sole or a large part of the same.

[0011] Another equally important purpose is to achieve a sole structure for sports footwear that attains the above objective and purposes at competitive costs and that can be achieved with the usual known equipments, machinery and tools.

[0012] The above objective and purposes, and others that will become more evident in the following description, will be achieved by a sole structure for sports footwear as defined in claim 1.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] Further characteristics and advantages of the sole structure for sports footwear according to the present invention will become more evident from the following description of a particular, but not exclusive, embodiment illustrated by way of non-limiting example with reference to the following figures, in which:

Figure 1 illustrates, in an exploded view, a sports footwear provided with a sole structure according to the present invention;

Figure 2 shows, in a view similar to the one of Figure 1, the sole structure partially assembled on the footwear.

DETAILED DESCRIPTION OF THE INVENTION

[0014] With reference to the above-mentioned figures, reference numeral 1 generally indicates a sole structure for a sports footwear; the embodiment illustrated in the enclosed figures refers to a sole of a ski boot, but the following description is also applicable to different sports footwear, according to what is described in the premises, that require a sole structure that is torsionally rigid, unless otherwise specified.

[0015] The sole structure 1 includes a midsole 2 provided with at least one centering member 3 defined by a protuberance or a projection, preferably polygonally shaped, extending from the midsole 2 toward the ground; preferably, the midsole 2 is provided with a plurality of centering members, collectively indicated with the reference numeral 3, defined by a plurality of protuberances or projections extending from the midsole 2 toward the ground. Such protuberances or projections may be of different shapes, not necessarily polygonal shapes - for example triangular, rhomboidal, trapezoidal, elliptical - depending on their arrangement on the midsole plane 2.

[0016] Preferably, the midsole 2 is box-shaped, and thus it is provided with at least one peripheral wall, preferably a front peripheral wall 4 and a rear peripheral wall 5 separated from each other approximately at the region of the arch 6, which extends from the opposite side with respect to an overlying upper or shell, partially shown in the enclosed drawings and indicated with reference numeral 7. A recess 8 is thus defined in the midsole 2 by the peripheral wall or walls 4, 5.

[0017] It is herein specified that in footwear provided with a shell of plastic material, such as a ski boot or a skating boot, the midsole 2 is an integral part of the shell, as it is made up of the bottom base of the shell itself, while in footwear provided with a soft upper the midsole 2 is generally a component distinct from the upper, to which it is connected by means, for example, of stitching or glueing.

[0018] The sole structure 1 also includes a stiffening element 9 resistant to torsion along the longitudinal axis, for example an element consisting of a plate of metal or

carbon fibre material, provided with at least one opening 10 suitable to engage the centering element 3; preferably, the plate is provided with a plurality of openings 10 suitable to engage the corresponding plurality of centering elements 3; the openings 10 are thus formed on the stiffening element 9 according to an arrangement and a form countershaped with respect to the respective centering elements 3 to engage.

[0019] Naturally, the stiffening element 9 can be formed in a single piece or by more pieces connected to each other so as to still impart on the footwear the required torsional strength.

[0020] The longitudinal extension of the stiffening element 9 substantially corresponds to the longitudinal extension of the midsole 2, or of the recess 8 if the midsole 2 is made in a box-like shape; thus, once it is placed in the midsole 2, or inside the recessed seat defined by the recess 8, the stiffening element 9 extends substantially from the toe-end region to the heel region of the footwear.

[0021] Advantageously, the stiffening element 9 has, in the region of the arch 6 if the peripheral walls 4, 5 are separate, one or more side wings 11 to cover and protect the midsole 2 in the area where the front wall 4 and the rear wall 5 are separated from each other.

[0022] To complete the sole structure 1, the structure is advantageously designed to have a one-piece outsole provided if necessary with a deep-grooved tread for applications, such as mountaineering boots or motorcycling boots, where this characteristic is required, or a number of portions 12, 13, as in the embodiment illustrated in the enclosed drawings, in which the outsole is formed by a front portion 12 covering the toe end and a rear portion 13 covering the heel.

[0023] The assembling of the sole structure 1 as described above takes place as follows: the stiffening element 9 is arranged and connected, preferably in a removable manner, on the midsole 2, or within the recess 8 if the midsole 2 has a box-like shape, so that each of the centering elements 3 engages the corresponding opening 10. When the assembling operation is completed, and in the cases in which it is required, the outsole 12, 13 is overlaid on the stiffening element 9 and fastened, preferably in a removable manner as for example through screws, on the midsole 2. In this manner, the stiffening element 9 is held in position and can be easily replaced in case of breakage or, if the user wishes to vary the degree of torsional and/or flexural stiffness of the sole, with another element of different structural characteristics or made with a different material.

[0024] If the midsole 2 has a box-like shape, an edge trim 14 can advantageously be provided on the peripheral walls 4, 5 to facilitate the seating and support of the outsole 12, 13.

[0025] Naturally, different methods of assembling the sole structure 1 can be provided for, such as for example glueing the stiffening element 9 or embedding it by over-injection in the midsole 2 or in the recess 8 to achieve a more stable connection, even though it would be perma-

ment and no longer removable, without however departing from the innovative concept of the present invention as defined in claim 1.

[0026] With the sole structure thus obtained, it is readily evident how any increase in the weight of the footwear is extremely limited, thanks to the presence of the openings 10, which considerably lighten the stiffening element 9, while however maintaining substantially unchanged its characteristics of torsional strength along the longitudinal axis.

[0027] In addition, the engagement and mutual cooperation between the centering elements 3 and the openings 10 prevents, or at any rate considerably reduces, the relative movements between the stiffening element 9 and the midsole 2 along a plane substantially horizontal to the footwear; in such a way, the torsional deformation of the stiffening element 9 is practically prevented, or at least considerably reduced, thus achieving the effect of conferring a greater torsional resistance to the sole structure in general.

[0028] Lastly, the sole structure so conceived makes it possible to achieve a greater torsional stiffness substantially along the whole longitudinal extension of the sole, including the toe-end and the heel-end regions. This aspect is particularly important in footwear in which such end regions make up the connecting interface to sports equipment, such as ski boots, snowboarding boots, skating boots or cycling shoes, where torsional deformations originate in one or both of said regions, or in footwear in which these regions are used to operate the controls of a vehicle, such as in motorcycling boots.

[0029] From the above description, it is evident how the present invention achieves the objectives and advantages initially foreseen: in effect, a sole structure has been devised for sports footwear capable of considerably and effectively improving the precision and rapidity of transmission of forces from the user's foot to the sports equipment or the ground through an increase in the torsional stiffness of the sole; such increase in torsional strength is achieved thanks to a better and more effective cooperation of the stiffening element 9 with the midsole 2 due to the effect of the engagement between the centering elements 3 and the openings 10 that makes it possible to eliminate, or at any rate considerably reduce, the relative movements and thus also the possibility of torsional deformation, of the stiffening element 9 with respect to the midsole 2.

[0030] In addition, as explained above, the increase in torsional stiffness involves substantially the full extension of the sole or a large part of it, thanks to the possibility of seating the stiffening element 9 substantially along the whole extension of the midsole 2, or of the recess 8, and of also achieving in the toe-end and the heel-end regions the engagement between the centering elements 3 and the openings 10. This is particularly appreciated in ski boots wherein the toe- and heel end regions of the boot engage with the ski binding and the stiffening element 9, affecting the sole structure all along its longitudinal ex-

tension including the end portions attached to the front and the rear ski bindings, considerably increases the torsional stiffness of the whole structure.

[0031] Naturally, the present invention is susceptible to numerous applications, modifications or variants without departing from the scope of patent protection as defined in claim 1.

[0032] In addition, the materials and equipment used to carry out the present invention, as well as the shapes and dimensions of the individual components, can be the most suitable depending on the specific requirements.

Claims

1. A sole structure for sports footwear comprising a stiffening member (9) associable, preferably in a removable manner, to a midsole (2), **characterized in that** it comprises at least one centering member (3) projecting from said midsole (2), said stiffening member (9) being provided with at least one opening (10) corresponding and countershaped to said at least one centering member (3), said at least one opening (10) matingly cooperating with said at least one centering member (3) to prevent a relative movement between said stiffening member (9) and said midsole (2) on a plane defined by said midsole (2).
2. A sole structure as in claim 1, wherein the longitudinal extension of said stiffening member (9) substantially corresponds to the longitudinal extension of said midsole (2).
3. A sole structure as in claim 1, wherein said stiffening member (9) substantially extends from a toe end region to a heel end region of said sole structure (1).
4. A sole structure as in any of the preceding claims, wherein said stiffening member (9) is formed by one or more pieces mutually connected.
5. A sole structure as in claim 1, wherein said centering member (3) is defined by a projection, preferably polygonally shaped, extending, in use, from said midsole (2) towards the ground.
6. A sole structure as in claim 1, comprising a plurality of centering members (3) projecting from said midsole (2), said stiffening member (9) being provided with a plurality of openings (10) corresponding and countershaped to said plurality of centering members (3), said plurality of openings (10) matingly cooperating with said plurality of centering members (3) to prevent a relative movement between said stiffening member (9) and said midsole (2) on a plane defined by said midsole (2).
7. A sole structure as in claim 6, wherein said centering

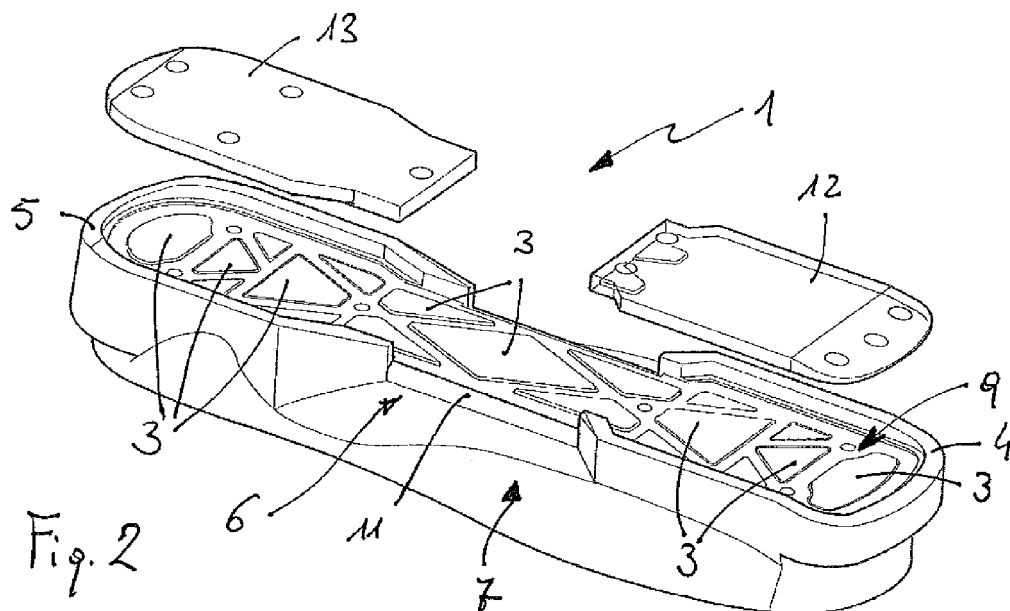
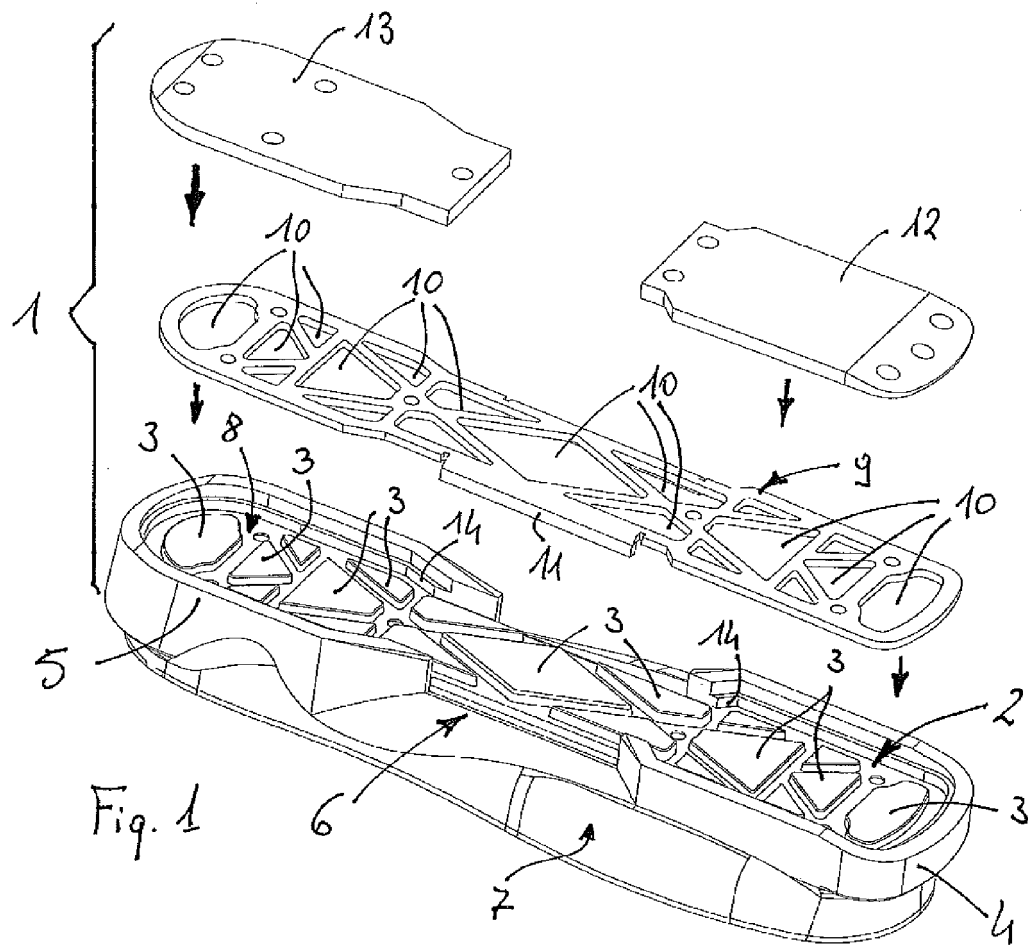
members (3) are defined by a plurality of projections extending, in use, from said midsole (2) towards the ground.

8. A sole structure as in any of the preceding claims, wherein said midsole (2) is box-like shaped and comprises at least one peripheral wall (4, 5) extending, in use, towards the ground, said at least one peripheral wall (4, 5) defining a recess (8) in said midsole (2). 5 10
9. A sole structure as in claim 8, wherein the longitudinal extension of said stiffening member (9) substantially corresponds to the longitudinal extension of said recess (8). 15
10. A sole structure as in claim 8, wherein said box-like midsole (2) comprises a front peripheral wall (4) and a rear peripheral wall (5) separated each other in the arch region (6). 20
11. A sole structure as in claim 10, wherein said stiffening member (9) is provided, in said arch region (6), with one or more side wings (11) adapted to cover and protect said midsole (2) in the area where said front peripheral wall (4) and said rear peripheral wall (5) are separated each other. 25
12. A sole structure as in any of the preceding claims, further comprising an outsole formed by one or more portions (12, 13) adapted to overlap said stiffening member (9) and associable, preferably in a removable manner, to said midsole (2). 30
13. A sports footwear comprising a sole structure (1) as in any of the preceding claims. 35
14. A ski boot or a snowboard boot comprising a sole structure (1) as in any of the preceding claims, wherein said stiffening member (9) extends along said midsole (2) substantially between the front and rear engaging portions of said boot to a sports equipment. 40

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EUROPEAN SEARCH REPORT

Application Number
EP 10 16 7902

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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 17 November 2010	Examiner Vesin, Stéphane
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			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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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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