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(54) **Footwear with a concave profile in the front part and a mould for making such footwear**

(57) Footwear (8), in particular of the sports type, and mould (1) for making footwear (8) wherein the mould (1) comprises a front part (6) which has a crossways concavity (7) and a front to back concavity with an area "M" of maximum width in an intermediate position of the front part (6); the footwear (8) comprises a sole (2), and upper part or shoe upper (3) fixed to the sole (2) where the sole (2) comprises a front part which has - when seen from

the outside of the footwear - a crossways concavity (9) corresponding to the crossways concavity (7) of the mould (1) and a front to back concavity corresponding to that of the mould (1); the footwear (8) enables the natural expansion of the foot under load, optimises front damping during running, changes of direction and the waiting movements which precede a rapid movement; the present invention can be used for sports footwear, hobby shoes, safety and work footwear.

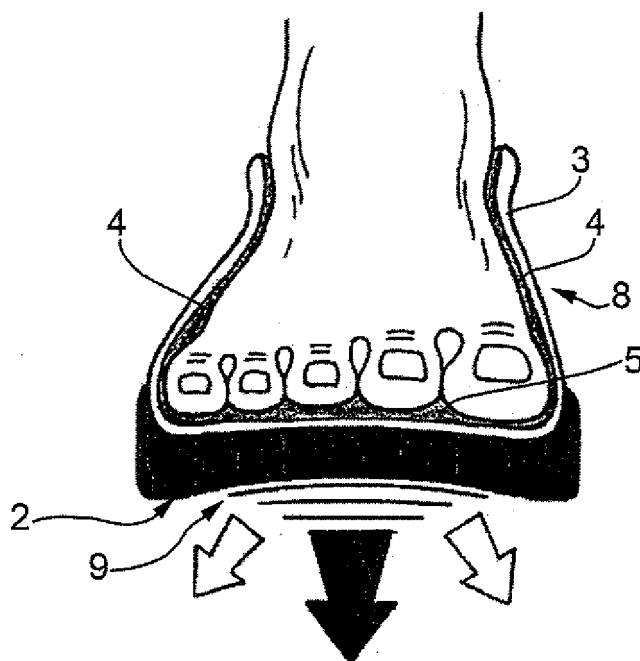


FIG.3

Description

Technical field

[0001] The present invention refers to footwear with a concave profile and in particular to sports footwear where the front part has a crossways concavity and a lengthways concavity from front to back and which is combined with a sole comprising one or more elements having on the front part the same concavity, and a mould also with a crossways concavity and a lengthways concavity from front to back for making this footwear.

Background Art

[0002] Known technology in the footwear sector includes damping cushions to be inserted inside footwear in the front part in order to support the metatarsal arch of the foot. This type of cushion is known, for example, in the British patent GB-480 304. The application for international patent WO-987/25494 and French patent FR-2 618 648 disclose anatomically-shaped insoles to be applied inside the footwear and which in the front part comprise one or two parts in relief which support and enable the distension of the metatarsal arch of the foot.

[0003] However, none of the cushions or insoles of the known type offer adequate support for the forefoot in the heavy, dynamic conditions of the type which occur during sports activities.

[0004] The metatarsal cushions and the insoles provide a relatively limited and purely static support for the foot.

[0005] Given that the foot is inside a shoe which has a substantially flat sole at the front outer part and given that the shoe has an internal width which is only slightly wider than the foot this means that the foot cannot stretch freely sideways and substantially remains blocked inside the shoe.

[0006] The application for French patent FR-2 680 452 describes multipurpose footwear comprising a sole with a wear layer which has a slight arch formed by a crossways concave shape on part of the crossways extension of the sole, leaving a flat outer edge for contact with the ground. This sole is attached to an intermediate insert having flexibly deformable protuberances in the areas of the forefoot and the heel. These protuberances project slightly from the insole and massage the corresponding areas of the foot and together define a ventilation network inside the sole.

[0007] The footwear in this patent application also has a sole which permits only limited elastic deformation in a crossways direction because the sole still has a side edge which limits movement relative to the ground and therefore also the sideways expansion of the sole. Furthermore, the arch of the sole has a very limited width and serves solely as a means of circulating air through the sole and not for providing dynamic damping of stresses.

Disclosure of the Invention

[0008] The aim of the present invention is to improve the state of the prior art.

[0009] A further aim of the present invention is to provide footwear which has better performance under conditions of stress.

[0010] Another aim of the present invention is to provide footwear which enables a reduction in the impact forces acting on the foot and in particular on the forefoot.

[0011] A further aim of the present invention is to provide footwear which follows the natural, crossways deformation of the foot when under load. Yet another aim of the present invention is to provide a footwear mould for making the footwear with the characteristics described above.

[0012] A further aim of the present invention is to provide an improved method for making the footwear with the characteristics described above by means of an improved footwear mould.

[0013] One embodiment of the present invention provides footwear as specified in claim 1.

[0014] A further embodiment of the present invention provides a footwear mould as specified in claim 8. Another embodiment of the present invention provides a method for making footwear as specified in claim 12.

[0015] The dependent claims describe a preferred and advantageous embodiment of the present invention.

Brief Description of the Drawings

[0016] The characteristics and advantages of the present invention are described in more detail below with the aid of drawings showing a preferred embodiment of footwear provided merely by way of example without restricting the scope of the inventive concept and in which:

- Figure 1 is a perspective view with a part shown in cross section of a mould for footwear according to the present invention.
- Figure 2 is a front view with a part shown in cross section of the mould for footwear shown in Figure 1.
- Figure 3 shows a front view under conditions of use of footwear made with the mould described in the previous figures.
- Figure 4 is a perspective view from below which shows the crossways section of the front part of the mould for footwear according to the previous figures.
- Figure 5 is a perspective view from below showing the lengthways section of the front part of the mould for footwear according to the previous figures.
- Figure 6 is a side view of footwear during manufacture employing the mould described in Figures 1, 2, 3, 4 and 5.

Modes for Carrying out the Invention

[0017] In Figures 3 and 6, the reference numeral 8 in-

dicates the footwear according to the present invention. Figures 1, 2, 3, 4 and 5 shown a mould designed for making the footwear 8. Figure 6 shows the footwear 8 made employing the mould 1 in the final stages.

[0018] The footwear 8 substantially comprises a sole 2 and an upper part or shoe upper 3 fixed to the sole 2 according to a known method and therefore not described in detail here. The inside of the footwear 1 comprises a lining 4 and an insole 5. The mould 1 has a front part 6 fitted with a concavity 7 comprising a plurality of arches. The concavity 7 starts at the front end and extends and increases towards the area "M" of maximum width in an intermediate position of the front part 6 and terminating approximately at half the length of the mould 1.

[0019] The sole 2 and the footwear 8 as a whole also have at the front part a concavity 9 which follows the metatarsal arch of the wearer's foot and has the same crossways and lengthways concavity as the mould 1.

[0020] Figure 4 is a view from below of the mould 1 showing a crossways section "T" of the front part of the mould where the concavity 7 is clearly visible.

[0021] The progression of the concavity 7 is also clear from the longitudinal section "L" shown in Figure 5 where it is clear that the concavity 7 reaches its maximum width in an intermediate longitudinal position corresponding to the area "M" cited previously.

[0022] In the footwear 8 the concavity 9 in the front part of the sole 2 corresponds to the concavity 7 in the mould 1 and corresponds to the anatomy of the forefoot and in particular to the crossways arch of the foot.

[0023] The footwear 8 can in effect be made by using the mould 1 which reproduces all the geometric characteristics - in particular the geometric characteristics of the concavity 7 - of the mould 1.

[0024] The concavity 7 of the mould 1 and the corresponding concavity 9 of the footwear 8 are designed to follow the natural curves of the foot. The footwear 8 and in particular the sole 2 permit optimal rolling of the foot thereby reducing and optimising the vertical impact forces.

[0025] During sporting activity these impact forces can reach two or three times the user's own weight. Given that the sole 2 has a arched concave shape, the sole 2 and the entire footwear 8 modify their shape with each step that the user takes, stretching and flattening so as to absorb and dampen the dynamic force produced by walking or by the sporting activity thereby acting in the same way as a spring or a leaf spring or in the mechanical fashion typical of a dome shaped object. The contact of the sole 2 with the ground takes place with a progressive increase of the force exercised on the sole by the user, that is with a force consisting of the user's weight also increased by the dynamic support force resulting from the conditions of use.

[0026] In this way, with each step that the user takes there is a gradual increase in the number of points of contact between the sole and the ground thereby improv-

ing the load distribution.

[0027] The sole 2 can be made with lines or cuts (not shown here) designed to allow the foot to move in a natural, anatomically-correct way.

[0028] During use, the sole 2 and the footwear 8 together provide a dynamic response activated by the user's weight which can also assist sporting movements and the ordinary movements associated with footwear. The concave shape of the entire footwear 8 mirrors the natural shape of the foot and thereby enables improved functioning of the footwear. This also allows the natural crossways deformation of the foot thereby reducing fatigue and as a consequence improving the user's performance.

[0029] The footwear according to the present invention achieves the aims proposed and in particular it should be noted that the footwear according to the present invention enables the natural expansion of the foot when subject to load, optimising front damping during running, changes of direction and the waiting movements which precede a rapid movement.

[0030] The footwear according to the present invention, with a sole provided with a crossways concavity, enables control of the forwards and backwards motion of the foot during sporting activity or during normal use.

[0031] With the characteristics described above, the footwear according to the present invention is suitable for use in sporting activities and in particular for those activities generating high dynamic stresses.

[0032] The present invention can also be applied to other footwear including hobby shoes, casual shoes, safety and work footwear.

[0033] The present invention as described above is susceptible to numerous modifications and variants without thereby departing from the scope of the inventive concept or from the protection of the following claims.

Claims

1. Footwear (8), in particular for sports use, comprising a sole (2), and upper part or shoe upper (3) fixed to the sole (2), **characterised in that** the sole (2) comprises a front part which has - when seen from the outside of the footwear (8) - a crossways concavity (9).
2. The footwear (8) according to claim 1, wherein the front has - when seen from the outside of the footwear (8) - a front to back concavity (9).
3. The footwear (8) according to claim 1 or 2, wherein the front part is designed to follow the natural curves of the forefoot.
4. The footwear (8) according to any one of the foregoing claims, wherein the crossways concavity (9) has a area of maximum width located in an interme-

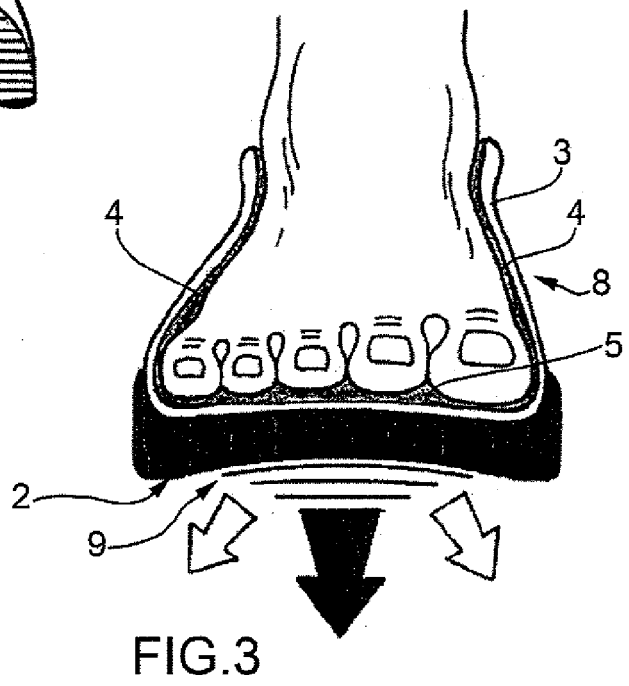
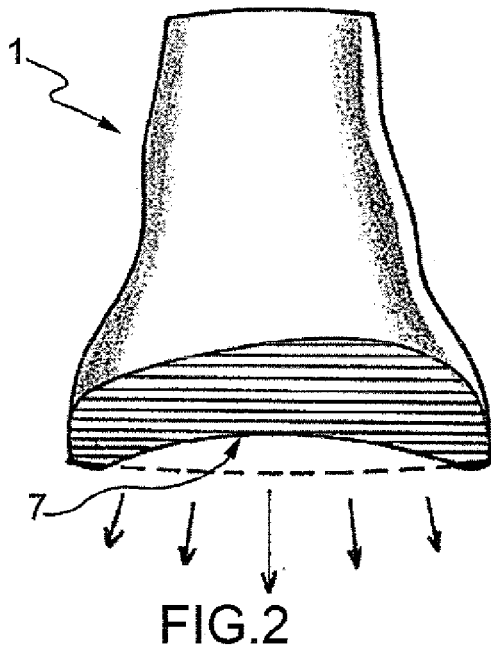
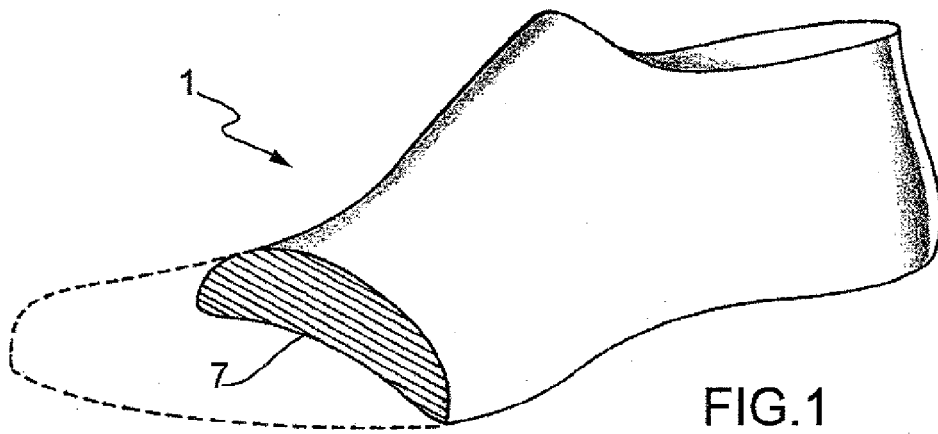
diate position of the front part.

5. The footwear (8) according to any one of the foregoing claims, wherein the upper part or shoe upper (3) and the sole (2) in the front part together have a concave shape. 5
6. The footwear (8) according to any one of the foregoing claims, wherein the sole (2) comprises lines or cuts at the roots of the toes made in the lengthways direction of the sole (2) and designed to allow the foot to move in a natural manner in accordance with its anatomic characteristics. 10
7. The footwear (8) according to any one of the foregoing claims, wherein the upper part or shoe upper (3) and the sole (2) deform in a crossways direction enabling a natural flattening of the foot when subject to load and permitting optimal rolling of the foot thereby reducing and optimising vertical impact forces. 15
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8. A footwear mould (1) of the type used to make footwear by shaping and constructing the footwear on top of the mould, comprising a front part (6), **characterised in that** the front part (6) comprises a crossways concavity (7). 25
9. The footwear mould (1) according to claim 8, wherein the front part (6) has a front to back concavity. 30
10. The footwear mould (1) according to claim 8 or 9, wherein the front part (6) reproduces the natural curves of the forefoot.
11. The footwear mould (1) according to any one of the foregoing claims from 8 to 10, wherein the crossways concavity (7) has an area "M" of maximum width in an intermediate position of the front part (6). 35
12. A method for making footwear (8) according to any one of the foregoing claims from 1 to 7 employing a footwear mould (1) according to any one of the claims from 8 to 11. 40

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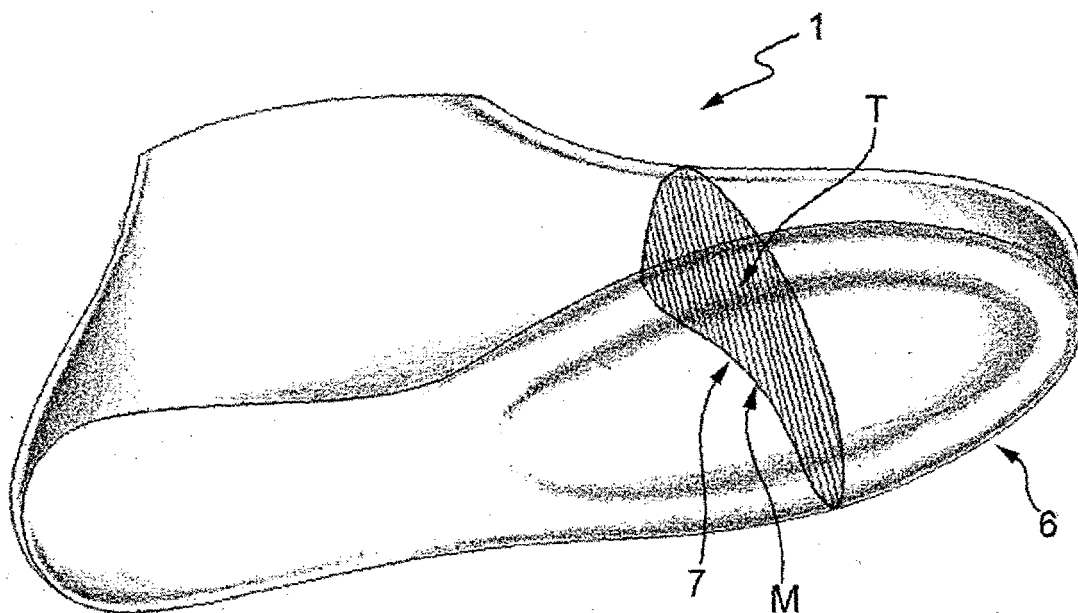


FIG. 4

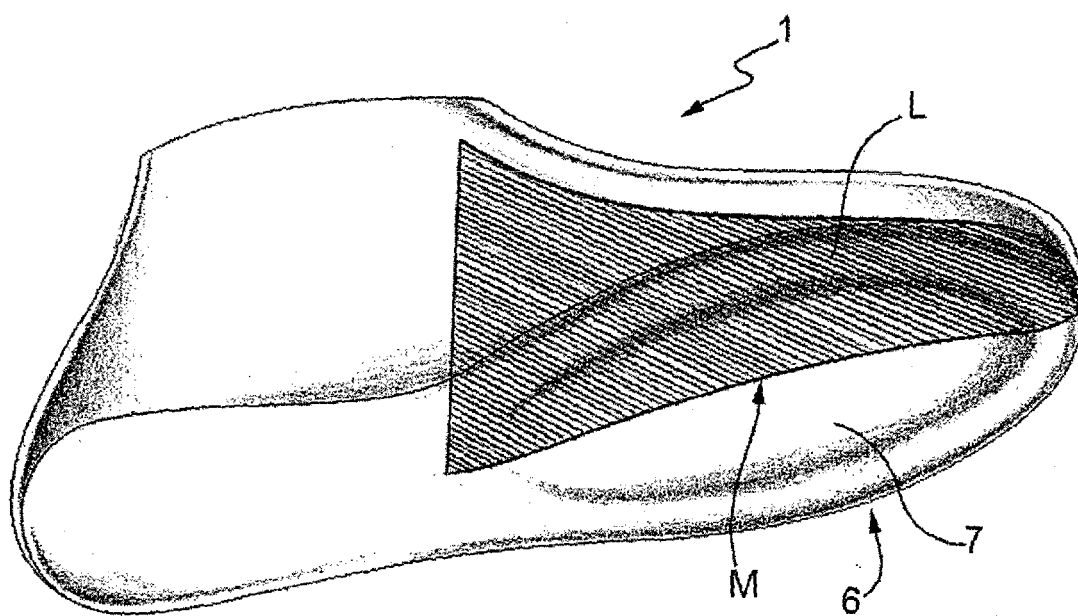


FIG. 5

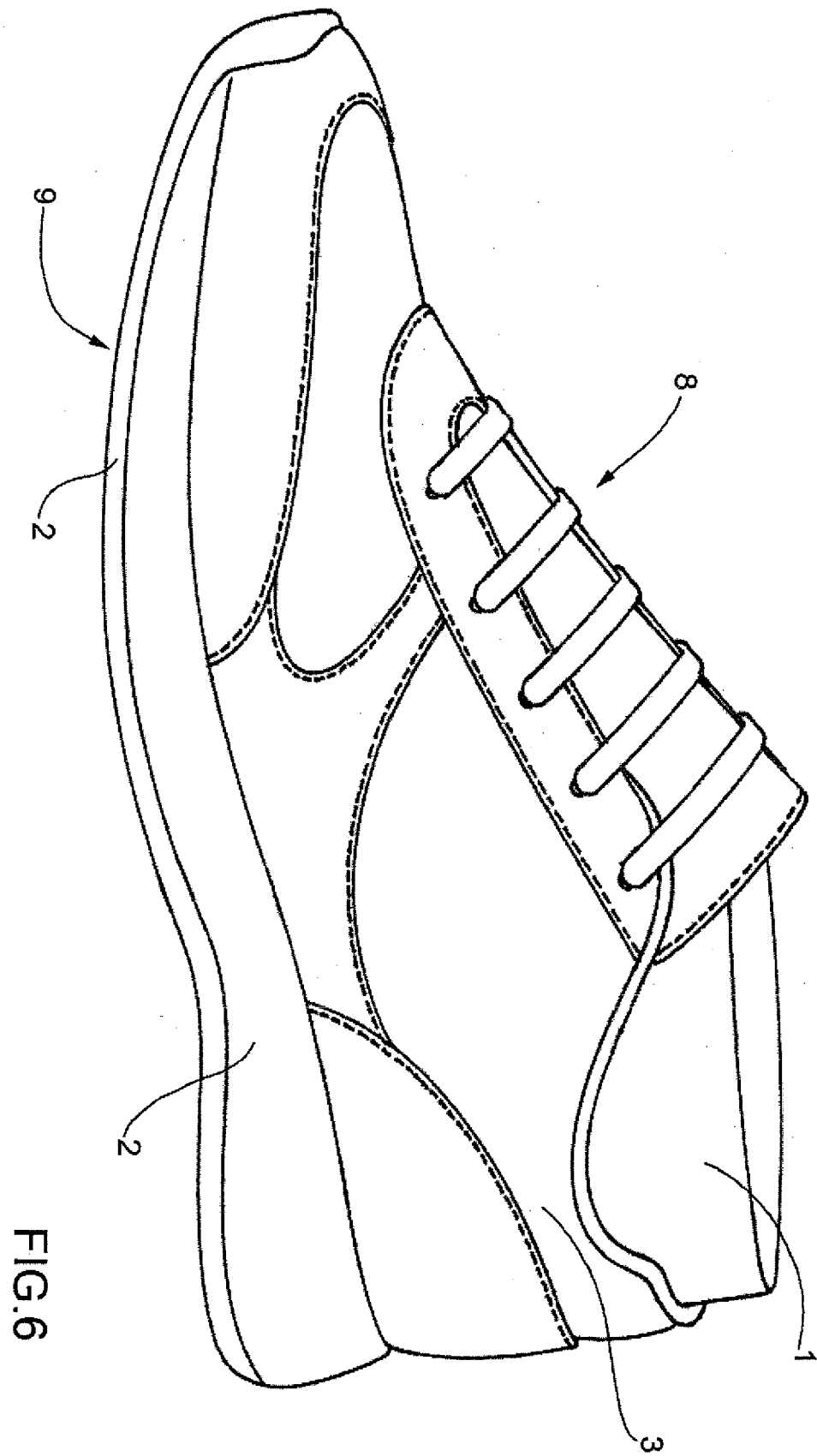


FIG. 6



EUROPEAN SEARCH REPORT

Application Number
EP 09 15 1828

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 4 741 114 A (STUBBLEFIELD JERRY D [US]) 3 May 1988 (1988-05-03)	1-5,7	INV. A43B13/14 A43B13/18 A43D3/02
Y	* the whole document *	6,12	
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			TECHNICAL FIELDS SEARCHED (IPC)
			A43B A43D
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 14 July 2009	Examiner 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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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 09 15 1828

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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14-07-2009

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