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(54) **Heel-bearing footbed device for footwear with reinforcement of composite material**

(57) A heel-bearing footbed device (1) for footwear with reinforcement of composite material, comprising a reinforcing body (4) made of composite material, particularly of composite material of carbon fibre and/or Kevlar and/or glass fibre, the reinforcing body (4) of composite

material being totally or partially covered by a covering shell (5) of thermoplastic or thermo-hardening material, the reinforcing body (4) including suitable slots (41a,41b) for facilitating the positioning of fixing means for the other elements forming the shoe, which are usually assembled to the heel-bearing footbed portion.

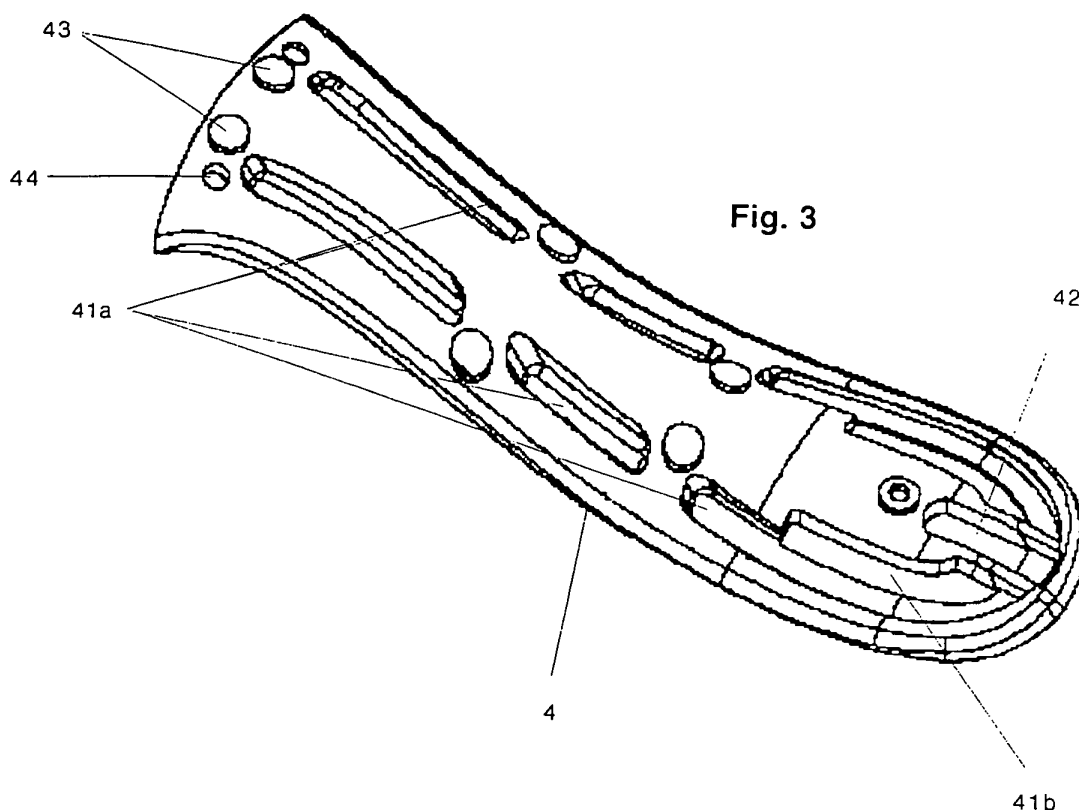


Fig. 3

Description

[0001] This invention relates to a heel-bearing footbed device for footwear with reinforcement of composite material.

[0002] The invention finds particular, but not exclusive, application in the field of footwear production industry, and accessories and components thereof, particularly in the feminine footwear production industry producing feminine footwear provided with heel or wedge heel.

Domain

[0003] Footwear, whose essential structure comprises at least one upper for wrapping up the upper portion of the foot, and an appreciably rigid portion made up by the sole and, if necessary, a heel, for at least partially contacting the ground, are known and used for a long time. Particularly in feminine footwear, the presence of a raised portion placed at the heel, known as heel or wedge heel, allows keeping the hind foot elevated compared to the forefoot. The presence of the heel in a shoe, especially if it is of considerable height and even more if it has a limited ground-contacting surface, like a stiletto heel, creates the need of reinforcing the shoe with a reinforcing structure suitable to support the weight of the body, as well as to avoid and counteract all the stresses due to the action of forces developing during the walking movements, the deformations of the shoe itself mainly involving the portion supporting the heel and the remaining portion of the footwear coinciding with the waist edge of the area of the foot metatarsus. Intuitively, stresses imparted to the footwear are proportionally correlated to the heel height and to the ground-contacting surface of the heel, said stresses depending, furthermore, on the weight and specific walking characteristics. In this way, the need to suitably strengthen, in particular, feminine footwear, which, depending on momentary fashion precepts, are provided of considerably high heel or wedge heel, has determined the development of solutions aiming at strengthening the structure of the sole, constituting the shoe supporting structure, and, in particular, the structure of sole for supporting the heel or wedge heel, being commonly called insole. The characteristics and shape of the insole contribute, in a determinant manner, to define the shape of the whole shoe, being the upper and the heel or wedge heel anchored to the insole. Traditionally, the insole consists of an assembly comprising two reciprocally connected portions, of which one first front portion coincides with the area of the foot including the toes and a portion of the metatarsus, and a second back portion coincides with the area of the foot including the metatarsus and the tarsus. Particularly the back portion of the insole coinciding with the area of the foot including the metatarsus and the tarsus has to present constructional features of rigidity and resistance, such as to counteract all the stresses imparted by the weight of the body and by walking movements, and such as to allow

the appropriate anchoring of the upper and heel or wedge heel, usually by using known retaining means.

Prior art

[0004] Within the known sector techniques, different solutions for manufacturing a suitable and functionally effective structure for suitably supporting the heel or wedge heel, are known. Particularly, when manufacturing women's shoes with heel or wedge heel, in order to allow the anchoring of the upper and heel or wedge heel, a suitably shaped and sized insole is provided, usually called footbed, structured such as to give and ensure the needed characteristics of support and rigidity to the shoe. Notoriously, the structure of the insole is made, for the forefoot, of flexible materials such as, by way of example, fibre cardboard, Texon, or flexible plastic materials, and for the hind foot portion, which should have greater characteristics of rigidity, of coupled materials, among which, by way of example, fibre cardboard coupled to Texon or fibre cardboard coupled to Texon by interposing a metal sheet known as shank, or, furthermore, made of thermoplastic materials incorporating a metal shank.

[0005] Even in patent literature, by way of example, it is possible to find a lot of footbed manufacturing solutions, among which:

D1: n. JP8070908 (Hayashi)

D2: n. JP7023803 (Asahi)

D3: n. EP0916278 (Forestali)

[0006] D1 describes a reinforcing device, shank, for a shoe sole, in short comprising a body consisting of a strip of given length and thickness, as well as a bent surface, being provided with an enlarged portion in a longitudinal end portion, the reinforcing body being provided with at least one suitable rib, furthermore the thickness of the reinforcing body being thinner at one end. Preferably, the reinforcing body is made of resin.

[0007] D2 describes a solution for footwear soles and the production method thereof, said footwear soles having a forepart and a back part, wherein a reinforcement, made of thermoplastic composite material reinforced with fibres, is placed in said back part, said reinforcement being placed between two laminas consisting of the same material of the footwear sole, and being coupled by means of adhesives. Furthermore, it is provided that the material constituting the soles is heated, while being held in a metal form having a temperature lower than the temperature of the sole material, such as to carry out a complete adhesion.

[0008] D3 in short describes an assembly sole for assembling footwear of the type wherein an upper is folded and fixed under the sole. The sole includes a support base having a thermo-melting adhesive on the lower side, so that the upper can adhere to the sole by heating. The sole preferably includes a shank placed above the support base, and a reinforcement above the shank, in

order to form a single body. Furthermore, the invention includes a shoe assembled on the sole.

Drawbacks

[0009] All the known solutions for heel-bearing footbed for footwear have, though in different measure, deficiencies and/or limitations.

[0010] In the opinion of the applicant, a first limitation to the known solutions for heel-bearing footbed consists in that said footbed solutions do not have a high degree of rigidity, so that, in particular when the heel is very high, there is a considerable risk of the heel breaking or detaching from the footbed, as the related footbed structures of the known solutions are not, in any case, adequately rigid.

[0011] A second limitation concerns, in particular, the known solutions for heel-bearing footbed, particularly in the case of footbed solutions with metal shank. Although allowing a sufficient structural rigidity, they make the overall footwear structure significantly heavier and, as additional disadvantage, activate metal detector devices placed at access control gates in high risk sites.

[0012] In the opinion of the applicant, a third limitation concerning the known structures of heel-bearing footbed with shank consists in that their particular structure does not allow the extension of the reinforcement such as to cover the main area of the footbed, because the necessary considerable rigidity of the material used for the making the shank would prevent an easy fixing of the retaining means of the upper and heel.

[0013] Therefore, the enterprises of the sector still have the need of finding optimal solutions to achieve the desired scopes.

Brief description of the invention

[0014] These and other scopes are reached by the present invention according to the characteristics of the enclosed claims, solving the disclosed problems by means of a heel-bearing footbed device (1) for footwear with reinforcement of composite material, comprising a reinforcing body (4) made of composite material, particularly of composite material of carbon fibre and/or Kevlar and/or glass fibre, or of composite material of carbon fibre according to the teaching disclosed in Patent Application n.TV2009A000029 (Rampin), the reinforcing body (4) of composite material being totally or partially covered by a covering shell (5) of thermoplastic or thermo-hardening material, the reinforcing body (4) including suitable slots (41 a, 41 b) for facilitating the positioning of fixing means for the other elements forming the shoe, which are usually assembled to the heel-bearing footbed portion.

Aims

[0015] Scopes and advantages are achieved thanks

to the considerable creative contribution, the effect of which constitutes an immediate technical progress.

[0016] A first advantageous scope is that of obtaining a heel-bearing footwear device with reinforcement of composite material, whose innovative structure allows ensuring an optimal rigidity of the footwear structure, particularly in women's shoes with heel or wedge heel of appreciable height.

[0017] A second advantageous scope is that of obtaining a heel-bearing footbed device with reinforcement of composite material, whose innovative structure allows a significant reduction of the weight of the footbed and, consequently, of the whole shoe, as well as an optimal positioning of the retaining means of the upper and heel thanks to the particular structure of the reinforcing body.

[0018] A third advantageous scope is obtaining a heel-bearing footbed device with reinforcement of composite material whose innovative structure allows avoiding the above mentioned drawbacks of the footbed structures provided with metal shank, in order to avoid the inopportune activation of metal detector safety devices.

[0019] A more advantageous scope consists in obtaining a heel-bearing footbed device with reinforcement of composite material whose innovative structure allows a greater walking comfort, and a reduction of production costs and times of the whole footwear itself.

[0020] These and other advantages will appear from the following detailed description of some preferred embodiments, whose execution details are not intended to be limitative, but only illustrative.

Drawings

[0021]

Figure 1 is an overall view of the heel-bearing footbed of the present invention, with forepart attached;
Figure 2 is a perspective view of the back portion of the heel-bearing footbed of the present invention;
Figure 3 is a perspective view of the reinforcing body of the heel-bearing footbed of the present invention;
Figure 4 is a top view of the back portion of the heel-bearing footbed of the present invention;
Figure 5 is a section view along axis C-C of the footbed of figure 4;
Figure 6 is a section view along axis A-A of the footbed of figure 4;
Figure 7 is a section view along axis B-B of the footbed of figure 4.

Practical realization of the invention

[0022] Referring without limitation also to the content of the drawings, a heel-bearing footbed device (1) for footwear with reinforcement of composite material is described which, in the preferred embodiment described, as shown in figures 1 to 7, includes a front portion (2) corresponding to the area of the phalanges and at least

to a portion of the metatarsus area, being made in a known way and with known materials being at least partially flexible in the area wherein the front portion (2) is connected, usually and in a known way, preferably by means of adhesives, to the back portion (3) constituting the footbed portion intended for bearing the heel (Fig. 1). The back portion (3) of the heel-bearing footbed (1) specifically corresponds to the portion of the foot partially coinciding with the metatarsus and tarsus. Describing the embodiment more in detail, the back portion (3) of the heel-bearing footbed device (1) includes a reinforcing body (4) (Fig. 3) made of composite material. In particular, it is provided that the composite material forming the reinforcing body (4) is of a known type, being indifferently of carbon fibre and/or aramide fibre, by way of example Kevlar and/or glass fibre. Furthermore, there is the possibility that the material for manufacturing the reinforcing body (4) corresponds to the teaching of the Italian patent application n.TV2009A000029 (Rampin), wherein carbon fibre composite material is provided comprising a reinforcement made of carbon fibres which can indistinctly be of long and/or short type, with constant sizes and lengths, or made of an assembly of long and/or short fibres, with different lengths and sizes, or, indifferently, of a bundle of carbon fibres made of an assembly of one-way strands or variously twisted or woven fibres, the same carbon fibres being mixed, by means of known methods, to a polyurethane matrix whose index of hardness is equal to or higher than 70 ShoreD.

[0023] The use of composite materials for manufacturing the reinforcing body (4) of the back part (3) of the heel-bearing footbed (1) is particularly suitable to achieve a footbed structure having a suitable rigidity degree and an appreciably contained weight. In particular, it has been found that among the possible glass fibre composite materials potentially usable in the production of the reinforcing body (4), very good results for the proposed scope have been achieved with a glass fibre composite material whose reinforcement consists of 70% of glass fibres in a matrix of thermoplastic resins containing a combination of semi-crystalline polyamide and partially aromatic polyamide. The shape of the reinforcing body (4) necessarily depends on the overall shape of the heel-bearing footbed (1), while the shape of the heel-bearing footbed itself (1) depends on the overall shape of the whole shoe. The process for manufacturing the reinforcing body (4) is conventionally carried out by means of known execution methods, such as, by way of non-exhaustive example, by a moulding process.

[0024] Even more in detail, it is provided that the reinforcing body (4) has suitable slots (41 a) at least for anchoring the upper, and suitable slots (41 b) at least for anchoring the heel, which slots (41 a, 41 b) can be of different number and shape and should be placed in the areas in which the anchoring of other shoe parts is provided, like the upper, the heel or wedge heel, the leather, and/or textile laterals, and all other possible shoe accessories which may complete the footwear. The slots (41

a) provided for anchoring the upper, and the slots (41 b) provided for anchoring the heel can be blind slots, being shaped as recess areas, or through slots. Describing the embodiment more in detail, (Fig. 3), it is provided that the slots (41 a) for anchoring the upper are through slots, being suitably and differently shaped, and placed near the perimeter edge of the reinforcing body (4) whose development they follow at least partially. In further detail, it is provided that the slots (41 a) for anchoring the upper are placed in such a way as to be parallel and to mirror each other, being placed, in the example, in opposite pairs, wherein a first pair is placed at the front portion, a second pair is placed in the central area, and a third pair is placed in the back portion, coinciding with the heel positioning area of the reinforcing body (4).

[0025] In the embodiment described, the slots (41 b) for anchoring the heel are two, each being mirror-opposite and parallel to the other, and they are placed adjacent to the slots (41 a) for anchoring the upper placed in the back area of the reinforcing body (4), the slots (41 b) for anchoring the heel being shaped in such a way as to follow, at least partially, the development of the back area of the reinforcing body (4). In order to allow the easy positioning of at least one known threaded-screw device, usually at least one screw, it is provided that, in the area where the heel will be placed, the reinforcing body (4) is provided with an opening (42), preferably a through opening, placed in such a way as to coincide, at least partially, with the centre of the anchoring area of the heel, and, in any case, so as to cover the area of the heel wherein the positioning of at least one anchoring screw is provided.

[0026] The reinforcing body (4) constitutes the rigid core of the back portion (3) of the heel-bearing footbed device (1). In order to respond to functional characteristics necessary for the shoe structure, the reinforcing body (4) is partially or completely covered by a covering shell (5) (Fig. 7) preferably made of plastic, thermoplastic or thermo-hardening material, ABS in the example, having a counter-shaped coupling face. More in detail, the solution of the invention, as shown in figures 4 to 7, is conceived in such a way that the covering shell (5) covers, at least partially, the reinforcing body (4), in such a way that the material of which the covering shell is made (5) completely or partially covers the surface of at least one side, and the edge of the reinforcing body (4) also preferably completely fills the slots (41 a, 41 b) and the opening (42) of the reinforcing body (4). The thickness of the covering shell (5), depending on manufacturing needs, is preferably smaller than the thickness of the reinforcing body (4). In the present embodiment, the covering shell (5) completely covers the reinforcing body (4) shaped in such a way as to provide, as known in footbed structures, a flexible thinned and substantially rectilinear edge (51) for anchoring the front portion (2) of the heel-bearing footbed (1), the thinned edge (51) being placed at the end opposite to the heel anchoring. The reinforcing body (4), as well as the covering shell (5), are obtained with known methods. By way of non-exhaustive example, it is pro-

vided that the back portion (3) of the heel-bearing footbed device (1), particularly the covering of the reinforcing body (4) with the covering shell (5), provided with known fixation means such as pins (43) and/or holes (44), can be manufactured by a moulding process, in short consisting in positioning the so obtained reinforcing body (4) in a prearranged mould for moulding the covering shell (5), thus creating a single integral body.

[0027] One possible alternative manufacturing method provides the possibility to obtain the reinforcing body (4) and the covering shell (5) separately by known methods, usually by moulding, so that the covering shell (5) is substantially made up by two moulded half-shells whose internal portion is counter-shaped with respect to the corresponding sides of the reinforcing body (4) to which the two half-shells are intended to be coupled by means of known coupling methods, such as, by way of example, adhesive or thermal bonding.

[0028] One possible alternative embodiment of the present invention comprises an heel-bearing footbed device (1) with reinforcement of composite material, wherein at least one covering shell (5) covers only the areas of the slots (41 a, 41 b) and the opening (42) of the reinforcing body (4).

References

[0029]

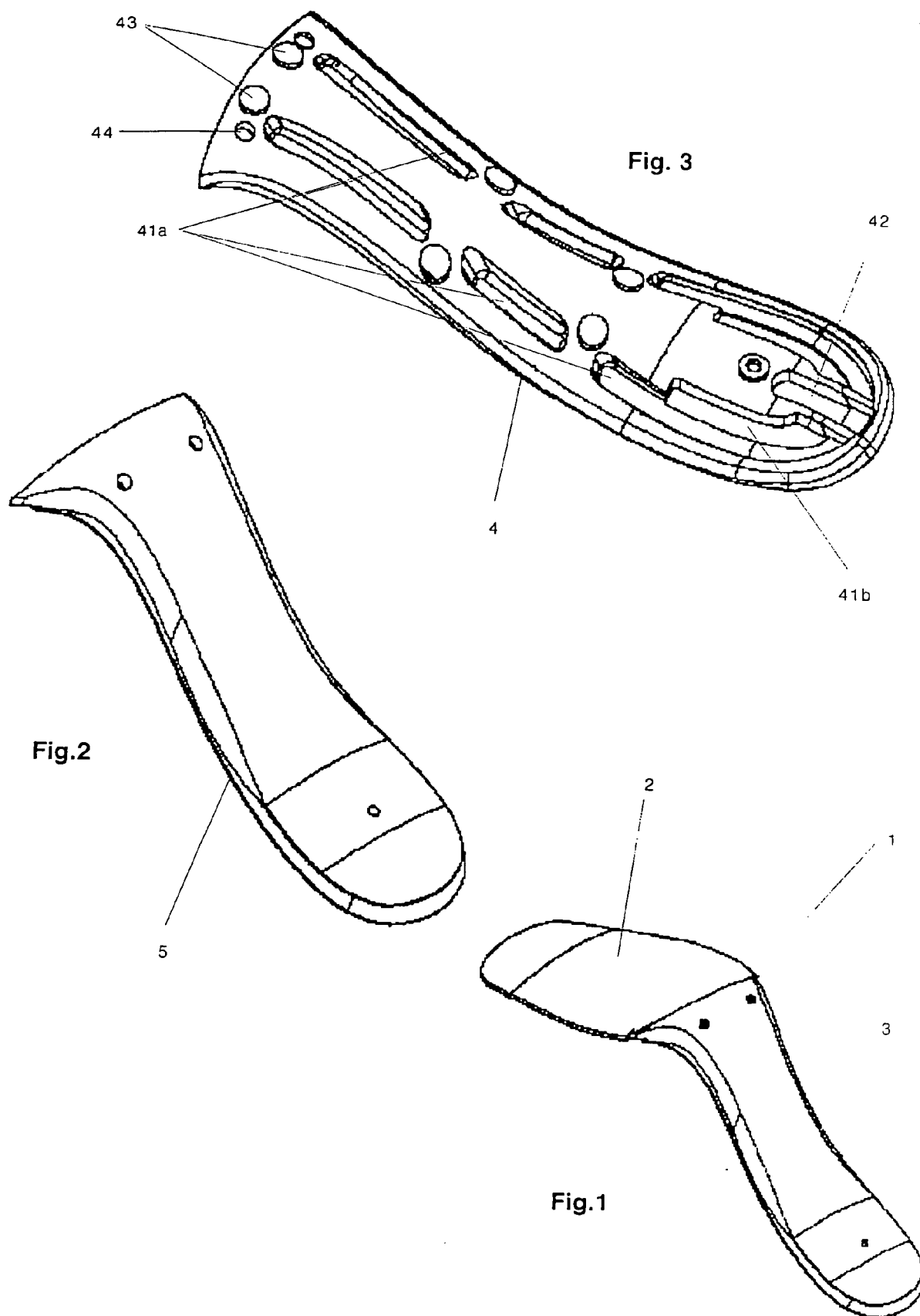
- (1) heel-bearing footbed device
- (2) front portion
- (3) back portion
- (4) reinforcing body, (41 a, 41 b) slots, (42) opening, (43) pins, (44) holes
- (5) coating shell, (51) thinned edge

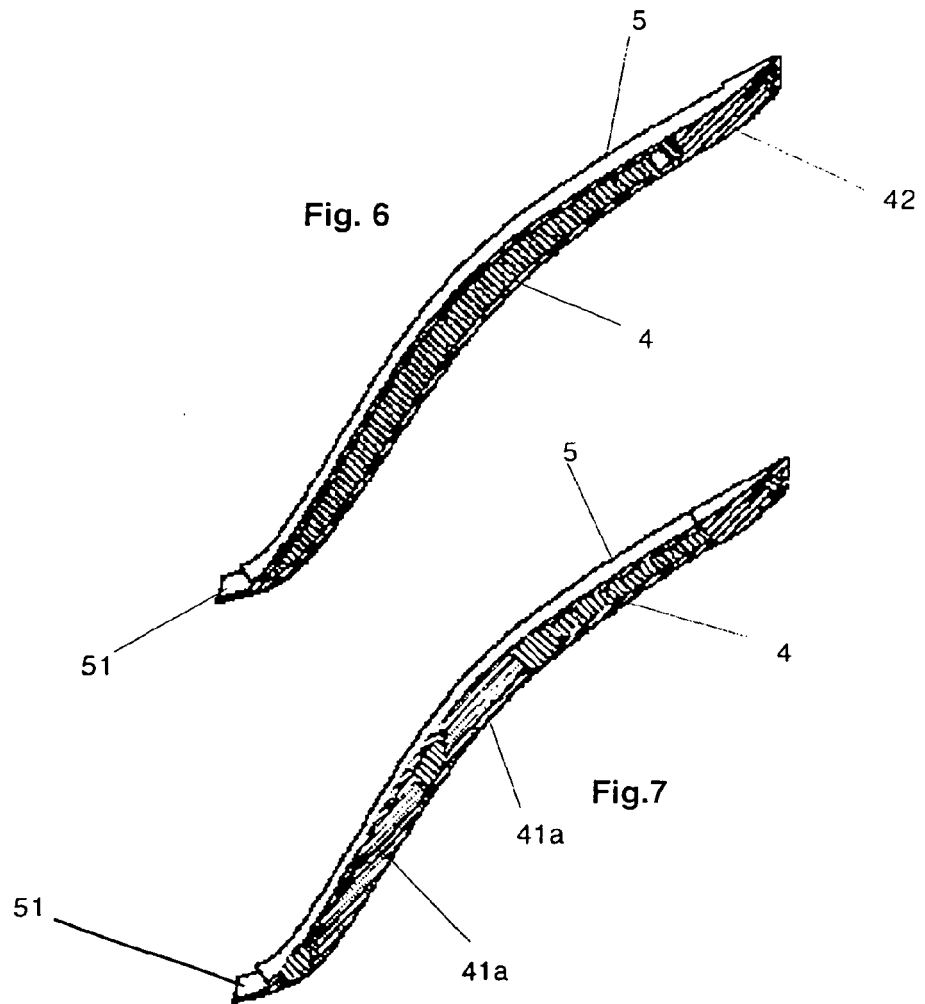
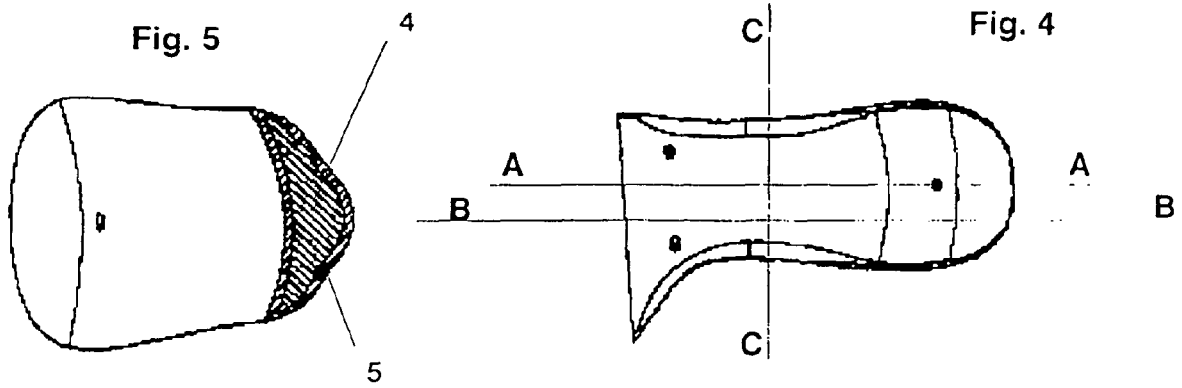
Claims

1. Heel-bearing footbed device (1) for footwear with reinforcement of composite material of the type comprising two portions, wherein one front portion (2), corresponding to the area where the phalanges are resting and to at least a part of the area of foot metatarsus, and being of at least partially flexible type, and a back portion (3) corresponding to the foot resting area coinciding with a part of the metatarsus and with the tarsus, **characterised in that** the back portion (3) comprises at least one reinforcing body (4) of composite material provided with at least one slot (41 a, 41 b), wherein said reinforcing body (4) is at least partially covered with a covering shell (5) presenting a counter-shaped coupling side, in such a way as to partially fill at least one slot (41 a, 41 b) of the reinforcing body (4).
2. Heel-bearing footbed device (1) for footwear according to claim 1, **characterised in that** the reinforcing

body (4) is made of carbon fibre composite material.

3. Heel-bearing footbed device (1) for footwear according to claim 1, **characterised in that** the reinforcing body (4) is made of aramide fibre composite material.
4. Heel-bearing footbed device (1) for footwear according to claim 1, **characterised in that** the reinforcing body (4) is made of glass fibre composite material.
5. Heel-bearing footbed device (1) for footwear according to claim 1, **characterised in that** the reinforcing body (4) is made of composite material like carbon fibre comprising a reinforcement made of carbon fibres mixed to a polyurethane matrix whose index of hardness is equal to or higher than 70 ShoreD.
6. Heel-bearing footbed device (1) for footwear according to claim 1, **characterised in that** the reinforcing body (4) is made of glass fibre composite material whose reinforcement consists of 70% of glass fibres in a matrix consisting of thermoplastic resins containing a combination of semi-crystalline polyamide and partially aromatic polyamide.
7. Heel-bearing footbed device (1) for footwear according to any of the preceding claims, **characterised in that** the covering shell (5) is made of plastic material.
8. Heel-bearing footbed device (1) for footwear according to claim 7, **characterised in that** the slots (41a, 41b) provided on the reinforcing body (4) are placed in at least those areas in which the anchoring of the footwear upper and heel is provided.
9. Heel-bearing footbed device (1) for footwear according to claim 8, **characterised in that** the reinforcing body (4) is provided with at least one opening (42) placed in the anchoring area of the heel, wherein the positioning of at least one anchoring screw of the heel is provided.
10. Heel-bearing footbed device (1) for footwear according to claim 9, **characterised in that** the material of the covering shell (5) fills all the slots (41 a, 41 b) and the opening (42) of the reinforcing body.
11. Heel-bearing footbed device (1) for footwear according to claim 10, **characterised in that** the covering shell (5) is formed on the reinforcing body (4).
12. Heel-bearing footbed device (1) for footwear according to claim 10, **characterised in that** the covering shell (5) is composed by at least two half-shells connected to each other as well to the reinforcing body (4).







EUROPEAN SEARCH REPORT

Application Number
EP 10 00 1869

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	US 2007/163150 A1 (YANG JERRY [TW]) 19 July 2007 (2007-07-19) * paragraphs [0024] - [0026]; figures *	1-11	INV. A43B13/41 A43B13/12 A43B23/22
Y	EP 0 913 101 A2 (LOTTO SPA [IT]) 6 May 1999 (1999-05-06) * paragraph [0014] - paragraph [0019]; figures *	1-11	
A	US 2007/011918 A1 (SNOW REBECCA E [US] ET AL) 18 January 2007 (2007-01-18) * paragraphs [0033], [0034], [0038]; figure 6 *	1-12	
A	US 2008/086906 A1 (WILKENFELD DAVID [AU]) 17 April 2008 (2008-04-17) * paragraphs [0041] - [0045]; figure 8 *	1	
A	FR 2 678 810 A1 (JOURDAN IND CHARLES [FR]) 15 January 1993 (1993-01-15) * page 3, lines 1-12; figure 1 *	1	
			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		23 June 2010	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			

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EPO FORM 1503 03.82 (P04C01)

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

EP 10 00 1869

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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23-06-2010

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