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(54) **ARTICLE OF FOOTWEAR AND LACING SYSTEM THEREFOR**

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(57) **ABSTRACT**

An article of footwear having an upper, a sole, and a tightening system, the tightening system having a tightening plate arranged in the area of the instep zone of the article of footwear, the tightening plate having on each medial and lateral side, respectively, at least one channel for the passage of a tightening cord/lace, the sole and/or the upper having on each medial and lateral side, respectively, at least one guide arranged in the vicinity of the sole and adapted to the passage of the tightening cord/lace, the tightening cord/lace having at least one strand running along an alternating path between each guide and channel of the upper/sole and tightening plate, respectively, a blocking mechanism being associated with each strand of the cord/lace, the tightening plate being displaceable at least vertically in relation to the sole by traction on the cord/lace.

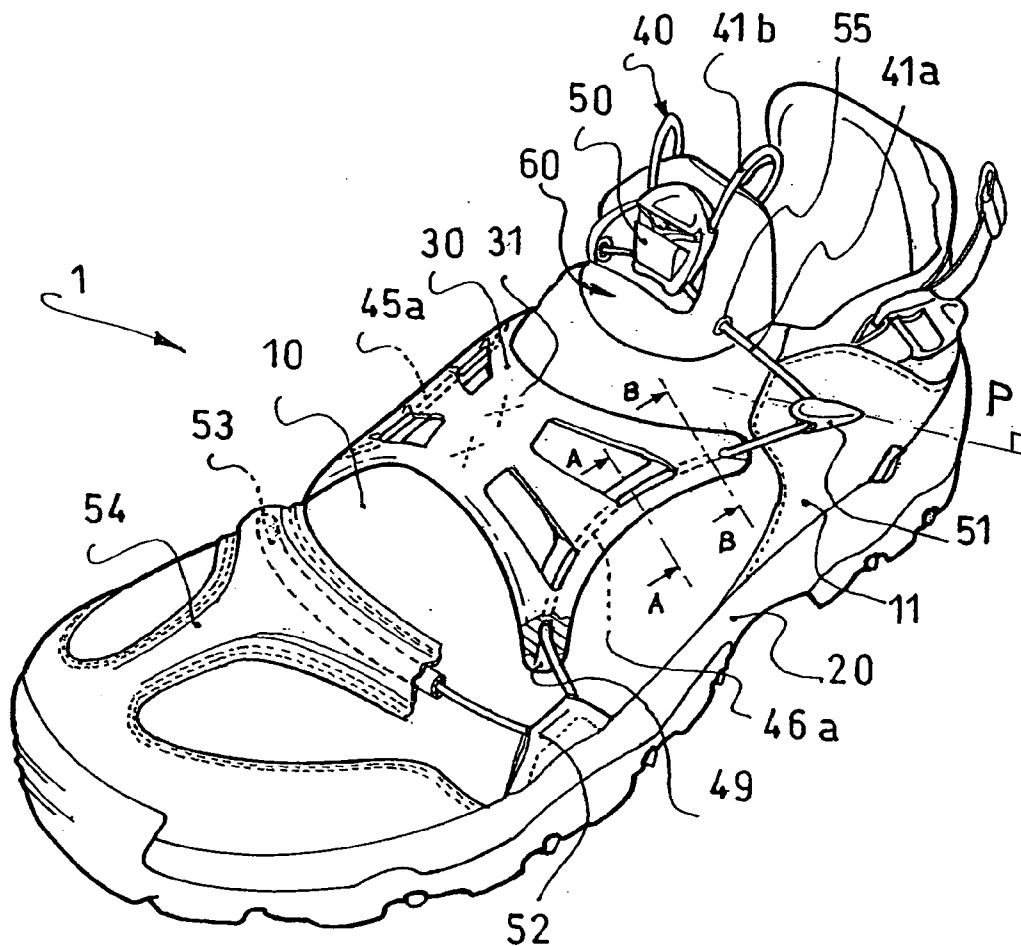
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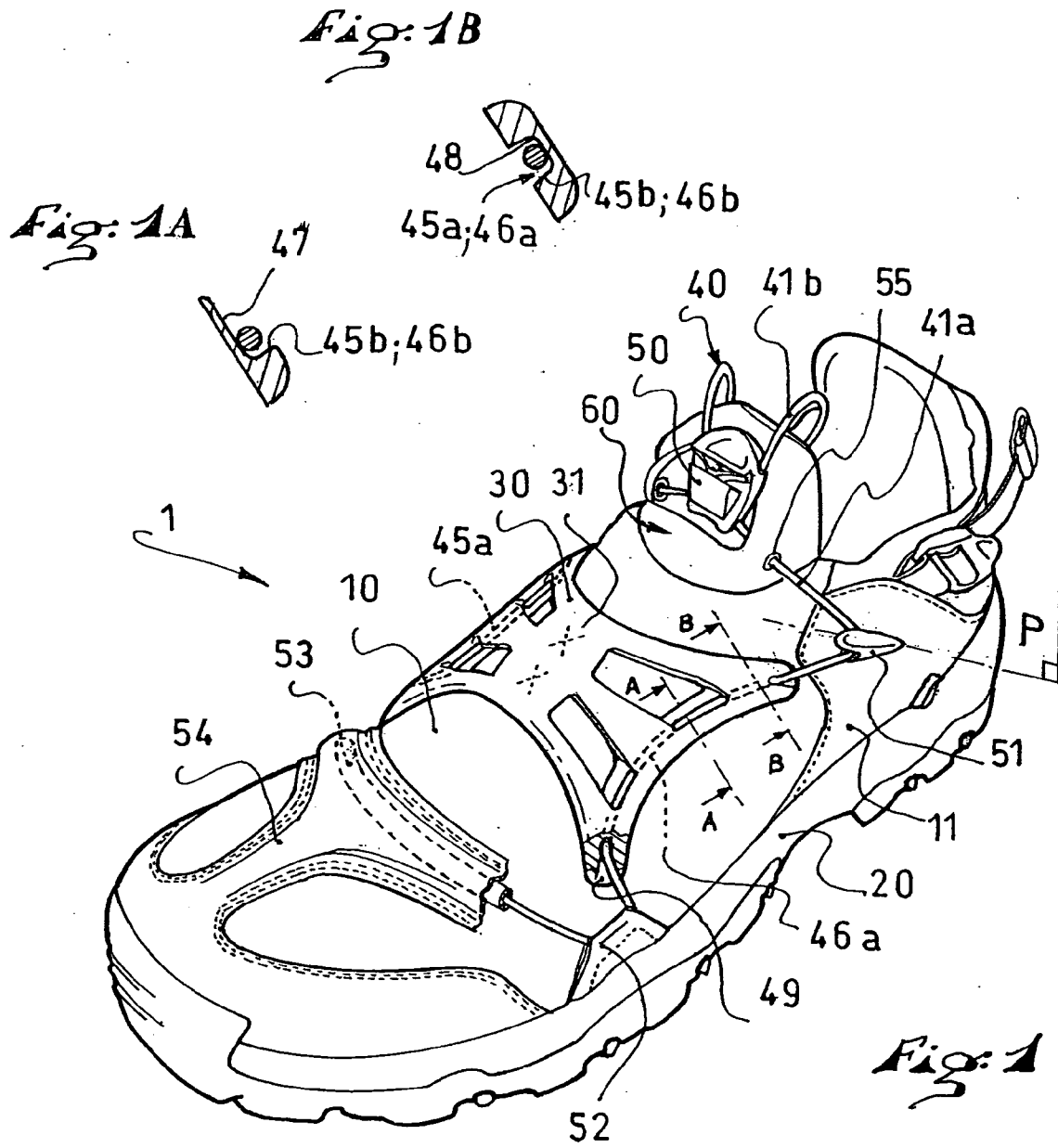


Fig. 2

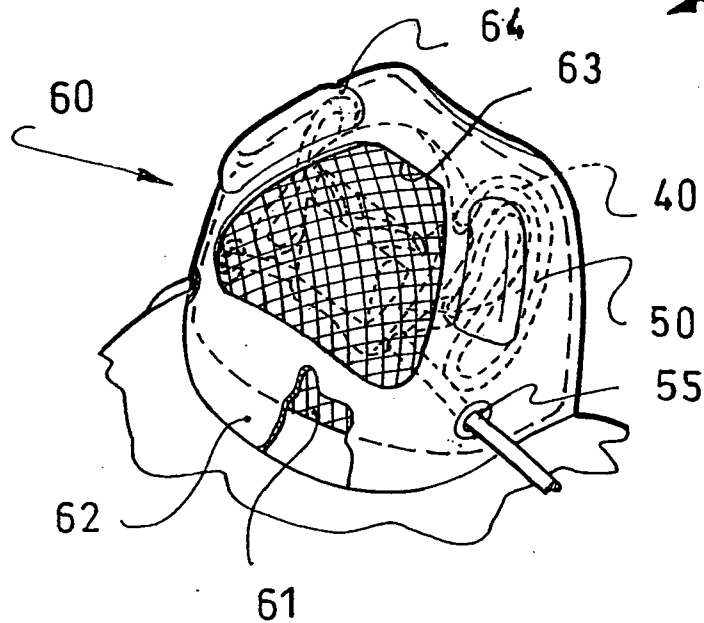


Fig. 3

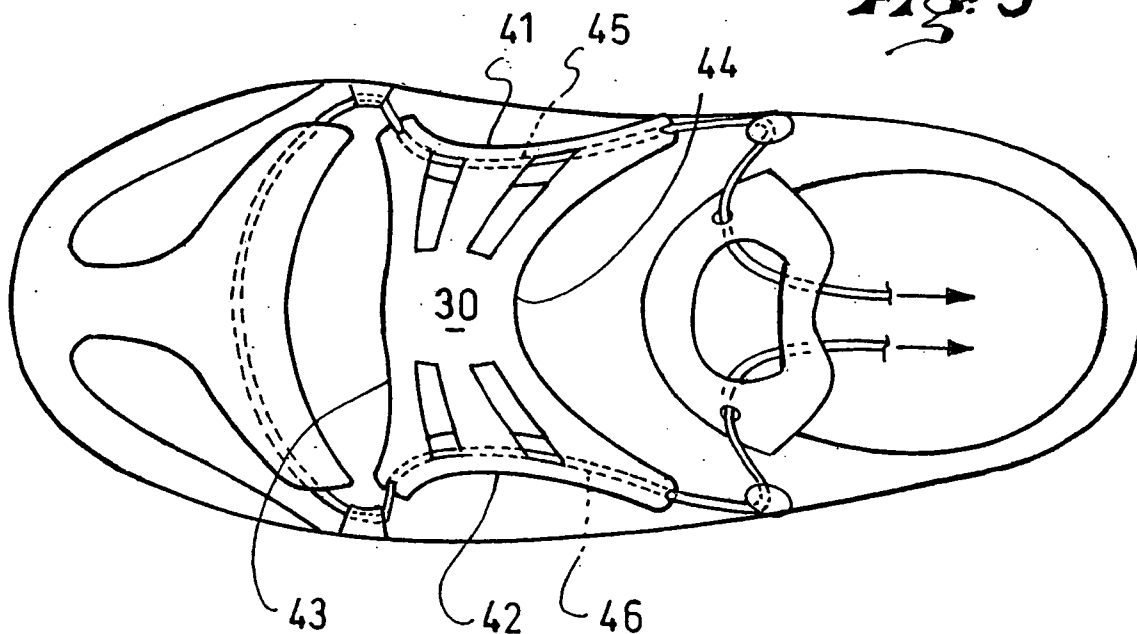


Fig. 4

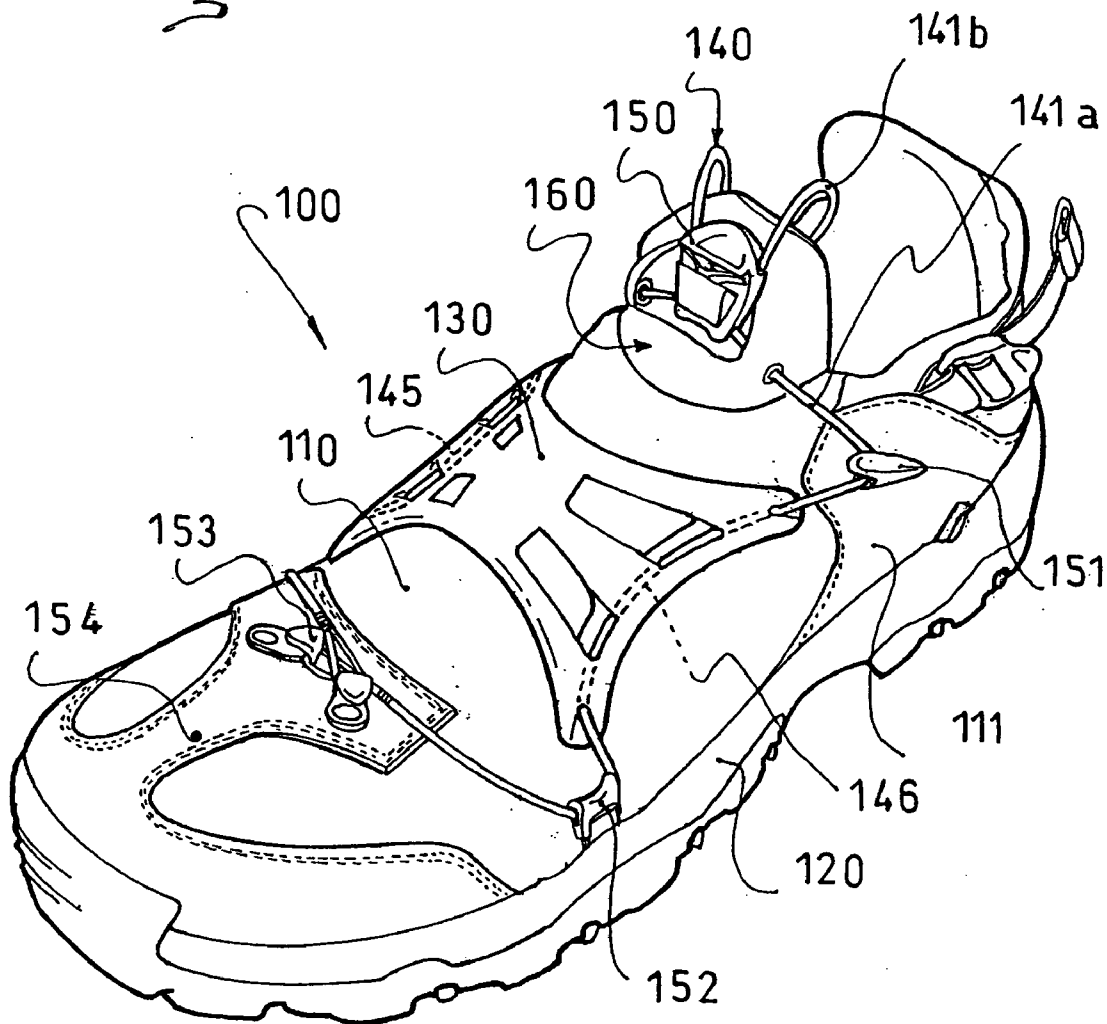
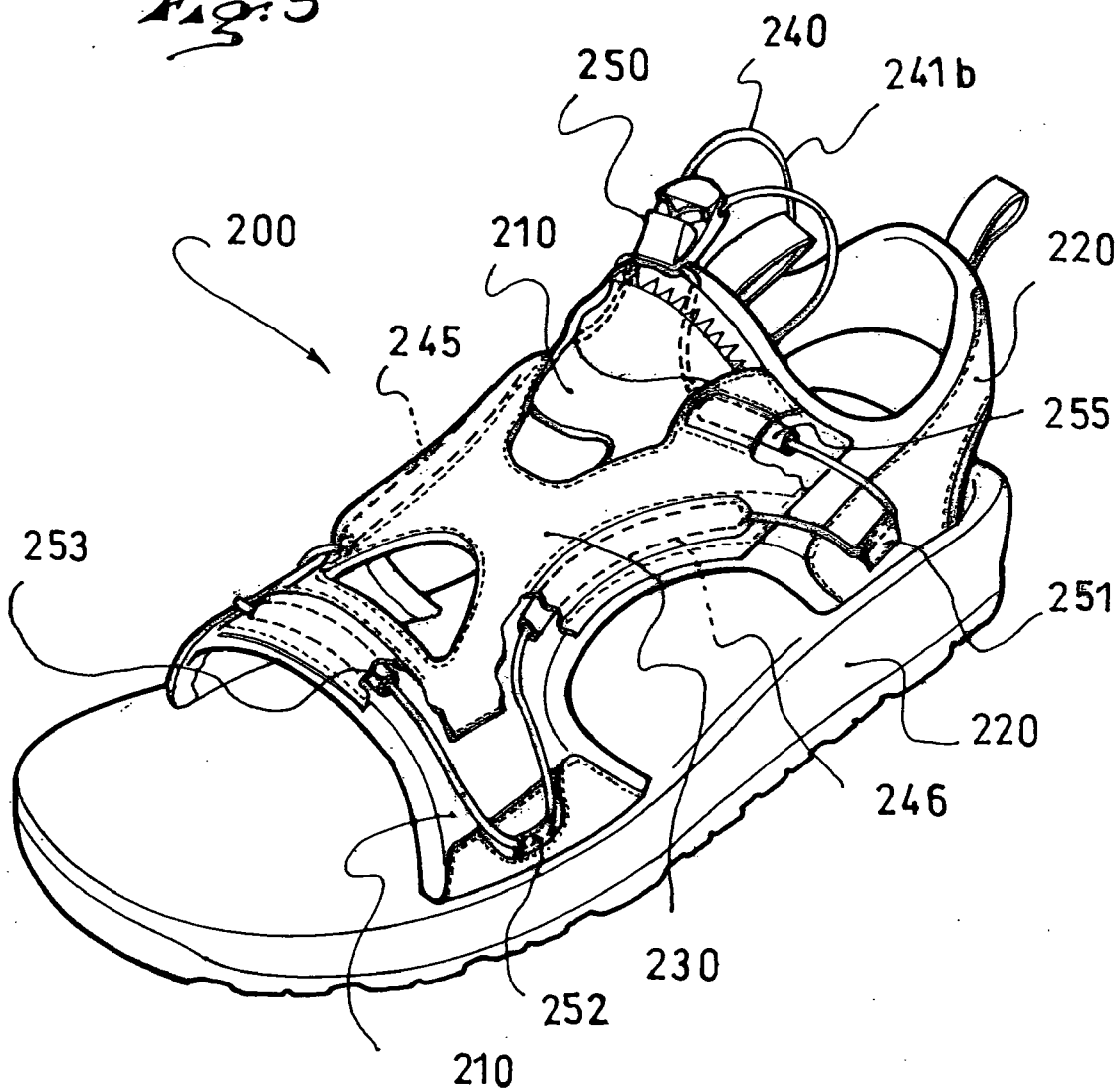


Fig. 5



ARTICLE OF FOOTWEAR AND LACING SYSTEM THEREFOR

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application is based upon French Patent Application No. 04.07333, filed Jul. 2, 2004, the disclosure of which is hereby incorporated by reference thereto in its entirety and the priority of which is hereby claimed under 35 U.S.C. 119.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The present invention relates to an article of footwear, such as a shoe or a boot, and a lacing system for an article of footwear.

[0004] The invention relates to any type of footwear, including but not limited to footwear adapted for use in sports, such as walking shoes, running shoes, etc., or footwear adapted to particular sporting activities, such as snowboard boots, ski boots, skating boots, etc.

[0005] 2. Description of Background and Relevant Information

[0006] Currently, there are shoes provided with very thin laces which, when associated with keepers or lace guides having a specific shape, allow for an extremely quick and precise tightening of the shoe. For example, such shoes are sold by Salomon S.A. under the trademark "XA-Pro®".

[0007] There are also shoe tightening systems having a winding device that uses nylon or steel cables and pressure distribution plates. Such tightening systems are known, for example, from the European Patent Publication EP 474 708 and U.S. Pat. No. 5,117,567, in which the winding system is positioned on the top of the distribution plate, or from the European Patent Publication EP 666 718 and U.S. Pat. No. 5,381,609, in which the winding system is positioned at the rear of the heel.

[0008] In these known shoes, the distribution plates are made of a plastic that is sufficiently rigid to be capable of resisting the wear and tear caused by the steel or nylon cables used.

[0009] The drawbacks of the winding systems are caused by the required numerous rotations of the winding device to perform the tightening.

SUMMARY OF THE INVENTION

[0010] An object of the present invention is to provide an article of footwear that includes an improved tightening system.

[0011] One of the objects in particular is to provide a foot tightening system that is easy and quick to use.

[0012] Another object is to provide a construction for the footwear that is simple and the lightest possible.

[0013] A further object is to provide an ergonomic and comfortable tightening system.

[0014] Object(s) of the invention is/are achieved in the article of footwear according to the invention, which

includes an outer sole, an upper, and a foot tightening system, with the tightening system having a tightening plate arranged in the area of the instep of the article of footwear; the tightening plate having on each medial and lateral side, respectively, at least one channel for the passage of a tightening cord/lace; the sole and/or the upper having on each medial and lateral side, respectively, at least one keeper/guide arranged in the vicinity of the sole and adapted for the passage of the tightening cord/lace, the tightening cord/lace having at least one strand running along an alternating path between each keeper/guide and channel of the upper/sole and the tightening plate, respectively, a blocking system being associated with each strand of the cord/lace, the tightening plate being displaceable at least vertically in relation to the sole by traction on the cord/lace.

[0015] As a result, the tightening is carried out by displacing the tightening plate downwardly toward the sole, in a substantially vertical direction, this displacement having the effect of pressing the foot inside the article of footwear against the sole and, therefore, of ensuring that the foot has an excellent contact with the sole.

[0016] Furthermore, the blocking system associated with each strand makes it possible to adjust and to lock the desired tightening value precisely and quickly which, therefore, enables a quick and ergonomic tightening.

BRIEF DESCRIPTION OF DRAWINGS

[0017] The invention will be better understood, and other characteristics and advantages thereof will become apparent from the following description, with reference to the attached schematic drawings, showing several embodiments by way of several non-limiting examples, and in which:

[0018] **FIG. 1** is a front perspective view of a shoe according to a first embodiment;

[0019] **FIG. 1A** is a cross-sectional view along the line A-A of **FIG. 1**;

[0020] **FIG. 1B** is a cross-sectional view along the line B-B of **FIG. 1**;

[0021] **FIG. 2** is a detailed view of **FIG. 1** with a section partially broken-away;

[0022] **FIG. 3** is a top view of the shoe of **FIG. 1**;

[0023] **FIG. 4** is a view, similar to **FIG. 1**, of a shoe according to a second embodiment;

[0024] **FIG. 5** is a view, similar to **FIG. 1**, of a shoe according to a third embodiment.

DETAILED DESCRIPTION OF THE INVENTION

[0025] The shoe **1** shown in **FIG. 1** has an outer upper **10**, an outer sole or walking sole **20**, and a tightening system having a tightening plate **30**, a lacing system with a lace **40** cooperating with the tightening plate and a lace blocker **50**, as well as a storage pocket **60**. Although the lace is shown to have a circular cross-section, other shapes are encompassed by the invention, such as an oval cross-section and a square or rectangular cross-section.

[0026] The tightening plate **30** has a substantially saddle-shaped left surface, that is, a plate in the form of a portion

of a cylinder demarcated by four concave edges, namely, a medial edge **41**, a lateral edge **42**, a front edge **43**, and a rear edge **44**.

[0027] The medial and lateral edges **41**, **42** are arranged on the medial and lateral sides, respectively, of the shoe **1**, and the front and rear edges **43**, **44** are arranged toward the front, or toe, and toward the rear, or heel, respectively, of the shoe.

[0028] A medial channel **45** and a lateral channel **46** are arranged on the medial and lateral edges **41**, **42**, respectively, of the tightening plate.

[0029] In fact, each of the channels **45**, **46** is a very thin tube or tube segment having a diameter corresponding to that of the lace **40** or substantially corresponding to that of the lace. Each tube **45**, **46** extends along and fits the contour of the associated edge **41**, **42**, respectively, of the plate and, therefore, also has a curved shape. According to one embodiment, the curvature corresponds to an arc of a circle with a radius between 50-70 millimeters (mm) or approximately between 50-70 mm.

[0030] The arc can alternatively have a non-circular but slightly elliptical shape.

[0031] To facilitate the sliding of the lace, one can provide that each channel **45**, **46** be made from a material having a coefficient of friction that is compatible with that of the cord/lace **40** or coated with such material. This can also be a channel made of a material coated, for example, with polytetrafluorethylene (PTFE) in order to facilitate the sliding.

[0032] In the example shown in the two views of **FIGS. 1A and 1B**, the tightening plate **30** is made of a flexible plastic material such as polyurethane (PU), that is, a material that is flexible while being substantially non-deformable under traction, and which is compatible with an optimum sliding of the cord/lace. Each channel **45**, **46** is defined by a groove **45a**, **46a** arranged in the thickness of the material of the tightening plate and exposed alternatively on the top and bottom; in other words, its lower **47** and upper **48** walls, respectively, are alternatively interrupted.

[0033] Thus, the lace only rubs the lower **47** or upper **48** surface of the groove each time and possibly along one edge/of the edges **45b**, **46b** thereof, which reduces the friction.

[0034] Thus, as also shown in **FIG. 1**, the end **49** of each channel **45**, **46**, respectively, is widened out or flared, which makes it possible to avoid additional friction of the lace in the area of this end. Due to its concave edges, the saddle-shaped tightening plate **30** has a very anatomical shape that adapts well to various foot shapes, and particularly to the shape of the instep of a wearer. It is therefore very comfortable. In the example shown in **FIG. 1**, the tightening plate **30** is fixed to the upper **10** by any known means, such as stitches **31** (as shown) or glue, etc. This attachment of the tightening plate to the upper is not required, but it improves the positioning of the plate **30**.

[0035] In addition to guiding channels **45**, **46**, various keepers/returns or guides are arranged on the upper and/or at the boundary of the upper/sole junction zone.

[0036] Thus, rear guides **51** are provided at the rear of the upper. These guides **51** are arranged along a plane P, angled

relative to the longitudinal, extending from the area of the flexion crease of the article of footwear to the rear thereof. These guides **51** are further fixed mid-height to the upper on a lateral stiffener **11**. As the case may be, the lateral stiffener **11** can also be a part of a heel stiffener. The guides **51** can be constituted by merely folded straps, or by straps that are folded and provided with an insert made of plastic, such as described in the European Patent Publication EP 826 318 and U.S. Pat. No. 5,906,057, or by lacing hooks, as shown in **FIG. 1**.

[0037] Front guides **52** are also provided on each medial and lateral side and at the front of the upper **10**, in the area of the lower end of the upper, or even in the upper/sole junction zone.

[0038] As is the case with the guides **51**, the guides **52** can take the form of any of various types. In the example shown, these guides are each constituted by a strap that is folded over, through which the lace can extend.

[0039] A relatively large guide **53** is also provided on the top of the upper **10**, at the front end thereof, in front of the front edge of the tightening plate **30** in the illustrated embodiment. In the example of **FIG. 1**, this large keeper **53** is a channel in the form of an arc of a circle. This channel **53** can be defined by a thin tube, the diameter of which is compatible with that of the lace, or by thermoforming the material of the upper or a reinforcement thereof in the appropriate shape.

[0040] In the example shown, the upper **10** is made of a very flexible and ventilated mesh-type material, and the channel **53** is made by thermoforming an element **54** for reinforcing the upper, which makes it possible to guarantee a certain volume for the sliding of the lace and/or the passage of a sliding tube/channel.

[0041] Finally, two eyelets **55** are provided at the upper end of the upper **10**, on the lateral and medial sides, respectively, in order to constitute two last lace return elements on the front of the article of footwear, in the area of the upper end of the instep zone. These eyelets **55** are of the conventional type but could be replaced by any type of guides. The lace blocker **50**, which can be of the type described in the European Patent Publication EP 629 793 and U.S. Pat. No. 5,477,593, for example, or of any other type, is fitted on each of the strands **41a** of the lace and makes it possible, in a known fashion, to block the lace in a predetermined blocking position. This blocker **50**, which is common to both strands, could be replaced by two blockers, that is, a blocker provided on each side of the upper and cooperating with a single strand of the lace at a time. In that case, the blocker could be of the type known from the commonly owned European Patent Publication EP 848 917 and U.S. Pat. No. 5,956,823.

[0042] The tightening cord/lace **40** therefore runs an alternating path between each guide **51**, **52** and the channels **45**, **46**, **53**, respectively, of the tightening plate and/or of the upper. The two ends of the lace **40** are connected to one another, for example, by a system such as described in the European Patent Publication No. EP 1 477 078 and U.S. Pat. Publication No. U.S. 2004/0226151, or by mere stitches, so as to form a traction loop.

[0043] **FIG. 2** is a detailed view of the pocket **60** for storing the loop of the lace and the blocker **50** after use. This

pocket **60** is fixed on the top of the upper **10**, at the upper end of the instep zone. It has a double wall, namely, a first wall **61** made of an extensible material within which both the lace blocker **50** and the lace **40** can be stored. Such an elastic pocket is described, for example, in the European Patent Publication EP 923 886 and U.S. Pat. No. 6,473,999.

[0044] The first wall **61** is partially covered by a second wall **62** made of more rigid material, such as leather, a synthetic material, such as PU, PVC, etc., in which eyelets **55** are arranged for the passage of the lace **40**. This second wall **62** is centrally provided with an aperture **63** that makes it possible to grab and manipulate the first wall **61** in order to store the blocker **50** and the lace **40**. This second wall **62** can also be thermoformed in order to make bosses **64** and to provide an additional volume for receiving the blocking system and/or the lace.

[0045] As can be easily understood, a mere traction on the loop **41b** of the lace, or on each of the strands **41a** thereof, makes it possible to displace, in this case to vertically bring the tightening plate **30** closer to the outer sole **20**, and therefore to tighten the user's foot against the sole. It is noted that the tightening operation is particularly easy, quick, and ergonomic, since it suffices to pull the lace forward of the shoe, as it is usually done with conventional lacing. In particular, the tightening operation is carried out in a more ergonomic manner than with the tightening systems having a winding device, especially when these winding devices are arranged in the heel area.

[0046] FIGS. 4 and 5 show other embodiments in which similar or identical elements are designated by the same reference numerals increased by **100**, **200**, respectively.

[0047] The shoe shown in FIG. 4 differs from that of FIGS. 1 and 3 only by the front portion of the shoe. In this case, instead of a channel **53** at the front end of the upper, two systems **153** for anchoring the ends of the lace are provided. These anchoring systems **153** can be constituted by hooks of a known type, as shown in the drawing, or by fastening straps, or any other similar element. The anchoring hooks **153** facilitate the traction force on the lace loop, since this traction is then applied from fixed points. In this case, where the ends of the strands of the lace **140** are anchored, there is no need for an additional system to form a lace loop at the opposite end, unless two laces are used. The position of the anchoring points **153** also makes it possible to modulate the effect of the tightening system.

[0048] It is also noted that in the case of FIG. 4, the guide **152** is of the plastic guide/keeper/hook type, and not a strap-like guide as is the case with the guide **52** of FIG. 1. This guide **152** also has a certain radius of curvature adapted to facilitate the sliding of the lace **40**.

[0049] FIG. 5 shows the application of the invention to a sandal-type shoe **200**.

[0050] In this case, the upper **210** of the shoe is reduced to its minimum and only extends in the zone of the lacing system, that is, in the zone of the tightening plate **230** and of the front guiding channel **253**, which in this case form a single piece, and in the heel zone by means of a rear strap **220**. This upper **210** is made of a flexible and elastic material, such as neoprene, in order not to hinder the tightening process. Furthermore, the eyelets **55** are replaced here by channel-type guides **255**. These guides could also be made in the form of eyelets.

[0051] Therefore, it is noted that the tightening system according to the invention is compatible with a footwear upper reduced to its minimum and is therefore the lightest possible.

[0052] The present invention is not limited to the particular embodiments described hereinabove by way of non-limiting examples, but encompasses all similar or equivalent embodiments. Although the illustrated embodiments include footwear having a low height, such that the upper extends beneath the ankle, the invention encompasses articles of footwear having a mid-eight or at the ankle and footwear in which the upper extends above the ankle. The term lace as used herein is not intended to be limiting to any particular filiform element and includes lace, cord, rope, cable, or other element that would perform the tightening function described above. The lace is preferably inextensible or substantially inextensible along its length.

1. An article of footwear comprising:

an upper having a medial side and a lateral side;

a sole having a medial side and a lateral side;

a tightening system comprising:

at least one tightening cord/lace;

a tightening plate positioned at least partially in an instep zone of the article of footwear, the tightening plate comprising at least one passage channel on each of medial and lateral sides of the tightening plate for the passage of the tightening cord/lace;

at least one guide for the tightening cord/lace attached, in a vicinity of the sole, to each of the medial and lateral sides of the upper and/or attached to each of the medial and lateral sides of the sole;

the tightening cord/lace comprising at least one strand extending along an alternating path between a plurality of the guides and channels of the upper/sole and the tightening plate;

a blocking mechanism to block movement of each strand of the cord/lace;

the tightening plate being displaceable at least vertically in relation to the sole by traction on the cord/lace.

2. An article of footwear according to claim 1, wherein:

the tightening plate includes a channel in the form of an arc of a circle on each of the medial and lateral sides of the tightening plate for the passage of the cord/lace.

3. An article of footwear article according to claim 2, wherein:

the arc of a circle has a radius of about 50-70 mm.

4. An article of footwear according to claim 1, wherein:

means for guiding the cord/lace on the top of the shoe are provided forward of the tightening plate.

5. An article of footwear according to claim 4, wherein:

the means for guiding are constituted by a channel in the form of an arc of a circle arranged on the upper.

6. An article of footwear according to claim 4, wherein:

the means for guiding are constituted by a channel in the form of an arc of a circle affixed to the tightening plate.

7. An article of footwear according to claim 1, further comprising:

means for anchoring each end of the cord/lace provided on top of the upper, forward of the tightening plate.

8. An article of footwear according to claim 1, further comprising:

at least one additional cord/lace guide provided on each of the medial and lateral sides of the upper rearward of the passage channels of the tightening plate.

9. An article of footwear according to claim 1, wherein:

the tightening cord/lace comprises at least two strands;

the blocking mechanism is a common blocking mechanism for both of the two strands of the cord/lace.

10. An article of footwear according to claim 9, wherein:

the cord/lace forms a loop at a rearward extent of the cord/lace forms a loop;

the blocking mechanism is arranged on the cord/lace in a vicinity of the rearward extent of the cord/lace.

11. An article of footwear according to claim 1, wherein:

the distribution plate is fixed on the upper.

12. An article of footwear according to claim 1, wherein:

the upper is at least partially extensible.

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