United States Patent [19]

Kobayashi

[11] **3,846,921**

[45] **Nov. 12, 1974**

[54] **SPIKED SHOE**

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[73] Assignee: **Onitsuka Co., Ltd.**, Kobe City, Japan

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[30] **Foreign Application Priority Data**

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Dec. 27, 1972 Japan 47-148345

[52] **U.S. Cl.** ..... **36/59 R**
[51] **Int. Cl.** **A43b 23/28**
[58] **Field of Search** ..... 36/59 R, 67 R, 67 A, 67 D, 36/67 B

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Primary Examiner—Patrick D. Lawson

[57] **ABSTRACT**

The present invention relates to a spiked shoe comprising a sole provided with a plural number of spikes on the lower surface thereof, and an upper mounted on said sole, wherein the effective part of each spike comprises a parallel element having uniform cross section in form and area through the length thereof, the bottom face of said parallel element being of a shape cut by a plane vertical to the axis of the spike.

6 Claims, 14 Drawing Figures

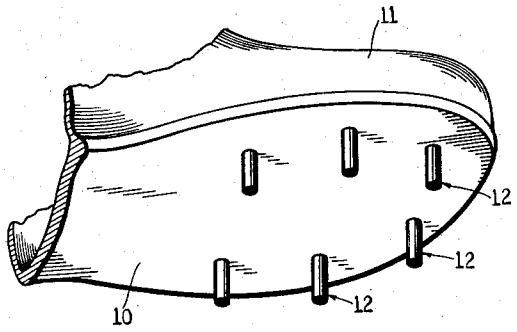


FIG. 1

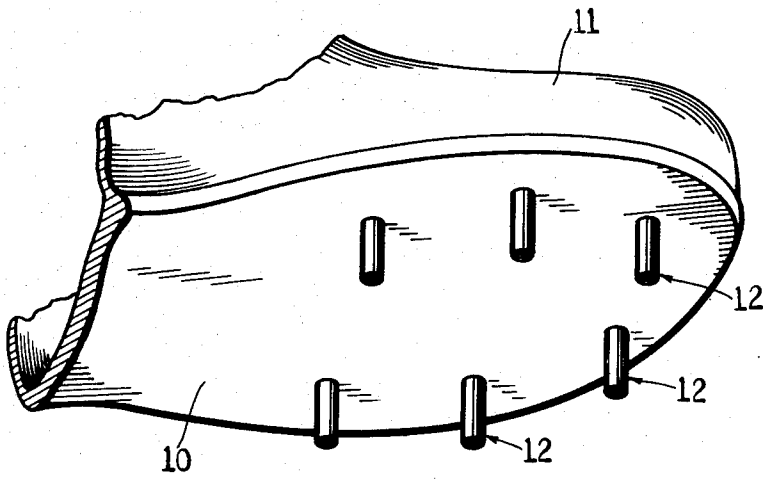


FIG. 2

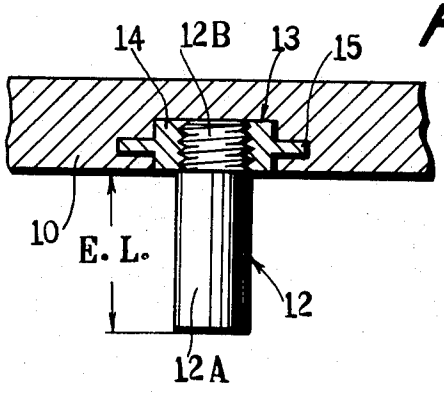
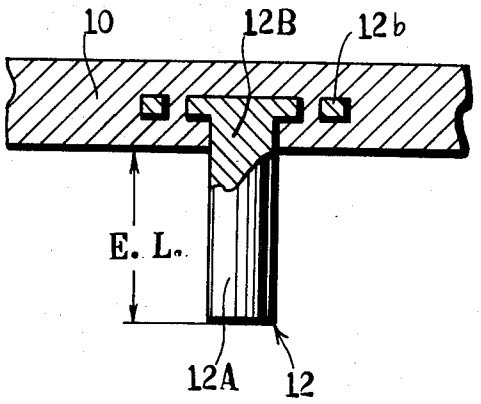


FIG. 3



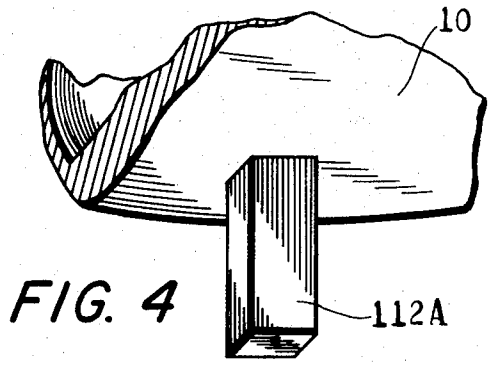


FIG. 4

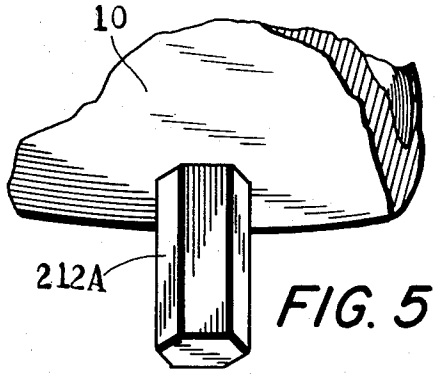


FIG. 5

FIG. 6

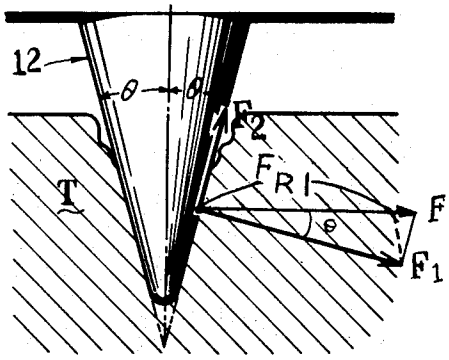


FIG. 7

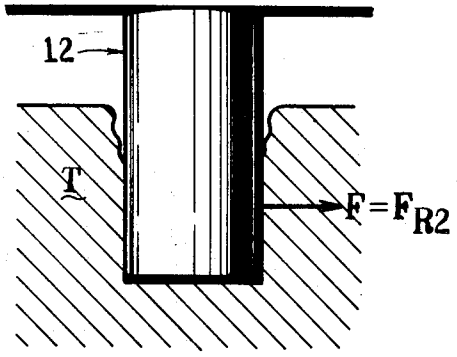


FIG. 8

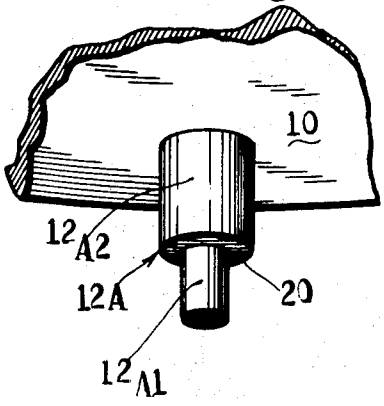


FIG. 9

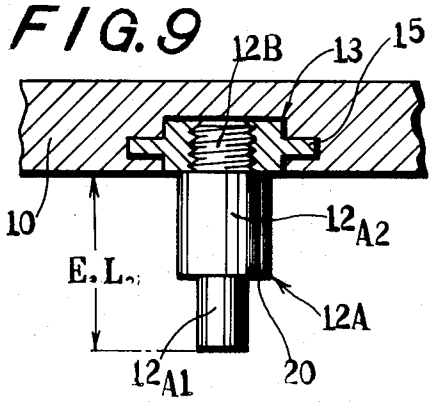


FIG. 10

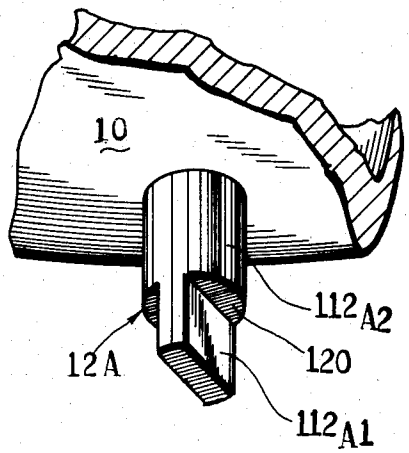


FIG. 11

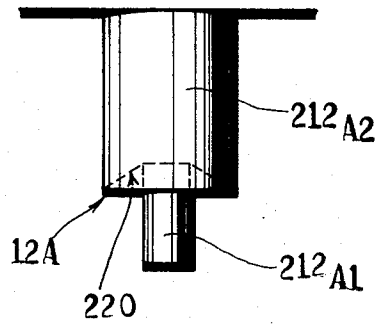


FIG. 12

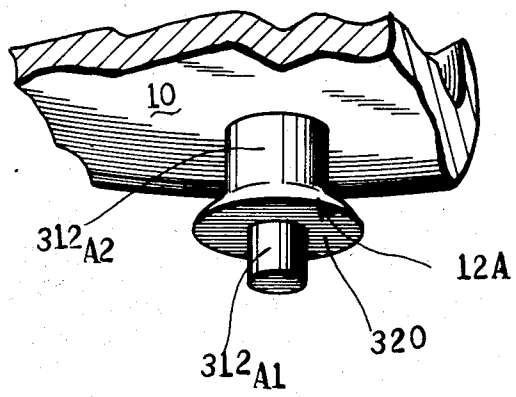


FIG. 13

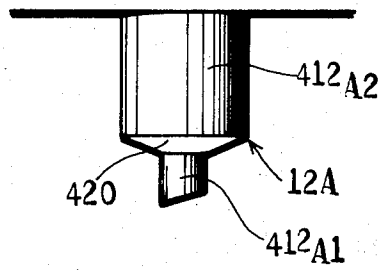
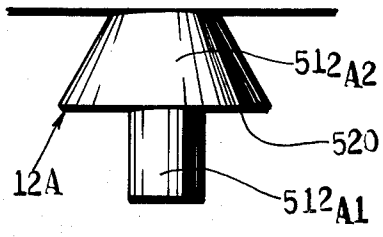


FIG. 14



SPIKED SHOE

The present invention relates to a spiked shoe for athletes.

A spiked shoes for athletes of the conventional type is usually provided with a number of spikes on the sole thereof and the effective part of each spike is usually of a circular conical shape, and therefore said spike is stuck into a running track from the surface to the inner-part thereof so as to make necessary resistance force to slide slipping. If a running track comprises multiple-layered soil in the conventional use, such as of an en-tout-cas layer, a cinder layer, a gravel layer and sand layer, spikes are deeply stuck into the track, so that kicking action of an athlete's foot is counteracted, and more energy is required for pulling out said stuck spikes, or the track surface is damaged, which causes so-called ground condition to go bad.

Further, all-weather ground has come into frequent use lately. For a track in such a kind of ground, resilient rubbery sheet formed of macromolecular compound is integrally mounted on a concrete floor. In fact, however, athletes still use spiked shoes of conventional type with circular conical spikes there.

Resilient rubbery sheet formed of macromolecular compound has the property of being buoyant and resilient when rather lightly pressed, and rigid when pressed hard. For example, in a sprint race, a weight 3 times as heavy as a running sprinter's weight is put on the track, and further, in the take-off of hop, step, and jump a weight 7 to 9 times as heavy as a racer's weight is put thereon. So, it is necessary to use spiked shoes suitable for the subject track after due consideration of such a character thereof.

Especially, if spiked shoes of conventional type with circular conical spikes are used on a track of resilient rubbery sheet formed of macromolecular compound, resistance force increases in pulling out the spikes once stuck into the track. Therefore, an athlete needs more energy for lifting his legs, so that the essential function of spiked shoes is lost. Further, marks left on the resilient rubbery sheet by said spikes are not healed of itself.

Consequently spiked shoes for such a track requested by an athlete as well as a ground owner are such as can catch the ground surface well, and has strong resistance to side slipping, and does not damage the track by leaving spike marks thereon.

The main object of the present invention is to eliminate above-mentioned disadvantages of the conventional spiked shoes.

Another object of the invention is to provide spiked shoes especially suitable for a track of a resilient rubbery sheet formed of macromolecular compound, for example, used for a all-weather ground.

In a spiked shoe of an embodiment of the present invention, a number of spikes are mounted on the lower sole thereof, and the effective part of each spike comprises a parallel element, the lower end or the grounding end of which is of a shape cut by a plane vertical to said parallel element.

In the present specification and claims the word "parallel element" is intended to mean an element with substantially uniform cross section in form and area through the length thereof, such as a circular cylinder element, a polygonal pillar element or the like.

Comparing a spiked shoe of the present invention with a conventional spiked shoe having tapered spikes, resistance force to side slipping, which is necessary for running and will exist on the grounding end of each spike in running, is obtained in the former shoe by shorter penetration of spikes into a track.

Further, when spiked shoes of the present invention are used on a resilient rubbery track formed of macromolecular compound, pressure (namely, reaction force exerting upwardly from the grounding face of each spike against the depressing pressure of the athlete's foot) is put uniformly on the whole bottom face or grounding face of each spike, so that each spike depresses and touches the track with temporally denting the surface thereof, and no spike marks are left thereon.

Further spiked shoes of the present invention are so comfortable for an athlete to wear that he can show his ability to the full in a race.

In a spiked shoe of another embodiment of the present invention, the effective part of each spike comprises a parallel element defining the lower portion thereof and an enlarged element integrally extending upwardly from said parallel element, on the lower end of said enlarged element is provided a resistance face for checking unnecessarily deep penetration of the spike into a track.

Therefore if a track is hard, spikes of a spiked shoe of said embodiment of the present invention never penetrate unnecessarily deep thereinto, and so, effective kicking action is not reduced and an extra energy is not required for pulling out the stuck spikes.

These and other objects, features and advantages of the present invention will become more apparent upon a reading of the detailed description of embodiments thereof with reference to the appended drawings.

FIG. **1** is a perspective view showing the front part of a spiked shoe according to the present invention, wherein the lower surface of the sole is seen being provided a plural number of spikes in place;

FIGS. **2** and **3** are vertical sectional views each showing spikes in connection with shoe sole, wherein each spike is provided with a parallel element of circular-cylinder shape;

FIG. **4** is a perspective view showing a spike having a parallel element of a square-pillar shape;

FIG. **5** is a perspective view showing a spike having a parallel element of a hexagonal-pillar shape;

FIG. **6** is a diagram showing the relation between the horizontal component of an athlete's kicking force and a propelling force for driving him forward in a circular conical spike of the conventional type;

FIG. **7** is a diagram showing the relation between the horizontal component of an athlete's kicking force and a propelling force for driving him forward in a pillar-shaped spike of the present invention;

FIG. **8** is a perspective view showing a spike of the present invention provided with a parallel element of circular-cylinder shape and an enlarged element of similarly circular-cylinder shape having a resistance face;

FIG. **9** is a vertical sectional view showing the spike of FIG. **8**;

FIG. **10** and FIG. **12** are perspective views showing modifications of the spike of FIG. **8**; and

FIG. **11**, FIG. **13** and FIG. **14** are elevational views showing other modifications of the spike of FIG. **8**.

In FIG. **1** is shown a spiked shoe for athletes including a sole **10** formed of hard natural or synthetic rubber or synthetic resin, an upper **11** mounted on said sole **10,** and a plural number of circular-cylindrical spikes **12** fixed to the lower surface of the sole **10.**

As seen in FIG. **2,** each spike **12** is vertically fixed through a supporting member **13** to the sole **10.** The supporting member **13** comprises a tubular part **14** with threaded inside and an annular anchoring flange **15,** and is entirely embedded in the sole **10.** Each spike **12,** at least in the effective part thereof (the length of said effective part is shown by the designation E.L.), forms a circular-cylindrical parallel element **12A.** The upper end portion of said parallel element **12A** is threaded and screwed into said supporting member **13.** And the bottom face of said parallel element is of a shape cut by a plane vertical to the axis thereof, and therefore is substantially parallel with the ground when the shoe is used.

The above-mentioned supporting member **13** for connecting the spike **12** to the sole **10** may be replaced by any other kind of suitable means. For example, a spike as shown in FIG. **3** is, on the upper end thereof, provided with an anchoring flange **12***b* formed integral with the spike, and the upper portion of the spike including said flange **12***b* is embedded in the sole **10.**

Further, a parallel element **12A** of a spike is not limited to the above-mentioned circular-cylindrical one but may be shaped in a pillar with an elliptical, rectangular, polygonal or other cross section. For example, in FIGS. **4** and **5,** are shown parallel elements **112A, 212A** with a rectangular or a hexagonal section respectively.

Further, the bottom face of a parallel element when used is not necessarily parallel with the ground but may be inclined relative thereto with a suitable angle.

FIGS. **6** and **7** illustrate a spike of the conventional type or of the present invention respectively, each penetrating into a track T formed of macromolecular compound when the athlete is running.

As shown in the two drawings, in either case, the horizontal component of force F of the athlete's kicking force horizontally exerts through the spike **12** upon the track T.

In case of a spike of the conventional type as shown in FIG. **6** (for example, the conical angle thereof being assumed 2θ), the horizontal component F of the athlete's kicking force is decomposed into two forces F_1, F_2 each in different direction, and the force F_1 exerts upon the vertical face of the recess formed on the track T ($F_1 = F \cos \theta$), while the force F_2 is the force upwardly pressing the spike ($F_2 = F \sin \theta$). And the horizontal component F_{R1} of the force F_1 is equal to a propelling force for driving the athlete forward ($F_{R1} = F_1 \cos \theta = F \cos^2\theta$).

On the contrary, in case of a spike including a parallel member according to the present invention, as shown in FIG. **7,** the horizontal component F of the athlete's kicking force exerts upon a face of the recess on the track T perpendicular to the direction of the force F. Consequently, the horizontal component F of the athlete's kicking force in itself is equal to a propelling force F_{R2} for driving the athlete forward.

As above-mentioned, comparing the two examples with each other

$$F_{R1} = F \cos^2 \theta \quad (1)$$

$$F_{R2} = F \quad (2)$$

From the formula (1) and (2)

$$F_{R2} > F_{R1} \quad (3)$$

From the formula (3) above, it can be said that resistance force to side slipping of a spike provided with a parallel element according to the present invention is larger than that of a conventional spike of a circular-conical shape.

Further, as apparently seen in FIGS. **6** and **7,** a spike of the present invention only temporally dents the track surface while the conventional spike is stuck into the track and leaves marks thereon foreover.

FIGS. **8** – **12** illustrate the other embodiments of the present invention, wherein a spike is connected to the sole in the same manner as in the above-mentioned embodiment.

Referring especially to FIGS. **8** and **9,** the effective part of a spike comprises a parallel element 12_{A1} and an enlarged element 12_{A2} extending upwardly from said parallel element. Said parallel element and said enlarged element are both of a circular-cylinder shape, but the diameter of cross section of the latter is larger than that of the former. Further the enlarged element has an annular resistance face **20** for checking unnecessarily deep penetration of the spike into a track. And the bottom face of the parallel element **12A** is of a shape cut by a plane vertical to the axis thereof.

The upper end portion of the spike **12** is threaded and screwed into a threaded portion inside a supporting member **13** provided with an anchoring flange **15,** said means **13** being embedded in the sole **10.**

The spike **12** can be connected to the sole **10** by various kinds of suitable means, as mentioned in the description relative to the first embodiment of the present invention.

Spikes illustrated in FIGS. **10** – **13** are various modifications of the spike shown in FIG. **8.**

The effective part **12A** of a spike illustrated in FIG. **10** comprises a parallel element 112_{A1} having a rectangular cross section, the bottom face of said parallel element being parallel with the lower surface of the sole **10,** and an enlarged element 112_{A2} shaped in a circular cylinder and formed integral with said parallel element 112_{A1}, at the lower end of said enlarged element 112_{A2} being provided a registance face **120** for checking unnecessarily deep penetration of the spike into a track.

The effective part **12A** of a spike illustrated in FIG. **11** comprises, similarly to the spikes shown in FIGS. **8** and **9,** a parallel element 212_{A1} and an enlarged element 212_{A2} extending upwardly from said parallel element 212_{A1} and having a resistance face **220** at the lower end thereof. However, said resistance face **220** is not perpendicular to the vertical axis of the spike, but is concaved.

Further, the effective part **12A** of a spike shown in FIG. **12** comprises a circular-cylindrical parallel element 312_{A1} and an enlarged element 312_{A2} provided with a resistance face **320** at the lower end thereof, wherein said enlarged element 312_{A2} includes a parallel part with uniform cross section both in form and area through the length thereof, and an expanded part of a frusto-conical shape with diameter gradually increasing

downwardly, said expanded part extending downwardly from said parallel part.

In any one of above-mentioned spikes, the bottom face or the grounding face of the parallel elements 112_{A1}, 212_{A1}, 312_{A1} is not necessarily perpendicular to the axis thereof.

The bottom face of the parallel element 412_{A1} of a spike illustrated in FIG. **13** is a little inclined relative to a plane vertical to the axis of the spike, and the enlarged element 412_{A2} is provided with an inclined resistance face **420** at the lower end thereof. Further, the effective part **12A** of a spike illustrated in FIG. **14** comprises a parallel element 512_{A1} of a circular-cylinder shape and an enlarged element 512_{A2} of a frustoconical shape, said two elements being coaxially connected to each other.

A spike, the effective part of which comprises parallel element and an enlarged element integral with and extending upwardly from said parallel element, prevents unnecessarily deep penetration thereof into a track, so that effective kicking action of an athlete's foot is not counteracted and at the same time unnecessary is extra energy for pulling out spikes stuck into the track.

What I claim is:

1. A spiked shoe comprising a sole and an upper mounted on the sole, the sole having a lower surface, a plurality of spikes extending from the lower surface of the sole, each spike having a longitudinal axis and an effective part which extends between the lower surface of the sole and the lower end of the spike, the effective part of each spike comprising an upper part extending axially downwardly from the lower surface of the sole and a lower part extending axially downwardly from the upper part and formed integrally therewith, each of the upper and lower parts extending parallel to the longitudinal axis of the spike and having a uniform cross section throughout the length thereof, the cross section of the upper part being larger than the cross section of the lower part, the lower end of each lower part having a planar surface crossing the axis of the spike and the lower end of each upper part having a resistance face extending outwardly beyond the lower part for checking unnecessarily deep penetration of the spike into the track.

2. The shoe of claim **1** in which the planar surface of each lower part extends perpendicularly to the longitudinal axis of the spike.

3. The shoe of claim **1** in which the resistance face of each spike extends perpendicularly to the longitudinal axis of the spike.

4. The shoe of claim **1** in which the planar surface of each lower part and the resistance face of each upper part extend perpendicularly to the longitudinal axis of the spike.

5. The shoe of claim **1** in which the upper and lower parts of each spike having circular cross sections.

6. A spiked shoe comprising a sole and an upper mounted on the sole, the sole having a lower surface, a plurality of spikes extending from the lower surface of the sole, each spike having a longitudinal axis and an effective part which extends between the lower surface of the sole and the lower end of the spike, the effective part of each spike comprising an upper part extending axially downwardly from the lower surface of the sole and a lower part extending axially downwardly from the upper part and formed integrally therewith, the lower part extending parallel to the longitudinal axis of the spike and having a uniform cross section throughout the length thereof, the lower end of each lower part having a planar surface crossing the axis of the spike, the upper part including a first portion extending axially downwardly from the lower surface of the sole and extending parallel to the longitudinal axis of the spike and having a uniform cross section through the length thereof and an expanded portion between said first portion and the lower part of the spike extending outwardly beyond the first portion, the lower end of the expanded portion having a resistance face extending outwardly beyond the lower part for checking unnecessarily deep penetration of the spike into the track.

* * * * *