The document describes a sports shoe, particularly for soccer use and the like, comprising an upper (2) and a sole (3a, 3b) provided with studs (4, 5), at least one of the studs (4, 5) comprising at least one portion that can be fixed to the tread side (8a, 8b) of the sole (3a, 3b) and is elastically deformable for the movement of at least part of the stud (4, 5) about its longitudinal axis (20a, 20b) in order to follow the direction changing, traction and braking movements of the athlete wearing the sports shoe (Ia, Ib).
SPORTS SHOE, PARTICULARLY FOR SOCCER USE AND THE LIKE

Technical Field

The present invention refers to a sports shoe, particularly for soccer use and the like.

Background Art

In order to have better adherence to the terrain, athletes who practice sports on slippery terrain and, in particular, soccer players use sports shoes that have riveting or studding on the tread side of the sole, which consists of a plurality of rigid studs that are integrally fixed to the sole.

Such known sports shoes are not devoid of drawbacks, among which the fact that such studding or riveting is implemented without taking account of the problems that can be caused to the joints in athletes' lower limbs owing to the excessive grip on the terrain that these sports shoes provide.

In fact, such known sports shoes are not capable of absorbing and/or discharging the thrust forces between the terrain and the shoe, which are the primary cause of injury to the entire system of joints of the lower limbs.

Indeed, the knee joint is frequently stressed in the kinematics of movement and it is subjected to loads and stresses of differing extent.

These external forces induce continual tensile responses from the ligamentary component, to maintain the normal integrity of the joint, while at the same time resisting the load applied.

For example, a professional or amateur soccer player, when playing a match or when training, moves principally by way of running with continual changes of direction. While running this technical move is repeated with high frequency and it includes concentric and eccentric work phases performed at high speed, and the acceleration and braking phases can also be performed at high speed.

Since the cruciate ligaments are the ligamentary structures of the knee that are most sensitive to torsion movements and, in particular, given the
Position of the anterior cruciate ligament, and its central function, together with the collateral ligaments, in the stability of the knee, these ligaments are frequently subjected to stress, micro-trauma, injury and complete breakage induced by the torsion/flexion movements that stimulate them.

More specifically, traumas in valgus deformity with external rotation can cause injury to the internal collateral ligament, to the oblique posterior ligament and to the anterior cruciate ligament.

Moreover, traumas in varus deformity with internal rotation can cause injury to the anterior cruciate ligament and to the anterolateral and posterolateral capsular ligaments.

More precisely, the anterior cruciate ligament, by means of its refined banded structure which comprises fibres of different lengths and oriented in different directions, provides stability on the sagittal plane and frontal plane of the knee joint, assisting in the rolling and sliding movement of the bone ends in flexion and in extension and actively controlling the rotation movement in flexion and in extension of the leg in order to maintain the stability of the knee in the rotation phase.

Moreover, the anterior cruciate ligament prevents excessive anterior translations of the tibia and dragging of the femur on the tibia when the latter is fixed and, vice-versa, it is stressed by the load when the femur is fixed and the tibia is moving.

Trauma to the anterior cruciate ligament is in most cases caused by a movement in which the tibia stays fixed but the femur is moving, performing the movement commonly called "foot on the ground".

Such trauma is due to the fact that there is an exponential and continuous load borne by the cruciate ligament owing to the contraction of the quadriceps muscle both in flexion and in extension.

**Disclosure of the Invention**

The aim of the present invention is to solve the above problems by providing a sports shoe, particularly for soccer use and the like, that makes
it possible to prevent and avoid injuries to the entire system of joints of the lower limbs, without depriving the athlete wearing the shoe of the essential sensations of adherence between the shoe and the terrain which the athlete demands during his/her sporting performances.

Within this aim, an object of the present invention is to provide a sports shoe that improves stability in the kinematics of movement of the athlete's lower limb.

This aim, as well as these and other objects which will become better apparent hereinafter, are achieved by a sports shoe, particularly for soccer use and the like, comprising an upper and a sole provided with studs, characterized in that at least one of such studs comprises at least one portion that can be fixed to the tread side of such sole and is elastically deformable for the movement of at least part of such at least one stud about its longitudinal axis in order to follow the direction changing, traction and braking movements of the athlete wearing the sports shoe.

**Brief description of the drawings**

Further characteristics and advantages of the present invention will become better apparent from the description of three preferred, but not exclusive, embodiments of a sports shoe, particularly for soccer use and the like, according to the invention, illustrated by way of non-limiting example in the accompanying drawings, wherein:

- Figure 1 is a side elevation view of the sports shoe according to the invention, in a first embodiment;
- Figure 2 is a view from below of the sports shoe shown in Figure 1;
- Figure 3 shows, in a sectional view, a detail of a stud of the sports shoe shown in Figure 1, not subjected to external stresses;
- Figure 4 shows, in a sectional view, a detail of a stud of the sports shoe shown in Figure 1, subjected to external stresses;
- Figure 5 is a side elevation view of the sports shoe according to the invention, in a second embodiment;
Figure 6 is a view from below of the sports shoe shown in Figure 5.

Figure 7 is a detail, in a sectional view, of a stud of the sports shoe shown in Figure 5, not subjected to external stresses;

Figure 8 is a detail, in a sectional view, of a stud of the sports shoe shown in Figure 5, subjected to external stresses;

Figure 9 is a side elevation view of the sports shoe according to the invention, in a third embodiment;

Figure 10 is a view from below of the sports shoe shown in Figure 9;

Figure 11 is a detail, in a sectional view, of a stud of the sports shoe shown in Figure 9, not subjected to external stresses;

Figure 12 is a detail, in a sectional view, of a stud of the sports shoe shown in Figure 9, subjected to external stresses.

With reference to the figures, the sports shoe, particularly for soccer use and the like, referred to globally in the two embodiments shown with the reference numerals 1a and 1b, comprises an upper 2 and a sole 3a or 3b provided with studs 4 or 5.

More specifically, the upper 2, in both embodiments, can have a frontal opening that can be closed by means of laces 6 or tear-off means of closing and can be provided with side and front reinforcements 7 where the impact with the soccer ball takes place.

According to the invention, at least one of the studs 4 or 5 comprises at least one portion that can be fixed to tread side 8a or 8b, of the sole 3a or 3b, and which is elastically deformable for the movement of at least part of the stud 4 or 5 about its longitudinal axis 20a or 20b, as shown in the figures, in order to follow the direction changing, traction and braking movements of the athlete wearing the sports shoe 1a or 1b.

In the first embodiment 1a, all of the studs 4 each comprise a helical traction spring 9, which can be fixed at an end turn 12 thereof to the tread side 8a of the sole 3a.

In more detail, the helical traction spring 9 has a substantially
frustum-like shape that diverges in the direction of the end turn and which is fixed to the tread side 8a with screw means 10 which can be associated both with the end turn 12 and with the tread side 8a.

For example, the screw means 10 can comprise at least one screw inserted into the helical traction spring 9 and screwed into a corresponding threaded seat 11 formed on the tread side 8a.

Such connection is achieved by the fact that the end turn 12 has an average diameter comprised between the diameter of a threaded stem 13 of the screw 10 and the diameter of a head 14 of the screw 10 and by the fact that such end turn 12 is interposed between the head 14 and the tread side 8a.

In order to ensure a connection of the stud 5 that is long-lasting and which resists external stresses, the threaded seat 11 can be formed on a metal disk 15 inserted in the tread side 8a when it is moulded.

The seat 11 could be formed directly on the tread side 8a but, since such tread side 8a is generally made of plastic, the threadings of the seats 11 could wear away rapidly following operations to remove and attach the studs 5.

For the same reason, a washer 16 can be interposed between the tread side 8a and the end turn 12.

Differently, in the second embodiment 1b, all of the studs 5 each comprise a rigid body 17 that can be fixed to the elastically deformable portion on the opposite side with respect to the tread side 8b.

More precisely, the elastically deformable portion of the stud 5 comprises a shock-absorbing disk 18 that is made of an elastically deformable material such as, for example, rubber and which can be accommodated in a respective compartment 19 that is formed on the tread side 8b and which can be fixed respectively to side walls 21 of a compartment 19 at an outer circular surface 22 of the shock-absorbing disk 18 and to the rigid body 17 of a central part 23 of the shock-absorbing disk.
More precisely, the external circular surface 22 is formed from an outward ring 26 that has a circumferential ridge 24 that is radially outward and which can be accommodated in a corresponding circumferential race 25 defined by the space 19 on the side walls 21.

The central part 23 is formed from a hub that defines a threaded hole 27 into which a threaded stem 28 is screwed, such threaded stem 28 extending coaxially to the rigid body 17.

Advantageously, the rigid body 17 is substantially frustum-shaped and the threaded stem 28 is extended to the longer end face of the rigid body 17.

In order to permit the removal and attachment of the studs 5, the rigid body 17 comprises a section that has a hexagonal base 29, which is formed at the longer end face of the rigid body 17 and which can engage fastening means for the screwing of the threaded stem 28 in the threaded hole 27, because the threaded stem 28 is jointly connected for rotation to the rigid body 17.

Since the shock-absorbing disk 18 could easily become damaged when in contact with the playing terrain, a protective cover 30 can be provided which is fitted on the threaded stem 28 and interposed between the shock-absorbing disk 18 and the rigid body 17.

The third embodiment of the sports shoe, particularly for soccer use and the like, referred to globally with the reference numeral Ic, also comprises an upper 2 and a sole 3c provided with studs 31.

According to the invention, at least one of the studs 31 can be fixed to the tread side 8c of the sole 3c at an elastically deformable portion 32 of the sole 3c for the movement of at least part of the stud 31 about its longitudinal axis 20c in order to follow the direction changing, traction and braking movements of the athlete wearing the sports shoe Ic.

More precisely, all of the studs 31 each comprise a rigid body 33 that
can be fixed to the elastically deformable portion 32, which is made of an elastically deformable material such as, for example, rubber.

More specifically, a rigid disk 34 is accommodated in the elastically deformable portion 32 and has a threaded hole 35 into which a threaded stem 36 is screwed, such threaded stem 36 extending coaxially to the rigid body 33.

Advantageously, the rigid body 33 is substantially frustum-shaped and the threaded stem 36 is extended to the longer end face of the rigid body 33.

In order to permit the removal and attachment of the studs 31, the rigid body 33 comprises a section that has a hexagonal base 37, which is formed at the longer end face of the rigid body 33 and which can engage fastening means for the screwing of the threaded stem 36 in the threaded hole 35, because the threaded stem 36 is jointly connected for rotation to the rigid body 33.

As will be better described hereinafter, in order to control and adjust the rigidity of the single stud 31, a washer 38 is interposed between the rigid body 33 and the corresponding elastically deformable portion 32.

Operation of the sports shoe Ia and Ib is as follows.

In the first embodiment Ia, when the stud is subjected to an external lateral stress, this causes the helical traction spring 9 to incline and deform according to the direction of the stress.

More precisely, a torsion of the helical traction spring 9 takes place which causes the spring to shift at least partially by making each turn slide over the next, perpendicularly to the longitudinal axis 20a.

Such sliding is much more evident the farther the turn under consideration is from the end turn 12 which stays fixed with respect to the tread side 8a.

In this way, the helical traction spring 9 deforms, extending itself and diverging its axis from the starting longitudinal axis 20a.
Differently, in the second embodiment Ib, when the stud 5 is subjected to an external lateral stress it tends to rotate by deforming the shock-absorbing disk 18 which twists by contracting and extending from the direction of the external stress.

In both the embodiments shown, the stud 4 or 5, owing to its elastically deformable portion, makes it possible for the sports shoe Ia and Ib to accompany the athlete's movement to change direction thus making his/her athletic move more natural and harmonic.

More precisely, the athlete's equilibrium and thrust during the change of direction are located at the first metatarsus of the foot. The position of the stud 4 or 5 in precisely this zone favours greater safety for the athlete in multidirectional movements, but in particular it allows the athlete to best respond to the negative forces of friction that arise when changing direction while maintaining good coordination together with modulation of the force impressed by the athlete on the terrain, or vice-versa.

Exiting from a rapid change of direction in full control and with maximum coordination means optimising the forces involved in favour of performance and prevention.

In the third embodiment, accompanying the athlete's change of direction and thus making his/her athletic move more natural and harmonic is left to the elastically deformable portion 32 which, when it is subjected to an external lateral stress, tends to rotate by deforming from the direction of the external stress.

In practice it has been found that the sports shoe, particularly for soccer use and the like, according to the invention, fully achieves the intended aim and objects because it makes it possible to reduce the risk of injury by ensuring a correct trim of the foot.

In more detail, in the rotation phase of any change of direction, the elastic deformability of the stud, or of at least part of it, reduces the angle of rotation in the rotator movements between femur and tibia and reduces the
angle of rotation of the ankle, so limiting the load applied on the anterior cruciate ligament and the torsion stress applied to the knee joint.

The rotation of the shoe with respect to the terrain makes it possible to keep the axes of the body in better trim, and it also confers better direction control and safety of movement.

Moreover, during rotation of the knee joint, with the aid of the stud according to the invention, the locking of the tibia is reduced thus making it freer to follow the rotation movement induced by the femur and hence avoiding falling into the condition that most often leads to indirect trauma to the knee joint, which consists in having the foot firmly connected to the ground, the tibia fixed and the femur moving.

Moreover, considering that in changing direction, the load point is at the level of the first metatarsus of the anterointernal part of the foot, the stud according to the invention positioned in this area of thrust, by means of its elastic deformability, permits movement that is directed towards the effective direction of running.

With regard to the prevention of injury, possibly considerable injury, the stud according to the invention is an effective element in preventing injury because it reduces the athlete's response time in producing a correct and voluntary muscular response, thus shortening the available time for the anterior cruciate ligament to be injured.

A further advantage of the sports shoe according to the present invention consists in that it ensures a correct stability of the support point of the foot by favouring, in addition, the athlete's equilibrium in the phase of changing direction and in the phase of gripping the terrain, both when braking and also when under traction.

A further advantage of the sports shoe according to the present invention consists in that it reduces the friction between the athlete's foot and the terrain, thus making a major contribution to saving energy when resuming motion after sharply braking because it takes advantage of the
elastic return of the elastically deformable portion of the stud.

More precisely, a shoe with the elastically deformable studs improves the athlete's global performance because the biomechanical support of the foot is turned more towards the point of thrust, i.e. in the direction of change of direction, and not in the direction of the previous running.

The time needed to complete the body rotation movement and to exit from a change of direction is also considerably lowered compared to a shoe with traditional studs, thus improving the athlete's performance.

The sports shoe, particularly for soccer use and the like, thus conceived, is susceptible of numerous modifications and variations, all of which are within the scope of the appended claims.

In addition, all the details may be replaced by other technically equivalent elements.

In practice the materials employed, provided they are compatible with the specific use, and the dimensions and the contingent shapes, may be any type according to requirements and to the state of the art.

The disclosures in Italian Patent Application No. MI2009A000886 from which this application claims priority are incorporated herein by reference.

Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly, such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.
Claims

1. A sports shoe, particularly for soccer use and the like, comprising an upper (2) and a sole (3a, 3b) provided with studs (4, 5), characterized in that at least one of said studs (4, 5) comprises at least one portion that can be fixed to the tread side (8a, 8b) of said sole (3a, 3b) and is elastically deformable for the movement of at least part of said at least one stud (4, 5) about its longitudinal axis (20a, 20b) in order to follow the direction changing, traction and braking movements of the athlete wearing the sports shoe (1a, 1b).

2. The sports shoe according to claim 1, characterized in that said at least one stud (4) comprises a helical traction spring (9), which can be fixed at an end turn (12) thereof to said tread side (8a).

3. The sports shoe according to claim 2, characterized in that said helical traction spring (9) has a substantially frustum-like shape that diverges in the direction of said end turn (12).

4. The sports shoe according to one or more of the preceding claims, characterized in that it comprises screw means (10) which can be associated both with said end turn (12) and with said tread side (8a).

5. The sports shoe according to one or more of the preceding claims, characterized in that said screw means (10) comprise at least one screw that is inserted in said helical traction spring (9) and is screwed into a respective threaded seat (11) formed on said tread side (8a), said end turn (12) having an average diameter comprised between the diameter of the threaded stem (13) of said screw (10) and the diameter of the head (14) of said screw (10) and being interposed between said head (14) and said tread side (8a).

6. The sports shoe according to claim 1, characterized in that said at least one stud (5) comprises a rigid body (17) that can be fixed to said at least one elastically deformable portion on the opposite side with respect to said tread side (8b).

7. The sports shoe according to claim 6, characterized in that said at
least one elastically deformable portion comprises a shock-absorbing disk (18), which is made of an elastically deformable material and can be accommodated in a respective compartment (19) that is formed on said tread side (8b) and can be fixed respectively to the side walls (21) of said compartment (19) at the outer circular surface (22) of said shock-absorbing disk (18) and to said rigid body (17) of the central part (23) of said shock-absorbing disk (18).

8. The sports shoe according to one or more of claims 6 and 7, characterized in that said rigid body (17) is substantially frustum-shaped and has a threaded stem (28) that is extended coaxially to said rigid body (17) from the larger end face of said rigid body (17), said threaded stem (28) being screwed into a threaded hole (27) that is formed by said central part (23).

9. The sports shoe according to one or more of claims 6 to 8, characterized in that said rigid body (17) comprises a section that has a hexagonal base (29), which is formed at said longer end face of said rigid body (17) and can engage fastening means for the screwing of said threaded stem (28) in said threaded hole (27), said threaded stem (28) being jointly connected for rotation to said rigid body (17).

10. A sports shoe particularly for soccer use and the like, comprising an upper (2) and a sole (3c) provided with studs (31), characterized in that at least one of said studs (31) can be fixed to the tread side (8c) of said sole (3c) at an elastically deformable portion (32) of said sole (3c) for the movement of said at least one stud (31) about its own longitudinal axis (20c) in order to follow the direction changing, traction and braking movements of the athlete wearing the sports shoe (Ic).
1. A sports shoe, particularly for soccer use and the like, comprising an upper (2) and a sole (3a, 3b) provided with studs (4, 5), at least one of said studs (4, 5) comprising at least one portion that can be fixed to the tread side (8a, 8b) of said sole (3a, 3b) and is elastically deformable for the movement of at least part of said at least one stud (4, 5) about its longitudinal axis (20a, 20b) in order to follow the direction changing, traction and braking movements of the athlete wearing the sports shoe (Ia, Ib), characterized in that said elastically deformable portion fixed to the tread side is elastically deformable according to an extension movement when subjected to an external lateral stress.

2. The sports shoe according to claim 1, characterized in that said at least one stud (4) comprises a helical traction spring (9), which can be fixed at an end turn (12) thereof to said tread side (8a).

3. The sports shoe according to claim 2, characterized in that said helical traction spring (9) has a substantially frustum-like shape that diverges in the direction of said end turn (12).

4. The sports shoe according to one or more of the preceding claims, characterized in that it comprises screw means (10) which can be associated both with said end turn (12) and with said tread side (8a).

5. The sports shoe according to one or more of the preceding claims, characterized in that said screw means (10) comprise at least one screw that is inserted in said helical traction spring (9) and is screwed into a respective threaded seat (11) formed on said tread side (8a), said end turn (12) having an average diameter comprised between the diameter of the threaded stem (13) of said screw (10) and the diameter of the head (14) of said screw (10) and being interposed between said head (14) and said tread side (8a).

6. The sports shoe according to claim 1, characterized in that said at least one stud (5) comprises a rigid body (17) that can be fixed to said at least one elastically deformable portion on the opposite side with respect to said tread side (8b).

7. The sports shoe according to claim 6, characterized in that said at least one elastically deformable portion comprises a shock-absorbing disk (18), which is made of an elastically deformable material and can be accommodated in a respective
compartment (19) that is formed on said tread side (8b) and can be fixed respectively to the side walls (21) of said compartment (19) at the outer circular surface (22) of said shock-absorbing disk (18) and to said rigid body (17) of the central part (23) of said shock-absorbing disk (18).

8. The sports shoe according to one or more of claims 6 and 7, characterized in that said rigid body (17) is substantially frustum-shaped and has a threaded stem (28) that is extended coaxially to said rigid body (17) from the larger end face of said rigid body (17), said threaded stem (28) being screwed into a threaded hole (27) that is formed by said central part (23).

9. The sports shoe according to one or more of claims 6 to 8, characterized in that said rigid body (17) comprises a section that has a hexagonal base (29), which is formed at said longer end face of said rigid body (17) and can engage fastening means for the screwing of said threaded stem (28) in said threaded hole (27), said threaded stem (28) being jointly connected for rotation to said rigid body (17).

10. A sports shoe particularly for soccer use and the like, comprising an upper (2) and a sole (3c) provided with studs (31), characterized in that at least one of said studs (31) can be fixed to the tread side (8c) of said sole (3c) at an elastically deformable portion (32) of said sole (3c) for the movement of said at least one stud (31) about its own longitudinal axis (20c) in order to follow the direction changing, traction and braking movements of the athlete wearing the sports shoe (Ic).
**INTERNATIONAL SEARCH REPORT**

**A. CLASSIFICATION OF SUBJECT MATTER**

INV. A43C15/16

ADD.

According to International Patent Classification (IPC) or to both national classification and IPC.

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

A43C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

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* Further documents are listed in the continuation of Box C

See patent family annex

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"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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**Date of the actual completion of the international search**

17 August 2010

**Date of mailing of the international search report**

24/08/2010

**Name and mailing address of the ISA**

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**Authorized officer**

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