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Amended claims in accordance with Rule 137(2)
EPC.

(54) **Shoe**

(57) Shoe comprising:
- a sole having a lower surface;
- an upper provided with connecting means arranged for receiving lacing;
- a lacing tensioning mechanism arranged for tensioning the lace received in said connecting means, wherein the lacing tensioning mechanism is moveable between a loose position with reduced lacing tension for easy access in the shoe and a second tensioned position wherein

the lace is under tension; and
- an actuator mechanism for moving the lacing tensioning mechanism between the positions, wherein actuator mechanism comprises a moveable sole part which is moveable from and into the surface of the sole and wherein the actuator mechanism is arranged for moving the lacing tensioning mechanism from the loose position to the tensioned position upon movement of the moveable sole part into the surface of the sole.

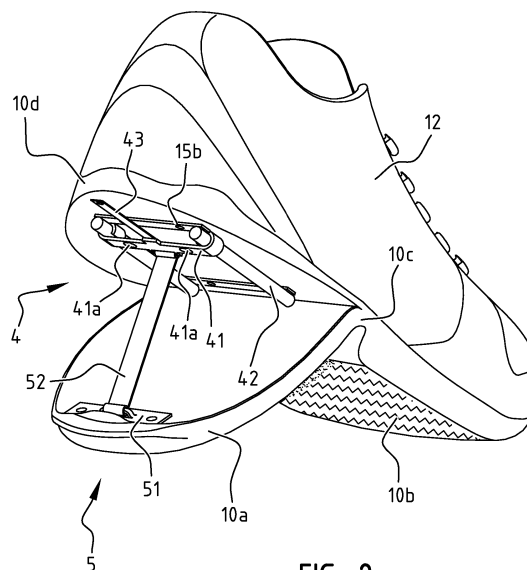


FIG. 2

Description

[0001] The present invention relates to a shoe comprising a sole having a lower surface, an upper provided with connecting means arranged for receiving lacing, a lacing tensioning mechanism arranged for tensioning the lace received in said connecting means, wherein the lacing tensioning mechanism is moveable between a loose position with reduced lacing tension for easy access in the shoe and a second tensioned position wherein the lace is under tension and an actuator mechanism for moving the lacing tensioning mechanism between the positions.

[0002] Typically, a shoe is fastened using laces (or shoestrings) which are received and guided in holes, eyelets, loops or hooks on either side of the shoe, more specifically the upper, and which form the connecting means for lacing. Tying a shoelace for fastening a shoe is however difficult, especially for smaller children and elderly people.

[0003] Next to the alternatives of for instance Velcro, zippers or straps with buckles which allow fastening of shoes without tying a knot, shoes are known which are provided with lacing tensioning mechanisms. These mechanisms allow tensioning of the lace without actually tying a knot. It is for instance known to provide a turning knob as actuator which tensions the lace upon turning or to provide a clamp at the lace ends for interconnection. It is however a drawback that these known mechanisms are still difficult to operate, in particular for children and elderly people as mentioned above.

[0004] It is therefore a goal of the present invention, amongst other goals, to provide an efficient, easy in use shoe which can be fastened and/or loosened easily.

[0005] This goal, amongst other goals, is met by a shoe according to claim 1. More specifically, to meet this goal, amongst other goals, the shoe according to the invention comprises:

- a sole having a lower surface;
- an upper provided with connecting means arranged for receiving lacing;
- a lacing tensioning mechanism arranged for tensioning the lace received in said connecting means, wherein the lacing tensioning mechanism is moveable between a loose position with reduced lacing tension for easy access in the shoe and a second tensioned position wherein the lace is under tension; and
- an actuator mechanism for moving the lacing tensioning mechanism between the positions, wherein actuator mechanism comprises a moveable sole part which is moveable from and into the surface of the sole and wherein the actuator mechanism is arranged for moving the lacing tensioning mechanism from the loose position to the tensioned position upon movement of the moveable sole part into the surface of the sole.

[0006] According to the invention, the lacing tensioning mechanism is actuated by a movement of a part of the sole. In a resting position, in which position the lacing tensioning mechanism is in the loose position for easy access in the shoe, the moveable part of the sole extends, or in other words protrudes, from the surface of the sole. By stepping into the shoe and exerting a force on the moveable part, the moveable part is moved into the surface of the sole, or in other words is moved towards a position wherein the moveable part is aligned with the surface of the sole. This movement activates the lacing tensioning mechanism, such that by simply stepping into and onto the shoe, the shoe can be fastened. It will be appreciated that fastening the laces in a shoe according to the invention does not require any manual work, which is typically the problem with children and elderly people.

[0007] It should be noted that the surface of the sole as defined herein is not necessarily flat. The sole typically bends in use, such that the surface is accordingly bent.

The sole may further be provided with a heel, which extends from the surface. The term surface of the sole should therefore be understood as the surface of the sole in a state wherein the user walks on the shoe.

[0008] The shoe according to the invention preferably uses a convention lace. It is however also possible that other tensioning or fastening means are used which can be tensioned using the tensioning mechanism.

[0009] According to a preferred embodiment, the lacing tensioning mechanism is arranged to receive a part of the lace in a moving body which is moveable to and from the connecting means for loosening and tensioning the lace, wherein the actuator is arranged to move the moving body. By moving the moving body, the distance, or path length for the lace, between the connecting means and the moving body is changed, thereby tensioning said lace upon elongated the distance and vice versa.

[0010] A compact composition while allowing sufficient room to move for the moving body for efficiently tensioning and loosing the lace is obtained if the moving body is arranged to move and is guided in a plane parallel to the surface of the sole. The shoe may thereto be provided with a guide, for instance in the form of rails or rods, which are arranged to guide the moving body. The guides preferably limit movement of moving body along a single line in said plane. Preferably, the guide for the moving body comprises opposing slits for receiving lateral edges of a substantially planar moving body. The slits allow movement of the moving body along the lengths of the slits. A very compact composition is obtained if the moving body is incorporated in the sole.

[0011] According to a further preferred embodiment, the shoe comprises guiding means for guiding the lace from the connecting means to the moving body. The guiding means may for instance comprise channels for receiving ends of lacing and may extend between the connecting means, for instance in the form of holes, to a location near the moving body. Upon movement of the

moving body, the lace in the guiding means is tensioned, thereby tensioning the lace in the connecting means for fastening the shoe. The guiding means preferably extend from the connecting means to a position in the shoe near the moving body in the loose position. For moving towards the tensioned position, the moving body is moved away from the end, or opening, of the guiding means, thereby applying tension on the lace.

[0012] It is preferred if the moving body is biased towards the connecting means, such that the lacing tensioning mechanism is biased towards the loose position. If the moving body is not forced or actuated, it will automatically move towards, i.e. shortens the lace path length to, the connecting means, thereby loosening the lacing. This allows efficient loosening of the shoe.

[0013] To prevent accidental loosening of the shoe in use, it is preferred if the shoe further comprises locking means arranged for locking the lacing tensioning mechanism in the tensioned position. The lacing tensioning mechanism is hereby actively held in the tensioned position, where upon unlocking, the tensioning mechanism moves to the loose position. An efficient locking mechanism is obtained if the locking means are arranged to lock the moveable sole part in the position in the surface of the sole. If the moveable sole part as actuator is locked, the tensioning mechanism is also locked. The locking means may for instance comprise a releasable connection between the sole parts.

[0014] According to a further preferred embodiment, the moveable sole part is hingeably connected to a stationary part of the sole. The moveable sole part hereby hinges or rotates for moving from and into the surface of the sole. It is possible that the sole hereto comprises a hinging mechanism comprising for instance a hinging axle. It is however preferred if the moveable sole part is hingeable due to the flexibility of the material of the sole. The moveable sole part may for instance be formed by cutting out a section of sole, while leaving the moveable sole part connected to the remainder of the sole along one edge. This edge interconnecting the moveable sole part and the remainder of the sole then forms the hinge. It is preferred if the moveable sole part is formed by a cut in the sole along a plane parallel to the sole.

[0015] A reliable hinging action while allowing easy access in the shoe is obtained if the moveable sole part is arranged to hinge about a centrally located hinging axis. The axis hereby extends a central location, making it less vulnerable than for instance an axis at the front or back of the shoe.

[0016] According to a further preferred embodiment, the actuator mechanism comprises a pushing rod extending between an end part of the moveable sole part opposite the hinging axis and the moving body, wherein the pushing rod is arranged for moving the moving body on movement of the moveable sole part. The pushing rod hereby transfers the force of the hinging moveable sole part to the moving body. The pushing rod is hereto also hingeably connected to the moveable sole part and

the moving body.

[0017] In order to provide an efficient movement to the tensioned position by stepping into the shoe, it is preferred if the moveable sole part forms the back part towards the heel of the sole. Further, in case of a tensioning mechanism comprising a moving body, this ensures sufficient room for the tensioning mechanism.

[0018] To allow an efficient transfer of the tensioning or loosening action along the connecting means for lacing upon activating the tensioning mechanism, it is preferred if the connecting means for receiving lacing comprise rotatable wheels, such as pulleys, for receiving and guiding a lace. This allows a more homogeneous distribution of the forces along the lace in the connecting means. This facilitates loosening and tensioning of the shoe. The rotatable wheels are preferably provided with a shielding wall, which encloses the lace between the wall and the wheel, such that the lace cannot come loose from the connecting means. The wall preferably extends along a length of the perimeter surface of the wheel, preferably at the outer or lateral sides of the shoe.

[0019] It is noted that the connecting means as wheels may also be applied to shoes having convention laces, i.e. without the actuator formed by the moveable sole part or without lacing tensioning mechanism.

[0020] To further facilitate the user of the shoe while stepping into the shoe, a further preferred embodiment of the shoe further comprises biasing means which are arranged for opening the body of the shoe for easy entry in the loose position of the lacing. Opening the body means that the entry opening of a foot in the shoe is enlarged. It is preferred if the biasing means are incorporated in the body of the shoe.

[0021] The biasing means for instance comprise elastic means, for instance springs or elastic fibres, arranged for urging wall sections of the body of the shoe outwardly. More specifically, the biasing means preferably comprise elastic means arranged to exert an outwardly oriented elastic force on the body. It is preferred if the biasing means are arranged in the body:

- around the entry opening of the shoe for opening said entry opening;
- around the upper for latterly moving apart the lateral sides of the upper; and/or
- in a tongue for moving the tongue in a direction away from the sole.

[0022] In particular the entry opening, the upper (the location of the connecting means) and the tongue limit easy entry in a shoe. By providing the biasing means at at least one of these locations, entry into the shoe is made easier. The biasing means may for instance comprise spring or elastic fibres as described above which are arranged around the opening, in the upper and in the tongue and which are biased towards an opening position. Also the biasing means may be applied to shoes having convention laces, i.e. without the actuator formed

by the moveable sole part or without lacing tensioning mechanism.

[0023] The present invention is further illustrated by the following Figures, which show a preferred embodiment of the device according to the invention, and are not intended to limit the scope of the invention in any way, wherein:

- figure 1 schematically shows a shoe according to the invention in perspective;
- figure 2 shows the shoe from behind; and
- figures 3 and 4 schematically show the tensioning mechanism in side view in two different stages of tensioning the shoe.

[0024] In figure 1, a shoe 1 is shown which is provided with a sole 10 and an upper 11, which forms a body 12 of the shoe 1. The upper 11 is provided with connecting means for lacing 3 in the form of pulleys 2. The pulleys 2 comprise wheels 21 which are arranged to rotate for efficiently guiding the shoelace 3. The wheel 21 is partly enclosed by a wall 22 to prevent the lace 3 from coming loose. The walls 22 are arranged at the lateral sides of the wheels 21 of pulley 2, such that the lace 3 can be arranged in a zig-zag fashion between the two sides of the upper 11.

[0025] The lace 3 in this embodiment is tied in a knot 31 at a frontal location of the shoe 1 and runs through the pulleys 2 towards entries 15a of channels 15 for guiding the lace 3 from the connecting means to a lacing tensioning mechanism 4 which will be explained in greater detail below. The tensioning mechanism is arranged for automatically tensioning and loosening the lace 3 and thereby the shoe 1.

[0026] To facilitate entry of a foot in the shoe 1 in a loosened state of the lace 3, the wall surrounding the opening 13 of the shoe 1 is provided with a spring member 13a extending along said wall. The spring member 13a exerts an outwardly directed force, indicated with arrows B, which opens the entry opening 13 in the loose state of the lace 3. Also the inner edge of the upper 11 is provided with a spring member 11a which extends along said edge. The spring member 11a exerts a biasing force directed laterally outwardly, as indicated with arrows C. This also opens the shoe 1 in loosened state of the lace 3. Finally, also the tongue 14 of the shoe 1 is provided with a spring member 14a which biases the tongue 14 to open, as indicated with arrow D. The spring members 13a, 11a and 14a form biasing means for biasing the body 12 in an opening position of the shoe 1, such that a foot can be easily inserted in the shoe 1.

[0027] The lacing tensioning mechanism 4 will now be elucidated with reference to figure 2 - 4. The tensioning mechanism 4 comprises a moving body 41 which is arranged to receive a part of the lace 3 in openings 41 a. In this example, the lace 3 is wound along the moving body 41. More specifically, the lace 3 enters the channel 15 at the entry 15a near the connecting means 2, see in

particular figure 3, and leaves the channel 15 at the end 15b near the tensioning mechanism 4 in the sole 10. The lace 3 then enters the first hole 41a of the moving body 41, returns in the second hole 41a to subsequently enter a channel again in an end (not shown) of the channel towards the connecting means 2. The lace thus forms a loop from the knot 31 (figure 1), through the connecting means 2, the two channels 15 provided at both lateral sides of the shoe 1 and the moving body 41.

[0028] The moving body 41 is guided by rods 42 which are arranged on an upper sole part 10d (as will be explained below). The moving body 41 is allowed to move along the rods 42. As an alternative (not shown), the moving body 41 is substantially planar and is guided at the lateral edges in correspondingly shaped slits arranged in wall sections of a recess in the upper sole part 10d. The slits then form the guides for guiding the moving body 41. The moving body 41 is further connected to the upper sole part 10d by a spring 43 or another material with elastic properties, such as an elastic band, for instance made of rubber. The spring 43 forces the moving body 41 in the position as shown in figure 2, i.e. towards the ends 15b of the channels 15.

[0029] For moving the moving body 41, an actuator 5 is provided in the form of a moveable sole part 10a. The moveable sole part 10a is formed by cutting the back half of the sole 10 in two, thereby forming an upper sole part 10d which is fixedly connected to the body 12 and a moveable part 10a which is hingeably connected to the remainder 10b of the sole. The upper sole part 10d and/or the moveable sole part 10a are provided with a recess for receiving the tensioning mechanism 4 there between. During use, the lower surface of the upper sole part 10d and the upper surface of the moveable sole part 10a at least partly abut, such that these surfaces form end surfaces.

[0030] The hinge axis 10c is located at a central region of the shoe. A connecting plate 51 fixed on the upper surface of the moveable sole part 10a connects to a push rod 52 which is at its other end connected to the moving body 41. Pivoting of the moveable sole part 10a (indicated with A in figure 1) will thus result in a movement of the moving body 41, as will be explained below.

[0031] In figure 3, the tensioning mechanism 4 is in its loose position. The distance between the moving body 41 and the ends 15b of the channels 15 is hereby small. By stepping into the shoe 1, a movement indicated with III in figure 4 is initiated, thereby pivoting the moveable sole part 10a towards the upper sole part 10d in a direction indicated with II in figure 4. Due to this pivoting movement, the pushing rod 52 will push the moving body 41 in a direction indicated with I along the rods 42. The distance between the moving body 41 and the ends 15b of the channels 15 is thereby increased, thereby increasing the path length of the lace 3 and thus thereby tensioning the lace 3. The pulleys 2 as connecting means ensure a homogeneous distribution of the tension along the length of the upper 11. While moving in a direction I, the spring

43 is tensioned.

[0032] When the moveable sole part 10a has moved into the surface of the sole 10, the upper surface of the moveable sole part 10a and the lower surface of the upper sole part 10d abut, thereby limiting any further relative movement in the direction II. In this position, the user can walk on the shoe. In this position, the moving body 41 has travelled along a length d as indicated in figure 4, thereby tensioning the lace 3. During a first use of the shoe 1, a user can adjust the needed tension by adjusting the knot 31 near the front of the shoe 1. After this adjustment, the lacing tensioning mechanism 4 can be used for fastening and loosening the lacing.

[0033] For preventing accidental loosening of the lace, as the moving body 41 tends to travel in a direction opposite I in figure 4 due to the spring 43, a locking mechanism 6 is arranged to interlock the upper sole part 10d and the moveable sole part 10a. In this example, a finger 62 is arranged to engage a protrusion 61 in a snap-fit fashion. The user can unlock the locking mechanism 4 by hand or by using his other foot, thereby loosening the lacing tensioning mechanism 4.

[0034] If the locking mechanism 4 is loose, lifting the heel (a movement opposite direction III in figure 4) will result in the movement of the moving body 41 towards the ends 15b of the channels 5 due to the tension in the spring 43. Also the weight of the moveable sole part 10a may assist in moving the moving body 41 back. The spring 43 is further sufficiently stiff to hold the moving body 41 in the position shown in figure 3, such that a user can efficiently step into the shoe 1.

[0035] The present invention is not limited to the embodiment shown, but extends also to other embodiments falling within the scope of the appended claims.

Claims

1. Shoe comprising:

- a sole having a lower surface;
- an upper provided with connecting means arranged for receiving lacing;
- a lacing tensioning mechanism arranged for tensioning the lace received in said connecting means, wherein the lacing tensioning mechanism is moveable between a loose position with reduced lacing tension for easy access in the shoe and a second tensioned position wherein the lace is under tension; and
- an actuator mechanism for moving the lacing tensioning mechanism between the positions,

wherein actuator mechanism comprises a moveable sole part which is moveable from and into the surface of the sole and wherein the actuator mechanism is arranged for moving the lacing tensioning mechanism from the loose position to the tensioned position

upon movement of the moveable sole part into the surface of the sole.

2. Shoe according to claim 1, wherein the lacing tensioning mechanism is arranged to receive a part of the lace in a moving body which is moveable to and from the connecting means for loosening and tensioning the lace, wherein the actuator is arranged to move the moving body.
3. Shoe according to claim 2, wherein the moving body is arranged to move and is guided in a plane parallel to the surface of the sole.
4. Shoe according to claim 3, wherein the moving body is incorporated in the sole.
5. Shoe according to any of the claims 2 - 4, wherein the shoe comprises guiding means for guiding the lace from the connecting means to the moving body.
6. Shoe according to any of the claims 2 - 5, wherein the moving body is biased towards the connecting means, such that the lacing tensioning mechanism is biased towards the loose position.
7. Shoe according to claim 6, further comprising locking means arranged for locking the lacing tensioning mechanism in the tensioned position by locking the moveable sole part in the position in the surface of the sole.
8. Shoe according to any of the preceding claims, wherein the moveable sole part is hingeably connected to a stationary part of the sole about a centrally located hinging axis.
9. Shoe according to claim 8, wherein the moveable sole part is formed by a cut in the sole along a plane parallel to the sole.
10. Shoe according to at least claims 2 and 8, wherein the actuator mechanism comprises a pushing rod extending between an end part of the moveable sole part opposite the hinging axis and the moving body, wherein the pushing rod is arranged for moving the moving body on movement of the moveable sole part.
11. Shoe according to any of the preceding claims, wherein the moveable sole part forms the back part towards the heel of the sole.
12. Shoe according to any of the preceding claims, wherein the connecting means for receiving lacing comprise rotatable wheels, such as pulleys, for receiving and guiding a lace.

13. Shoe according to any of the preceding claims, wherein the shoe comprises biasing means incorporated in the body of the shoe which are arranged for opening the body of the shoe for easy entry in the loose position of the lacing.

14. Shoe according to claim 13, wherein the biasing means comprise elastic means arranged to exert an outwardly oriented elastic force on the body.

15. Shoe according to claim 13 or 14, wherein the biasing means are arranged in the body:

- around the entry opening of the shoe for opening said entry opening;
- around the upper for latterly moving apart the lateral sides of the upper; and/or
- in a tongue for moving the tongue in a direction away from the sole.

Amended claims in accordance with Rule 137(2) EPC.

1. Shoe (1) comprising:

- a sole (10) having a lower surface;
- an upper (11) provided with connecting means (2) arranged for receiving lacing (3);
- a lacing tensioning mechanism (4) arranged for tensioning the lace (3) received in said connecting means, wherein the lacing tensioning mechanism (4) is moveable between a loose position with reduced lacing tension for easy access in the shoe (1) and a second tensioned position wherein the lace (3) is under tension; and
- an actuator mechanism (5) for moving the lacing tensioning mechanism (4) between the positions,

wherein actuator mechanism (5) comprises a moveable sole part (10a) which is moveable from and into the surface of the sole (10) and wherein the actuator (5) mechanism is arranged for moving the lacing tensioning mechanism (4) from the loose position to the tensioned position upon movement of the moveable sole part (10a) into the surface of the sole (10), **characterised in that** the lacing tensioning mechanism (4) is arranged to receive a part of the lace (3) in a moving body (41) which is arranged to move and is guided in a plane parallel to the surface of the sole (10) to and from the connecting means (2) for loosening and tensioning the lace (3), wherein the actuator mechanism is arranged to move the moving body (41).

2. Shoe (1) according to claim 1, wherein the moving

body (41) is incorporated in the sole.

3. Shoe (1) according to any of the claims 1 or 2, wherein the shoe (1) comprises guiding means (15) for guiding the lace from the connecting means (2) to the moving body (41).

4. Shoe (1) according to any of the claims 1 - 3, wherein the moving body (41) is biased towards the connecting means (2), such that the lacing tensioning mechanism (4) is biased towards the loose position.

5. Shoe (1) according to claim 4, further comprising locking means (6) arranged for locking the lacing tensioning mechanism (4) in the tensioned position by locking the moveable sole part (10a) in the position in the surface of the sole (10).

6. Shoe (1) according to any of the preceding claims, wherein the moveable sole part (10a) is hingeably connected to a stationary part of the sole about a centrally located hinging axis (10c).

7. Shoe (1) according to claim 6, wherein the moveable sole part (10a) is formed by a cut in the sole (10) along a plane parallel to the sole (10).

8. Shoe (1) according to at least claims 1 and 6, wherein the actuator mechanism comprises a pushing rod (52) extending between an end part of the moveable sole part (10a) opposite the hinging axis (10c) and the moving body (41), wherein the pushing rod (52) is arranged for moving the moving body (41) on movement of the moveable sole part (10a).

9. Shoe (1) according to any of the preceding claims, wherein the moveable sole part (10a) forms the back part towards the heel of the sole (10).

10. Shoe (1) according to any of the preceding claims, wherein the connecting means for receiving lacing (3) comprise rotatable wheels (21), such as pulleys (2), for receiving and guiding a lace (3).

11. Shoe (1) according to any of the preceding claims, wherein the shoe (1) comprises biasing means (11a, 13a, 14a) incorporated in the body of the shoe (1) which are arranged for opening the body of the shoe (1) for easy entry in the loose position of the lacing (3).

12. Shoe (1) according to claim 11, wherein the biasing means (11a, 13a, 14a) comprise elastic means arranged to exert an outwardly oriented elastic force on the body.

13. Shoe (1) according to claim 11 or 12, wherein the biasing means (11a, 13a, 14a) are arranged in the

body:

- around the entry opening (13) of the shoe for opening said entry opening;
- around the upper (11) for latterly moving apart the lateral sides of the upper (11); and/or
- in a tongue (14) for moving the tongue (14) in a direction away from the sole.

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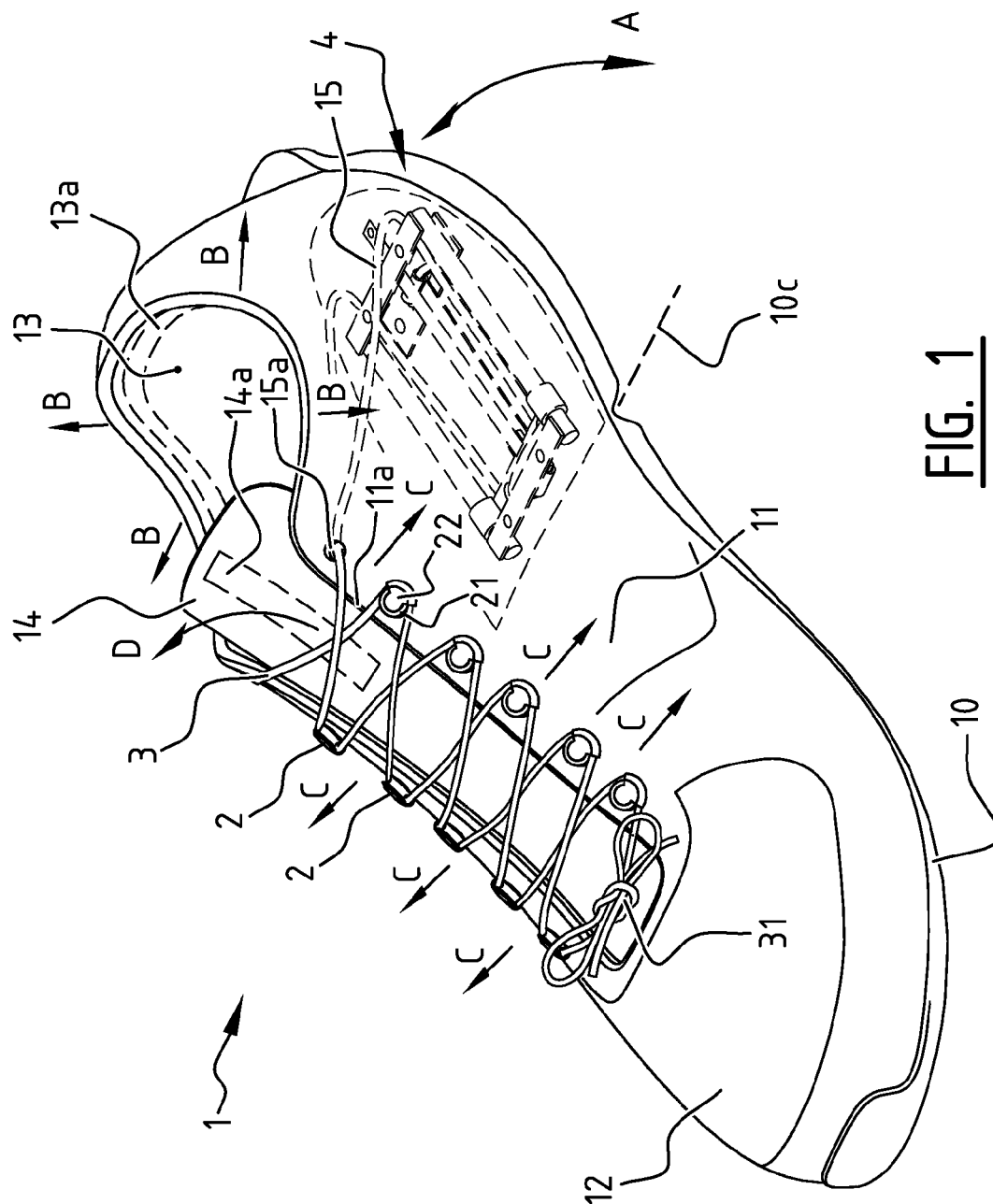


FIG. 1

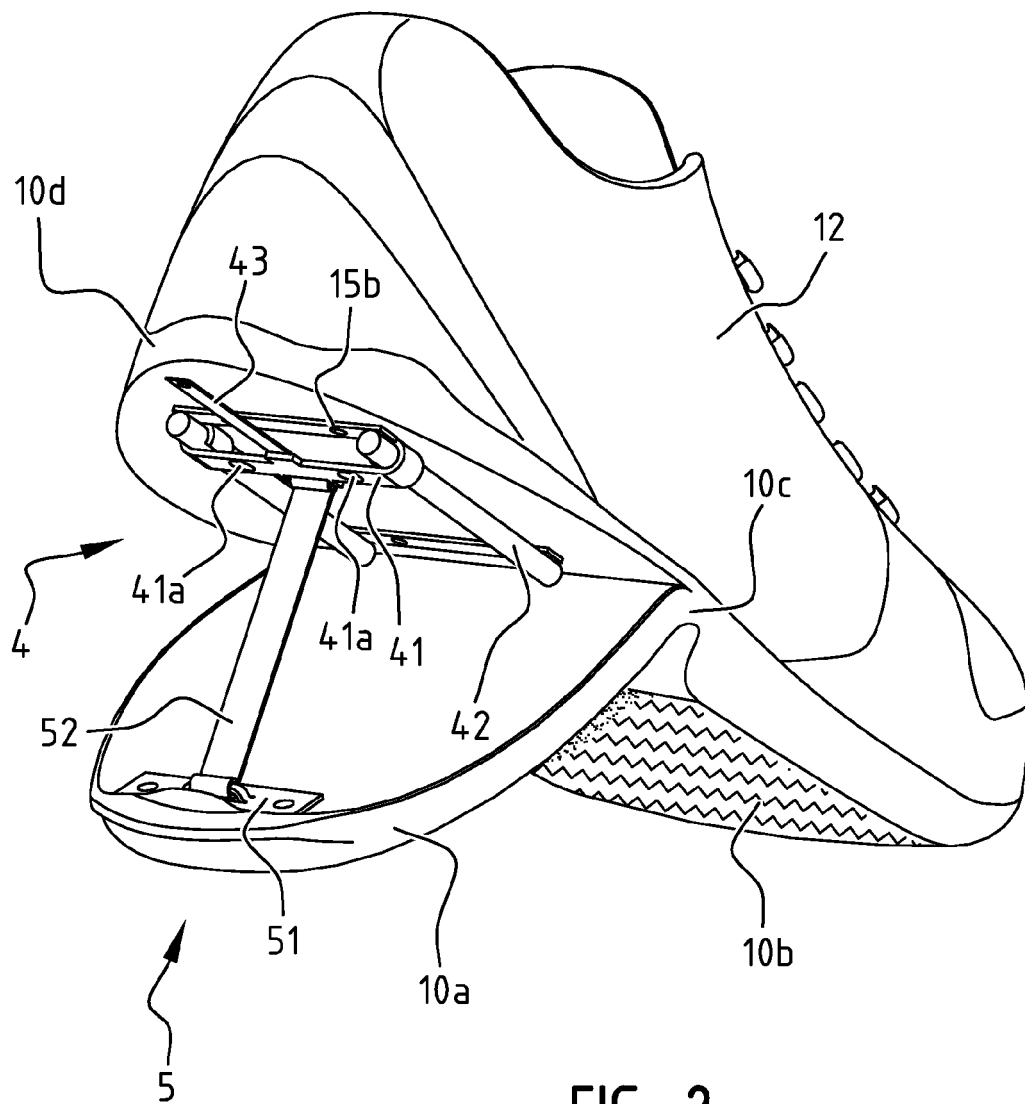


FIG. 2

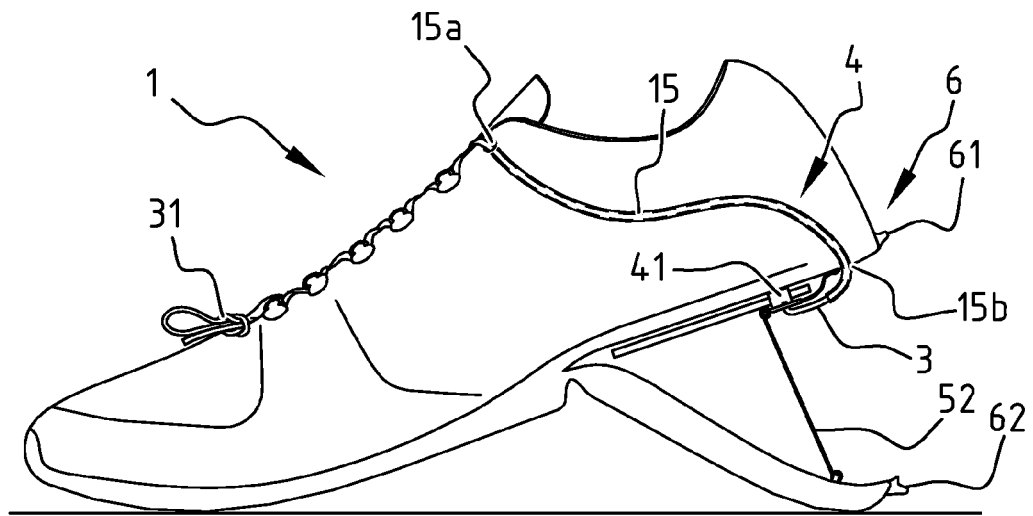


FIG. 3

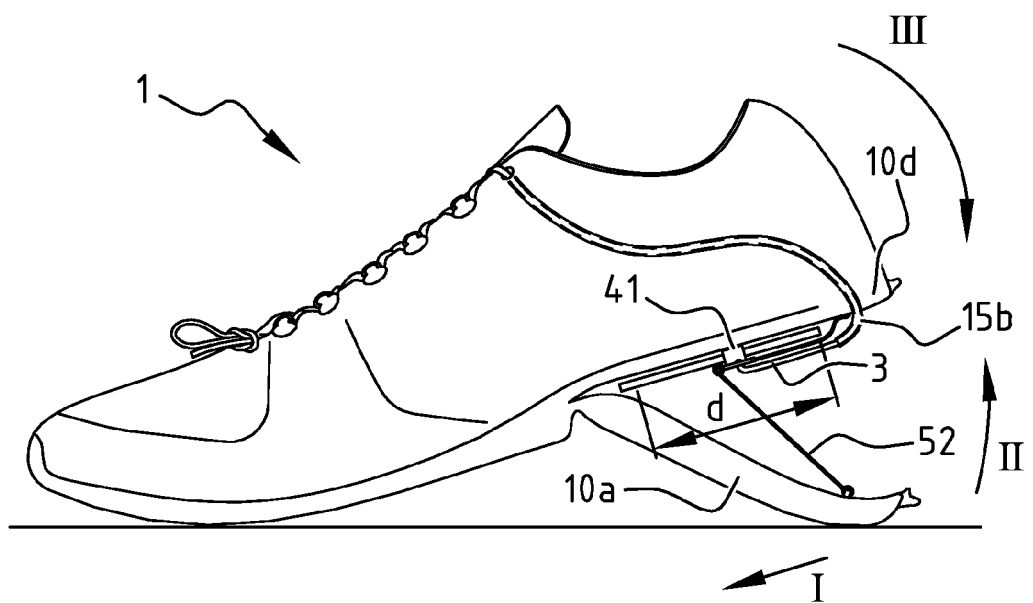


FIG. 4



EUROPEAN SEARCH REPORT

Application Number
EP 14 16 5969

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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 12 August 2014	Examiner Gkionaki, Angeliki
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 03.02 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 14 16 5969

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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