

(19)



(11)

EP 3 108 761 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
28.12.2016 Bulletin 2016/52

(51) Int Cl.:
A43C 15/16 ^(2006.01) **A43B 5/02** ^(2006.01)

(21) Application number: **16175027.8**

(22) Date of filing: **17.06.2016**

(84) Designated Contracting States:
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO
PL PT RO RS SE SI SK SM TR**
Designated Extension States:
BA ME
Designated Validation States:
MA MD

(71) Applicant: **adidas AG**
91074 Herzogenaurach (DE)

(72) Inventor: **WIEDERER, Wilfried Ernst**
91074 Herzogenaurach (DE)

(74) Representative: **Wegner, Hans**
Bardehle Pagenberg Partnerschaft mbB
Patentanwälte, Rechtsanwälte
Prinzregentenplatz 7
81675 München (DE)

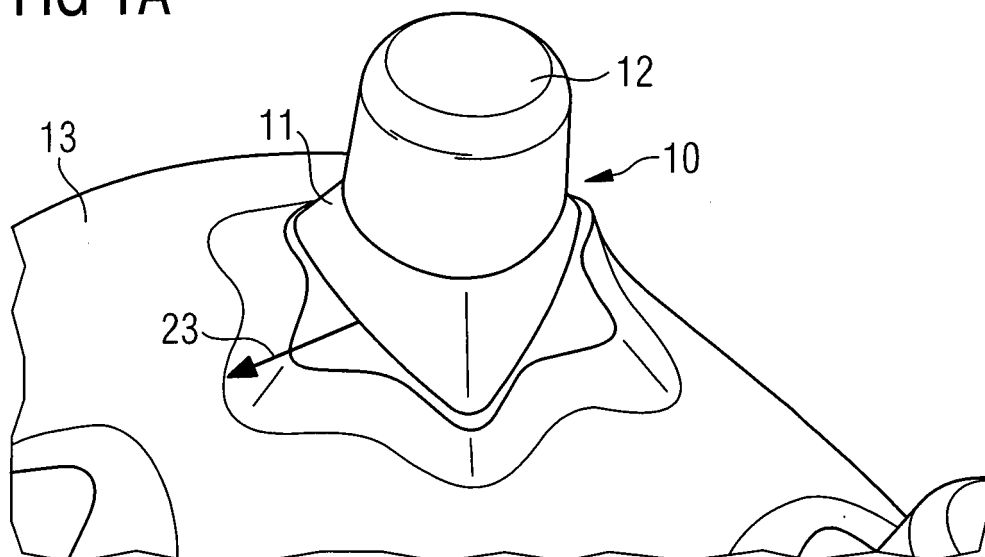
(30) Priority: **26.06.2015 DE 102015211927**

(54) **STUDS FOR SPORTS SHOES**

(57) The present invention relates to a stud (10) for a shoe comprising: a first part (11) for engaging a ground, wherein the first part (11) has a shape which provides for a higher traction along at least a first direction (23) compared to a second direction (25) different from the

first direction (23); and is adapted, such that it can be secured relative to a shoe sole (13) in at least two different positions, wherein in a first position the first direction (23) is oriented differently relative to the shoe sole than in a second position.

FIG 1A



EP 3 108 761 A1

Description

1. Technical field

[0001] The present invention relates to studs for shoes, shoe soles, shoes, and a method of manufacturing studs.

2. Prior art

[0002] Sports shoes are often equipped with studs to increase the traction of a shoe with the ground. The studs protrude from the shoe sole of the shoe and engage with a soft ground like turf, artificial turf, clay court, etc. The studs bore into the soft ground under the weight of a wearer of the sport shoe. Additionally, movements of the wearer like acceleration, deceleration or a change in direction drive the studs into the ground. Once the studs engage with the ground, the traction of the shoe is increased, because horizontal movements of the shoe are impeded by the studs being surrounded by the ground. Examples of sports shoes where studs play an important role are soccer shoes, football shoes and rugby shoes.

[0003] US 6,357,146 B1 relates to sports footwear having a sole studded with a plurality of directional studs, said directional studs being shaped to present a higher resistance to movement through a flowable ground surface in one radial direction of the stud than in the opposite radial direction of the stud, by means of stud conformation including an abrupt drive face, providing a drive side of the stud directed in one direction along a drive line corresponding to the stud's direction of maximum resistance to movement through a flowable medium, and flank regions diverging from the drive line towards respective shoulder regions bordering the drive side, thereby providing a compliant side of the stud directed in the opposite direction along the drive line.

[0004] WO 2014/022259 A1 relates to an article of footwear including an upper and a sole structure fixedly attached to a bottom portion of the upper. The sole structure includes a sole component including a baseplate having a bottom surface and at least a first ground engaging member extending substantially downward from the bottom surface of the baseplate, the first ground engaging member having a substantially circular cross-sectional shape. The sole structure may also include a tapered support structure having a substantially pyramidal shape and extending substantially downward from the bottom surface of the baseplate, abutting the first ground engaging member at a side portion, and partially surrounding the first ground engaging member such that a portion of the first ground engaging member is exposed between edges of the tapered support structure.

[0005] US 2009/021118 A1 relates to a cleat for use with an athletic shoe including a hub, a stud of substantially non-flexible material and extending downwardly and away from a lower surface of the hub, a cleat connector extending upwardly and from an upper surface of the hub and configured to engage a shoe-mounted mat-

ing connector disposed on a sole of the shoe, the upper surface opposing the lower surface of the hub, and at least one dynamic traction element extending downwardly from the lower surface of the hub and adapted to flex upwardly when the cleat is connected to a shoe and the at least one dynamic traction element is forced downwardly to contact a ground surface due to a weight load applied to a shoe. The distal end of the stud extends further from the lower surface of the hub than the distal end of each unflexed dynamic traction element such that, when the shoe to which the cleat is connected is forced downward toward the ground surface, the stud contacts and/or begins to penetrate the ground surface to provide initial traction before each dynamic traction element makes contact with the ground surface.

[0006] With conventional sports shoes equipped with studs the traction properties of the shoes are fixed and cannot be changed. This is also true for the sports footwear described in the documents cited above. For example, a shoe may have studs which are shaped to provide a good forward traction. Another shoe may provide more grip at sudden brakes. This may be acceptable, if the player wearing the shoe maintains his position in the field during consecutive matches or trainings. However, if he changes position, he may be forced to also change his shoes, because the shoes for his first position may not provide the right traction for his new position.

[0007] For example, in rugby union scrums are performed to restart a play after a minor infringement. A scrum involves up to eight players from each team binding together in three rows and interlocking with the free opposing team players. At this point the ball is fed into the gap between the opposing players and they both compete for the ball to win possession. A player who is standing at the right side of a row needs shoes with a different orientation of maximum traction than a player on the left side of a row.

[0008] Another example is soccer, where for example a right midfielder needs shoes with different traction properties than a left striker or a goal keeper.

[0009] Further prior art is disclosed in DE 10 2008 025 289 A1, WO 2005/072551 A1 and EP o 815 759 A2.

[0010] While professional players may have different pairs of shoes for different positions they are possibly playing, this is often not the case with hobby or recreational players who are usually not willing to buy and carry with them several different pairs of sports shoes. Thus, these players may have one "all-round" pair of shoes with average traction. Alternatively, these players may have a pair of shoes for a particular position and risk to play with sub-optimal shoes if they need to change position.

3. Summary of the invention

[0011] Therefore, it is the object of the present invention to overcome the technical problems mentioned above and to provide a stud which allows to adapt the traction properties of a sports shoe in a simple way. In

particular, the invention allows to change the direction of maximum traction of the sports shoe to adapt the shoe to different positions on a sports field that a player wearing such a shoe is playing. It is a further object to provide a corresponding sports shoe and to specify a method for manufacturing a corresponding stud.

[0012] According to a first aspect of the present invention, this problem is solved by a stud for a shoe comprising a first part for engaging a ground, wherein the first part has a shape which provides for a higher traction along at least a first direction compared to a second direction different from the first direction. Furthermore, the first part is adapted, such that it can be secured relative to a shoe sole in at least two different positions, wherein in a first position the first direction is oriented differently relative to the shoe sole than in a second position. Moreover, the first part comprises essentially a triangular shaped cross section at the surface which is adapted to contact a shoe sole, wherein the cross section of the first part transitions from an essentially triangular shape at its surface which is adapted to contact a shoe sole to a round shape at its opposite surface.

[0013] The stud according to the invention comprises a first part with such a shape that it may provide a higher traction in a first direction compared to a second direction. An example may be a stud having a triangular cross section. In this case, the traction in a direction from the center of the first part to one of the three sides is greater than the traction in a direction from the center to one of the three vertices. Further examples of shapes with different degrees of traction along different directions will be given below.

[0014] The stud according to the invention may be made of only the first part or may be made of this first part and at least a second part as will be described below.

[0015] The first part of the stud according to the invention is adapted, such that it can be secured relative to a shoe sole in at least two different positions. These positions differ in that in a first position the first direction is oriented differently relative to the shoe sole than in a second position. In this way, the direction of maximum traction of the stud may be oriented relative to the shoe sole in at least two different directions. In this way, the wearer of the shoe may adapt the traction properties according to his needs.

[0016] For example, a rugby or soccer player who is playing on a right field position may secure one or more studs according to the invention in such a position to the shoe sole, that the shoe provides maximum traction in a backward to right direction. Thus, if the player is involved in a scrum or starts to sprint towards the goal, he is provided with maximum traction on his particular position. If the player changes sides and plays in a left field position, he may secure the stud(s) in a second position, in which the stud provides maximum traction for this new field position.

[0017] Thus, by using the inventive studs, the player may adapt his pair of sports shoes to different field posi-

tions. He does not need to buy sports shoes for different positions. One pair of sports shoes equipped with studs according to the invention is sufficient. Furthermore, the player is able to customize the left and right shoe of a pair to have different traction properties. For example, a rugby player playing on a side position may adapt his outer shoe to provide more lateral traction and to adapt his inner shoe to provide more forward traction. Thus, the player is optimally prepared for a scrum.

[0018] The first part comprises essentially a triangular shaped cross section at the surface which is adapted to contact a shoe sole. Furthermore, the cross section of the first part transitions from an essentially triangular shape at its surface which is adapted to contact a shoe sole to a round shape at its opposite surface. Thus, the triangular shape on the upper side may provide for a different traction along different directions, whereas the round shape on the lower side fits for example the cross section of a round rotational symmetric second part of the stud provided with a thread for securing both parts to a shoe sole as previously described. "Essentially triangular" in this context is understood as any shape which resembles a triangle. The shape does not necessarily have straight edges. Curved edges are included as well. Also, the vertices need not necessarily be point-like. Rounded vertices are included as well.

[0019] In some embodiments, the stud may further comprise a second part for engaging a ground that is adapted to be secured relative to the shoe sole. This second part may be used to secure the first part to the shoe sole as well. For example, the second part may have a thread arranged in a bore of the first part and engaging a corresponding thread in the shoe sole. Thus, if the second part is secured to the shoe sole by means of the thread, the first part is secured as well by being clamped between the second part and the shoe sole.

[0020] The first part and the second part may be separate parts. Thus, if one of the two parts is worn out, in particular the one part which primarily makes contact with the ground, it may be replaced. Furthermore, the first part may be replaced by a different first part having a different size and / or shape and, thus, with different traction properties. For example, the player may secure a smaller first part to the shoe sole for playing soccer and a larger first part for playing rugby, because rugby studs are usually larger than soccer studs especially for rugby players in the first rows. Thus, by using studs according to the invention, the player may re-use his pair of shoes for a different kind of sports and / or for a different position on the field.

[0021] The first part may be adapted to be arranged at least partially between at least a portion of the second part and at least a portion of the shoe sole. In this way, the first part may be clamped between the second part and the shoe sole and may be easily secured in different positions to the shoe sole.

[0022] The first and the second directions may be radial directions of the stud. A radial direction extends per-

pendicular from a longitudinal axis of the stud. A longitudinal axis may for example be a symmetry axis and / or a principal axis of inertia.

[0023] The first part may comprise at least one surface with a curvature which is different than the average curvature of the first part. For example, the first part may comprise at least one surface with a smaller curvature than the average curvature of the first part. Accordingly, this surface provides for a higher traction than the other surfaces of the stud. Curvature may for example be defined as Gaussian curvature or mean curvature. Curvature of a stud may also be defined with respect to a cross section of the stud. The cross section may for example be perpendicular to an axis of the stud, for example the longitudinal axis.

[0024] The first part may essentially comprise convex external surfaces. Convex surfaces have the advantage that mud and soil is less likely to adhere to a convex surface. Furthermore, convex surfaces are easier to clean than concave surfaces. "Essentially" in this context is understood in the sense that most (i.e. more than 50%, in particular more than 80%) of the surface area and / or cross section of the first part is convex.

[0025] The first direction may be associated with a first external surface of the stud and the second direction may be associated with a second external surface of the stud. For example, the first external surface may provide for a higher traction than the second surface, e.g. by its curvature, dimension, etc. Thus, depending on the orientation of the first and second surface relative to the shoe sole, the traction properties of the sports shoe may be different depending on the position in which the stud is secured relative to the shoe sole.

[0026] The first external surface may have a different shape than the second external surface. Thus, the difference in shape may provide for different traction values along the directions associated with the external surfaces. The shapes may for example differ by their curvature, size, geometry, or any combination thereof.

[0027] The first external surface may comprise a lower absolute value of curvature than the second external surface. Thus, the first external surface has a lower traction than the second external surface. Varying the curvature of the stud is a simple way of providing the stud with different traction values along different directions.

[0028] The first external surface may be arranged opposite the second external surface. Thus, by turning the stud by approximately 180°, the traction of the shoe sole in a particular direction may be changed from lower traction to higher traction. For example, in the first position, the stud may provide a good traction in a lateral direction of the shoe, whereas in the second position, the stud may provide a good traction in a medial direction (opposite to the lateral direction) of the shoe.

[0029] The first external surface may have a rougher surface than the second external surface. This effect may be achieved by providing the first external surface with a surface texturing. For example, the first external sur-

face may have been treated by shot blasting or acids. Alternatively, the rougher surface may have been caused by a corresponding surface structure of a mold. The rougher first external surface may also be achieved by forming the first external surface from a first material which is rougher than a second material forming the second external surface.

[0030] The second external surface may have a smoother surface than the first external surface. This effect may be achieved for example by polishing or grinding. The smoother second external surface may also be achieved by forming the second external surface from a second material which is smoother than a first material forming the first external surface. Alternatively, the smoother surface may have been caused by a corresponding surface structure of a mold and/or a corresponding material used for the mold.

[0031] It should be noted that if the first part comprises more than two external surface, one of those surfaces may be rougher than the other external surfaces. For example, if the first part comprises three external surfaces, one external surface may be rougher than the other two surfaces. In another example, a first external surface may be rougher than a second external surface opposite the first external surface.

[0032] The geometry of the stud may be such that it comprises three different directions along each of which the traction of the stud has a local maximum. The geometry of the stud may be such that it comprises three different directions along each of which the traction of the stud has a local minimum. Both conditions may be achieved for example by a triangle-shaped cross section of the first part.

[0033] The first part may comprise three external surfaces of a first kind and three external surfaces of a second kind, wherein the surfaces of the first kind have a lower curvature than the surfaces of the second kind. The surfaces of the first kind and the surfaces of the second kind may be arranged in an alternating manner around the first part. Thus, by varying the curvature along the circumference of the first part, the first part of the stud may comprise a rather complex pattern of traction.

[0034] The external surface of the first part and the external surface of the second part may be adapted to have a smooth transition at the interface of the first part and the second part. This avoids that mud or soil adheres to the interface of the first part and the second part. Furthermore, injuries are reduced in case of contacting another player with the shoe for example.

[0035] The surface of the first part which contacts a shoe sole may comprise a structure which is adapted to engage a corresponding structure on a surface of the shoe sole. In this way, the stud may easily be secured to the shoe sole. Furthermore, the first direction of the stud may be fixed relative to the shoe sole, in particular the first direction may be rotationally fixed around an axis intersecting a plane of the shoe sole (e.g. around an axis perpendicular to the shoe sole), and an unintentional

twisting of the stud relative to the shoe sole may be avoided. The structures may be engaged only in certain positions, such that the first part may be secured to the shoe sole in the positions provided by the structures. For example, in case of hexagonal structures, the first part of the stud may be secured to the shoe sole in positions which differ relative to each other by multiples of 60°.

[0036] The surface of the first part which contacts the second part may comprise a structure which is adapted to engage a corresponding structure on a surface of the second part which contacts the first part. This may help to secure the second part to the first part and to avoid that the both parts may tilt unintentionally relative to each other, i.e. the alignment of both parts and, thus, a smooth transition between both parts is maintained.

[0037] The second part may comprise an attachment means for attaching the second part to a shoe sole. Such an attachment means may for example be a thread which engages a corresponding thread in the shoe sole.

[0038] The first part may be adapted to be engaged with the second part, such that the first part is secured to a shoe sole by attaching the attachment means of the second part to the shoe sole. For example, the first part may be clamped between the second part and secured to the shoe sole by engaging a thread of the first part with a corresponding thread in the shoe sole.

[0039] The first part may be adapted to be entirely arranged between the second part and the shoe sole when the first part and the second part are attached to the shoe sole. Thus, the first part may be securely held in place by the second part.

[0040] The first part may be made from a synthetic material and the second part may be made from a metal. In this way, the first part may be provided with a complex geometry by a corresponding manufacturing process for synthetic material (e.g. injection molding or 3D printing), whereas the first part may provide for very good wear resistance. Nonetheless, the first part may also contain or be made of metal and may be casted or 3D printed.

[0041] A further aspect of the present invention relates to a shoe comprising at least one stud as described before and a shoe sole which is adapted to receive the at least one stud. The shoe sole is also adapted to secure the first part of the stud relative to the shoe sole in at least two different positions, wherein in a first position the first direction is oriented differently relative to the shoe sole than in a second position.

[0042] The shoe sole may comprise at least one location which is adapted to receive the first part in the at least two different positions. The shoe sole may for example comprise at least one attachment means (e.g. a thread) which is able to engage with a corresponding thread of the first part (or of a second part as will be described next) to secure the first part in the at least two different positions. Thus, the stud may be mounted at the same location on the shoe sole, but in at least two different positions differing by the orientation of maximum traction of the stud.

[0043] The stud may comprise a second part for engaging a ground, and the shoe sole may be adapted to secure the second part relative to the shoe sole. This second part may be used to secure the first part to the shoe sole as well. For example, the second part may have a thread arranged in a bore of the first part and engaging a corresponding thread in the shoe sole. Thus, if the second part is secured to the shoe sole by means of the thread, the first part is secured as well by being clamped between the second part and the shoe sole.

[0044] The shoe sole may comprise a structure which is adapted to engage a corresponding structure on a surface of the first part of the stud. The structure may be arranged to engage with the corresponding structure of the first part of the stud in the first position and in the second position. In this way, the stud may easily be secured to the shoe sole. As the structures may be engaged only in certain positions, the first part may be secured to the shoe sole in certain positions only. For example, the structure may be arranged to engage with the corresponding structure of the first part of the stud in the first position and in the second position.

[0045] The structure may comprise a locking recess or a locking embossment. Such structure may rather easily be provided for example by injection molding or 3D printing.

[0046] The locking recess or the locking embossment may have a hexagonal shape. Thus, the first part of the stud may be secured to the shoe sole in six different positions.

[0047] The shoe sole may be shaped, such as to indicate a correct positioning of the first part of the stud. In this way, a wrong positioning of the stud may be avoided and the user is aided to quickly mount the stud in the right position. The correct position of the first part may for example be indicated by an arrow, a corresponding shape of the outsole, or a word (such as for example "brake" and/or "traction").

[0048] The external surface of the shoe sole may be adapted to have a smooth transition to the external surface of the first part of the stud at the interface of the shoe sole and the first part. This avoids that mud or soil adheres to the interface of the first part and the shoe sole.

[0049] The shoe sole may be adapted, such that the first part of the stud is removably secured to the shoe sole. Thus, the position of the stud and, thus, orientation of maximum traction may easily be changed by a wearer of the shoe.

[0050] The shoe sole may be adapted, such that the second part of the stud is removably secured to the shoe sole. The shoe sole may comprise a thread for engaging with a corresponding thread of the second part of the stud. Thus, if the second part is secured to the shoe sole by means of the thread, the first part is secured as well by being clamped between the second part and the shoe sole.

[0051] The shoe sole may comprise at least one stud being inseparably attached to the shoe sole. If, for ex-

ample, a stud exhibits a certain symmetry (rotational, mirror symmetry, etc.), such that changing the position of such a stud would not have any effect due to the symmetry, it is advantageous to provide such a stud as an inseparably attached stud. An inseparably attached stud could for example be a stud which is present on a variety of shoes for all field positions. An inseparably attached stud may be symmetrical (e.g. may have rotational or mirror symmetry) or may have no symmetry at all.

[0052] A still further aspect of the present invention relates to a method of manufacturing a stud for a shoe, comprising at least the steps of providing a first part for engaging a ground; shaping the first part, such that it provides for a higher traction along at least a first direction compared to a second direction different from the first direction, wherein the first part comprises essentially a triangular shaped cross section at the surface which is adapted to contact a shoe sole, and wherein the cross section of the first part transitions from an essentially triangular shape at its surface which is adapted to contact a shoe sole to a round shape at its opposite surface; and adapting the first part to be able to be secured relative to a shoe sole in at least two different positions, wherein in a first position the first direction is oriented differently relative to the shoe sole than in a second position.

[0053] The stud may be a stud as previously described.

[0054] The stud may be injection molded or printed using a 3D-printer. These methods allow to manufacture studs with rather complex geometries rather easily.

4. Short description of the figures

[0055] Aspects of the present invention will be explained in more detail with reference to the accompanying figures in the following. These figures show:

- | | |
|-----------------|--|
| Figs. 1A and 1B | an exemplary embodiment of a stud according to the present invention; |
| Fig. 2 | an illustration of a cross section of a stud according to the present invention; |
| Figs. 3A and 3B | an illustration of the principle underlying the present invention; |
| Figs. 4A to 4C | an exemplary embodiment of a first part and a second part of a stud according to the present invention in more detail; |
| Figs. 5A and 5B | an exemplary embodiment of a first part of a stud according to the present invention; |
| Fig. 6 | a shoe sole according to the present invention; |

Fig. 7

a cross sectional view of a stud secured to a shoe sole according to the present invention; and

5 Figs. 8A to 8D

details of attaching a stud to a shoe sole according to the present invention.

5. Detailed description of preferred embodiments

[0056] In the following, embodiments and variations of the present invention are described in more detail.

[0057] Figures 1A and 1B show an embodiment of a stud 10 for a shoe. The shoe may be a sports shoe for such a kind of sports where studded shoes are generally advantageous to increase the traction on soft ground like turf, artificial turf, clay court, etc. Examples of such kinds of sports are rugby, soccer and football. However, the present invention is not limited to such kind of sports and may be applied to sports shoes for other kind of sports as well.

[0058] The stud 10 comprises at least a first part 11 for engaging a ground. Thus, the first part 11 is able to bore into the soft ground under the weight of a wearer of the sport shoe. Additionally, movements of the wearer like acceleration, deceleration or a change in direction drive the first part 11 into the ground. Once the first part engages with the ground, the traction of the shoe is increased, because horizontal movements of the shoe are impeded by the first part 11 being surrounded by the ground.

[0059] In the embodiment of Figures 1A and 1B, the stud 10 also comprises a second part 12 which will be described in more detail below. However, it should be noted that in the context of the present invention, the stud 10 may generally only comprise a single part, namely the first part 11.

[0060] Coming back to the first part 11, as shown in the exemplary embodiment of Figures 1A and 1B, it has a shape which provides for a higher traction along at least a first direction compared to a second direction different from the first direction. To illustrate this principle, Fig. 2 shows a simplified cross section 21 of the first part 11 of the stud 10 shown in Figures 1A and 1B. As the cross section of the first part 11 on its upper end (i.e. the end facing the shoe sole 13) has a generally triangular form, the cross section 21 in Fig. 2 is shown as an equilateral triangle for illustrative purposes. In fact, however, as will be explained in more detail below, the shape of the first part 11 is slightly curved, i.e. the edges of the triangle are convex.

[0061] As shown in Fig. 2, a first direction 23 extends from the longitudinal symmetry axis 22 to the middle of a first edge 24 of the cross section 21 of the first part 11. Thus, in this particular embodiment, the first direction 23 is perpendicular to the first edge 24. In general, this need not be the case. It should be noted that the symmetry axis 22 is perpendicular to the plane of projection. Also,

instead of a symmetry axis, directions may be defined to start from any axis of the first part 11 or stud 10, respectively, such as principle axes of inertia, etc. A second direction 25 extends from the symmetry axis 22 to one of the vertices 26 of the cross section 21 of the first part 11. Thus, the directions 23 and 25 are radial directions in that they extend from a point inside the cross section 21 of the first part 11 of the stud 10 to the outside.

[0062] When the first part 11 engages a soft ground, the traction in the first direction 23 is higher than in the second direction 25 of the first part 11 of the stud 10. This is because in the first direction 24, the edge 24 of the cross section 21 is perpendicular to the direction of movement of the shoe sole 13 and, thus, of the first part 11 of the stud 10. Hence, the resistance to movement caused by the soft ground surrounding the first part 11 is very high. In contrast, along the second direction 25, the first part 11 faces the soft ground with one of its acute vertices 26. Hence, a movement of the shoe sole 13 and, hence, of the first part 11 of the stud 10 along this direction is much easier. The movement along the second direction 25 can be compared to the bow of a ship which is designed to reduce the resistance of the hull cutting through water. In contrast, the movement along the first direction 23 can be compared to the movement of a paddle which is designed to be pushed against water and, accordingly, comprises a high resistance.

[0063] As shown in Figures 1A and 1B, the first part 11 of the stud 10 is adapted, such that it can be secured relative to a shoe sole 13 in at least two different positions. Fig. 1A depicts the first position and Fig. 2B depicts the second position. In the second position in Fig. 1B, the first part 11 of the stud 10 is rotated by 60° relative to the first position in Fig. 1A. Accordingly, the first direction 23 which is indicated in Figures 1A and 1B by an arrow is also rotated by 60°. In general, according to the invention, in the first position the first direction 23 is oriented differently relative to the shoe sole 13 than in the second position. The difference in orientation need generally not be 60° as in the exemplary embodiment in Figures 1A and 1B, but can in general be any angle. It should be noted that the second direction of the first part 11 of the stud 10 is also rotated by 60° comparing Fig. 2A to Fig. 2B.

[0064] The first part 11 of the stud may be manufactured from a synthetic material like TPU or from metal like aluminum. In case of synthetic materials, the first part 11 may be injection molded or 3D printed. In case of metal, the first part 11 may be manufactured in a casting mold or 3D printed.

[0065] Figures 3A and 3B illustrate the principle underlying the present invention by means of four studs 10a, 10b, 10c and 10d mounted to the heel portion of a shoe sole 13. In Fig. 3A the studs 10a, 10b, 10c and 10d are secured to the shoe sole 13 in a first position in which the first direction 23 of high traction faces outwardly, i.e. the first direction 23 of the first part 11 of studs 10a and 10b point to the medial side 31 of the shoe sole 13 and

the first direction 23 of the first part 11 of studs 10c and 10d point to the lateral side 32 of the shoe sole 13. Hence, in this configuration, the studs 10a, 10b, 10c and 10d provide high traction in case of lateral or medial movements of the shoe.

[0066] In Fig. 3B, all of the studs 10a, 10b, 10c and 10d have been rotated by 60° relative to the first position in Fig. 3A. Hence, the second direction 25 (see Fig. 2) with lower traction compared to the first direction 23 (see Fig. 2) is now facing outwardly, i.e. the second direction 25 of the first part 11 of studs 10a and 10b point to the medial side 31 of the shoe sole 13 and the second direction 25 of the first part 11 of studs 10c and 10d point to the lateral side 32 of the shoe sole 13. Hence, in this configuration, the studs 10a, 10b, 10c and 10d provide lower traction in case of lateral or medial movements of the shoe. This may for example be desirable in case of ground which anyway provides high traction like e.g. soft and humid turf. In this case, injuries (like wrenching one's ankle) could be likely in case of high traction in the lateral and medial direction if the player comes to a sudden stop or is tackled by another player. At the same time, the forward and backward traction of the shoe is increased as the first direction 23 of each of the studs is now orientated in a diagonal manner pointing to the sides of the shoe sole comparable to the tread of a truck tire.

[0067] With respect to Figures 3A and 3B it should be noted that a wide variety of configurations of the studs 10a, 10b, 10c and 10d is possible. For example starting from the configuration shown in Fig. 3A, it would also be possible to only secure the medial studs 10a and 10b in a different position rotated by 60° and to leave the lateral studs 10c and 10d in their first position. In this case, the first direction 23 (see Fig. 2) of high traction of all studs 10a, 10b, 10c and 10d would point to the lateral side 32. Accordingly, the shoe would provide a very high traction on the medial side 32 and a smaller traction on the lateral side 31. In the exemplary embodiment of Figures 3A and 3B with four studs 16 different configurations (two for each stud) are possible in general.

[0068] Figures 4A, 4B and 4C show the first 11 and second part 12 of a stud 10 according to the invention in more detail and how they are secured to a shoe sole 13. The second part 12 is also able to engage a ground when secured to a shoe sole 13. In fact, the second part 12 touches the ground before the first part 11 when the player makes a step. In the exemplary embodiments described herein, the first part 11 and the second part 12 are separate parts. However, it is also possible that the first part 11 and the second part 12 are a single piece.

[0069] The second part 12 may be made from metal such as aluminum for example. It is also possible to manufacture the second part 12 from a synthetic material like TPU.

[0070] As shown in Figures 4A, 4B and 4C, the first part 11 of a stud 10 is adapted to be arranged at least partially between at least a portion of the second part 12 and at least a portion of the shoe sole 13. The upper

surface (i.e. the surface facing the shoe sole) of the second part 12 abuts the lower surface (i.e. the surface pointing away from the shoe sole) of the first part 11. At the same time, the upper surface of the first part 11 abuts the lower surface of the shoe sole 13. Thus, the first part 11 is clamped between the second part 12 and the shoe sole 13. In this way, the first part 11 is fixed and held in place. Also, the external surface of the first part 11 and the external surface of the second part 12 are adapted to have a smooth transition at the interface of the first part 11 and the second part 12. In the exemplary embodiment of figures 4A, 4B and 4C, this is achieved by the first part 11 and the second part 12 having a cylindrical cross section with the same diameter at their interface.

[0071] In the exemplary embodiment of Figures 4A, 4B and 4C, the second part 12 comprises a thread 41 for attaching the second part 12 to the shoe sole 13. To this end, the shoe sole 13 comprises a corresponding thread 42. Instead of a thread, other attachment means could be used as well, such as a bayonet joint.

[0072] As already mentioned, the two-part configuration of the stud 10 is only an exemplary embodiment and in general, the stud 10 could only comprise the first part 11. In this case, the first part 11 could be secured to the sole 13 by a thread on the first part engaging a corresponding thread in the shoe sole. Other types of attachment could be used as well, such as a bayonet joint. Also, in the case that the stud 10 comprises two parts, it is possible that the first part 11 is secured to the lower side of the shoe sole 13, whereas the second part is secured from the upper side of the shoe sole. In this case, the second part 12 could be a flat headed screw with a thread protruding through an opening in the shoe sole 13 and engaging a corresponding thread in the first part 11.

[0073] When the second part 12 is secured to the shoe sole 13 by means of the threads 41 and 42, the first part 11 engages with the second part 12 and is clamped between the second part 12 and the shoe sole 13. As shown in Fig. 4A, the first part 11 comprises a structure on its lower surface in the form of an annular groove 43. The second part 12 comprises a corresponding structure on its upper surface in the form of an annular rim 44. The rim 44 is adapted to engage the groove 43 to help securing the first part 11 relative to the second part 12. Instead of a groove 43 and a rim 44, different types of structures could be used. Also, the groove 43 and the rim 44 could be interchanged, i.e. the groove 43 could be arranged on the second part 12 and the rim 44 could be arranged on the first part 11.

[0074] Furthermore, as shown in Fig. 4C, the first part 11 comprises a structure in the form of a hexagonal embossment or rim 45. As shown in Figures 4A and 4B, the shoe sole 13 comprises a corresponding structure in the form of a hexagonal recess 46. The embossment or rim 45 is adapted to engage the recess 46. The rim 45 and the recess 46 cause the first part 11 to be attachable to the shoe sole 13 only in certain positions. Due to the hexagonal shape of both the rim 45 and the recess 46,

the first part 11 may be secured to the shoe sole 13 in six different configurations. However, due to the rotational symmetry of the first part 11, there are effectively only two different positions of the first part 11 which differ by the orientation of the direction 23 of highest traction (see Fig. 2). It should be noted that if the first part 11 had no symmetry at all, each of the six possible configurations resulting from the hexagonal shape of the rim 45 and recess 46 would result in a different position of the first direction of the first part. In general, it is possible that the rim 45 and the recess 46 comprise a different shape than hexagonal, for example triangular or rectangular. Also, the rim 45 and the recess 46 could be interchanged, i.e. the rim 45 could be arranged on the shoe sole 13 and the recess 46 could be arranged on the first part 11.

[0075] Figures 5A and 5B show the first part 11 of the stud 10 in more detail. As shown in Fig. 5A, the first part 11 comprises a surface 24 (also see the cross section 21 in Fig. 2) which is slightly convex. In general, the first part 11 in the exemplary embodiments comprises only convex surfaces. The curvature of the surface 24 is different than the average curvature of the first part obtained for example by summing up the curvature in each point of the outer surface or in each point around a cross section of the outer surface of the first part 11 and normalizing accordingly. In particular, the surface 24 has a lower curvature than the surface on the vertex 26 (also see Fig. 2). As explained with reference to Fig. 2, the surface 24 provides for higher traction than the surface 26. Due to the rotational symmetry of the first part, surfaces with lower traction are not only arranged adjacent the surface 24 (reference numerals 26 and 26a in Fig. 5A), but also arranged opposite (reference numeral 26b). For the same reason, the first part 11 comprises three surfaces 24, 24a and 24b with higher traction.

[0076] Accordingly, the first part 11 comprises three different directions along each of which the traction of the stud has a local maximum. In Fig. 2, this is the direction with the reference numeral 23 and the additional two directions obtained by rotating about 120° and 240°, respectively. Furthermore, the first part 11 comprises three different directions along each of which the traction of the stud has a local minimum. In Fig. 2, this is the direction with the reference numeral 25 and the additional two directions obtained by rotating about 120° and 240°, respectively.

[0077] Furthermore, in the exemplary embodiment of Figures 5A and 5B, the surfaces 24, 24a and 24b can be considered as surfaces of a first kind having a lower curvature than the surfaces 26, 26a and 26b which can be considered as surfaces of a second kind. Also, the surfaces 24, 24a and 24b of the first kind and the surfaces 26, 26a and 26b of the second kind are arranged in an alternating manner around the first part 11.

[0078] In this context, it should be noted that the present invention is not limited to a certain kind of symmetry of the first part 11, the second part 12, and the structures 43, 44, 45 and 46. In fact, those elements could

have a different kind of symmetry or no symmetry at all. Accordingly, the shapes of in particular the first part 11 and the second part 12 may be different from the shapes shown herein and the arrangement of the first direction 23, the second direction 25 and of the surfaces of the first part 11 could be different as well.

[0079] As shown in the exemplary embodiment of Figures 5A and 5B, the cross section of the first part 11 transitions from an essentially triangular shape (also see Fig. 2) at the upper surface 51 which contact a shoe sole to a round shape at the opposite surface 52.

[0080] The first part 11 also comprises a bore 53. As shown in figures 4A, 4B and 4C, the bore 53 is adapted to receive the portion of the second part 12 comprising the thread 41. As shown in figures 4A, 4B and 4C, the thread portion 41 extends through the bore 53 to engage with the corresponding thread 42 of the shoe sole 13. In this context it should be noted that there are basically two alternatives for attaching the first part 11 and the second part 12 to the shoe sole 13. According to the first alternative, the first part 11 is attached to the shoe sole 13. The first part 11 may for example be held in place by the engaging structures 45 and 46 as described above. Then, the second part 12 is attached to the shoe sole 13 by feeding its thread portion 41 through the bore 53 and screwing it in the corresponding thread 42 in the shoe sole 13. According to the second alternative, the first part 11 is attached to the second part 12 by feeding the thread portion 41 of the second part 12 through the bore 53 of the first part 11. Both parts may be held in place by the annular groove 43 and rim 44 as described above. Then, the protruding thread portion 41 of the second part 12 is screwed in the corresponding thread 42 in the shoe sole 13.

[0081] Fig. 6 shows an exemplary embodiment of a shoe sole 13 according to the invention in more detail. The shoe sole 13 can be made from synthetic material like polypropylene.

[0082] The shoe sole 13 is adapted to receive at least one stud 10 as described before. Thus, the stud 10 comprises a first part for engaging a ground and has a shape which provides for a higher traction along a first direction compared to a second direction different from the first direction when the first part is engaged in a ground.

[0083] To receive the stud 10, the shoe sole in the exemplary embodiment of Fig. 6 comprises a thread 42 which is adapted to engage a corresponding thread of the stud 10. The stud 10 could for example comprise two parts as described before and the second part 12 comprises the corresponding mating thread. This configuration is shown in more detail in the cross section of Fig. 7.

[0084] The shoe sole 13 is also adapted to secure the first part of the stud relative to the shoe sole in at least two different positions, wherein in a first position the first direction is oriented differently relative to the shoe sole than in a second position. In the exemplary embodiment of Fig. 6, this is achieved by hexagonal recesses in the shoe sole 13 of which one is denoted with the reference

numeral 46. As has been described before with respect to Fig. 4, the hexagonal recess 46 is adapted to engage a corresponding hexagonal embossment or rim 45 on the upper side 51 of the first part 11 of the stud 10.

[0085] The shoe sole 13 in Fig. 6 comprises star-shaped embossments around the threads 42 and the hexagonal recesses 43 of which one is exemplarily denoted by the reference numeral 61. The embossment 61 indicates a correct positioning of the first part 11 of the stud 10 relative to the shoe sole. For example, as shown in Fig. 1A, the first part 10 is correctly positioned if the acute vertices 26, 26a and 26b (see Fig. 5A) coincide with three of the six arms of the star-shaped embossment 61.

[0086] As can in particular be seen in Fig. 7, the external surface of the shoe sole 13 has a smooth transition to the external surface of the first part 11 of the stud 10 at the interface of the shoe sole 13 and the first part 11, in particular in the areas of the vertices.

[0087] Figures 8A, 8B, 8C and 8D show details of attaching a stud 10 to a shoe sole 13. As shown in Fig. 8B, threads 42 are inserted into corresponding openings in the shoe sole 13. In the exemplary embodiment of Fig. 8B the threads 42 have the shape of a sleeve with an annular collar as shown in Fig. 7. The threads 42 could be inserted during manufacturing the shoe sole 13 and could be glued to the shoe sole 13 or could be provided during injection molding the shoe sole 13. Alternatively, the threads 42 could be inserted into the corresponding openings in the shoe sole 13 by a customer before attaching the studs 10.

[0088] Next, as shown in Fig. 8C, the first part 11 of each stud 10 is attached to the shoe sole 13. To this end, the hexagonal rim 45 of each first part 11 is fitted into the corresponding hexagonal recess 46 in the shoe sole 13. The embossment 61 helps to find a correct orientation of the first part 11. In the exemplary embodiment of Fig. 8C, two different positions of each stud 10 are possible which differ with respect to the orientation of the first direction 23 of maximum traction (see Fig. 2) relative to the shoe sole 13.

[0089] Finally, as shown in Fig. 8D, the second part 12 is secured to the shoe sole 13 by screwing the thread 41 of the second part into the corresponding thread 42 of the shoe sole 13. The first part 11 is clamped between the second part 12 and the shoe sole 13 and firmly secured.

[0090] In the following, further embodiments are described to facilitate the understanding of the invention:

1. A stud for a shoe comprising:

a first part for engaging a ground, wherein the first part

a. has a shape which provides for a higher traction along at least a first direction compared to a second direction different from

- the first direction; and
 b. is adapted, such that it can be secured relative to a shoe sole in at least two different positions, wherein in a first position the first direction is oriented differently relative to the shoe sole than in a second position.
2. Stud according to the preceding embodiment, further comprising:
- a second part for engaging a ground that is adapted to be secured relative to the shoe sole.
3. Stud according to the preceding embodiment, wherein the first part and the second part are separate parts.
4. Stud according to one of embodiments 2 or 3, wherein the first part is adapted to be arranged at least partially between at least a portion of the second part and at least a portion of the shoe sole.
5. Stud according to one of the preceding embodiments, wherein the first and the second directions are radial directions of the stud.
6. Stud according to one of the preceding embodiments, wherein the first part comprises at least one surface with a curvature which is different than the average curvature of the first part.
7. Stud according to one of the preceding embodiments, wherein the first part essentially comprises convex external surfaces.
8. Stud according to one of the preceding embodiments, wherein the first direction is associated with a first external surface of the stud and the second direction is associated with a second external surface of the stud.
9. Stud according to the preceding embodiment, wherein the first external surface has a different shape than the second external surface.
10. Stud according to the preceding embodiment, wherein the first external surface comprises a lower absolute value of curvature than the second external surface.
11. Stud according to one of embodiments 9 or 10, wherein the first external surface is arranged opposite the second external surface.
12. Stud according to one of the preceding embodiments, wherein the geometry of the stud is such that it comprises three different directions along each of which the traction of the stud has a local maximum.
13. Stud according to one of the preceding embodiments, wherein the geometry of the stud is such that it comprises three different directions along each of which the traction of the stud has a local minimum.
14. Stud according to one of the preceding embodiments, wherein the first part comprises three external surfaces of a first kind and three external surfaces of a second kind, wherein the surfaces of the first kind have a lower curvature than the surfaces of the

second kind.

15. Stud according to embodiment 14, wherein the surfaces of the first kind and the surfaces of the second kind are arranged in an alternating manner around the stud.

16. Stud according to one of the preceding embodiments, wherein the first part comprises essentially a triangular shaped cross section at the surface which is adapted to contact a shoe sole.

17. Stud according to embodiment 16, wherein the cross section of the first part transitions from an essentially triangular shape at its surface which is adapted to contact a shoe sole to a round shape at its opposite surface.

18. Stud according to one of embodiments 2 to 17, wherein the external surface of the first part and the external surface of the second part are adapted to have a smooth transition at the interface of the first part and the second part.

19. Stud according to one of the preceding embodiments, wherein the surface of the first part which contacts a shoe sole comprises a structure which is adapted to engage a corresponding structure on a surface of the shoe sole.

20. Stud according to one of embodiments 2 to 19, wherein the surface of the first part which contacts the second part comprises a structure which is adapted to engage a corresponding structure on a surface of the second part which contacts the first part.

21. Stud according to one of embodiments 2 to 20, wherein the second part comprises an attachment means for attaching the second part to a shoe sole.

22. Stud according to embodiment 21, wherein the first part is adapted to be engaged with the second part, such that the first part is secured to a shoe sole by attaching the attachment means of the second part to the shoe sole.

23. Stud according to embodiment 22, wherein the first part is adapted to be entirely arranged between the second part and the shoe sole when the first part and the second part are attached to the shoe sole.

24. Stud according to one of embodiments 2 to 23, wherein the first part is made from a synthetic material and the second part is made from a metal.

25. Shoe sole comprising at least one stud according to one of the preceding embodiments.

26. Shoe sole which is adapted

a. to receive at least one stud, wherein the stud comprises a first part for engaging a ground, wherein the first part has a shape which provides for a higher traction along a first direction compared to a second direction different from the first direction when the first part is engaged in a ground; and

b. to secure the first part of the stud relative to the shoe sole in at least two different positions,

wherein in a first position the first direction is oriented differently relative to the shoe sole than in a second position.

27. Shoe sole according to embodiment 26, further comprising at least one location which is adapted to receive the first part in the at least two different positions. 5
28. Shoe sole according to one of embodiments 26 or 27, wherein the stud comprises a second part for engaging a ground, and wherein the shoe sole is adapted to secure the second part relative to the shoe sole. 10
29. Shoe sole according to one of embodiments 26 to 28, wherein the shoe sole comprises a structure which is adapted to engage a corresponding structure on a surface of the first part of the stud. 15
30. Shoe sole according to embodiment 29, wherein the structure is arranged to engage with the corresponding structure of the first part of the stud in the first position and in the second position. 20
31. Shoe sole according to embodiment 30, wherein the structure comprises a locking recess or a locking embossment.
32. Shoe sole according to embodiment 31, wherein the locking recess or the locking embossment has a hexagonal shape. 25
33. Shoe sole according to one of embodiments 26 to 32, wherein the shoe sole is shaped, such as to indicate a correct positioning of the first part of the stud. 30
34. Shoe sole according to one of embodiments 26 to 33, wherein the external surface of the shoe sole is adapted to have a smooth transition to the external surface of the first part of the stud at the interface of the shoe sole and the first part. 35
35. Shoe sole according to one of embodiments 26 to 34, wherein the shoe sole is adapted, such that the first part of the stud is removably secured to the shoe sole. 40
36. Shoe sole according to one of embodiments 28 to 35, wherein the shoe sole is adapted, such that the second part of the stud is removably secured to the shoe sole.
37. Shoe sole according to embodiment 36, wherein the shoe sole comprises a thread for engaging with a corresponding thread of the second part of the stud. 45
38. Shoe sole according to one of embodiments 26 to 37, wherein the shoe sole comprises at least one stud being inseparably attached to the shoe sole. 50
39. Shoe comprising a shoe sole according to one of embodiments 25 to 38.
40. Method of manufacturing a stud for a shoe, comprising at least the steps: 55

- a. providing a first part for engaging a ground;
- b. shaping the first part, such that it provides for a higher traction along at least a first direction

compared to a second direction different from the first direction; and

c. adapting the first part to be able to be secured relative to a shoe sole in at least two different positions, wherein in a first position the first direction is oriented differently relative to the shoe sole than in a second position.

41. Method according to the preceding embodiment, wherein the stud is a stud according to one of embodiments 1 to 24.

42. Method according to one of embodiments 39 or 40, wherein the stud is injection molded or printed using a 3D-printer.

Claims

1. A stud (10) for a shoe comprising:

a first part (11) for engaging a ground, wherein the first part (11)

a. has a shape which provides for a higher traction along at least a first direction (23) compared to a second direction (25) different from the first direction (23);

b. is adapted, such that it can be secured relative to a shoe sole (13) in at least two different positions, wherein in a first position the first direction (23) is oriented differently relative to the shoe sole than in a second position; and

c. comprises essentially a triangular shaped cross section at the surface which is adapted to contact a shoe sole, wherein the cross section of the first part transitions from an essentially triangular shape at its surface which is adapted to contact a shoe sole to a round shape at its opposite surface.

2. Stud according to the preceding claim, further comprising:

a second part for engaging a ground that is adapted to be secured relative to the shoe sole.

3. Stud according to the preceding claim, wherein the first part and the second part are separate parts.

4. Stud according to one of the preceding claims, wherein the geometry of the stud is such that it comprises three different directions along each of which the traction of the stud has a local maximum.

5. Stud according to one of the preceding claims, wherein the geometry of the stud is such that it comprises three different directions along each of which

the traction of the stud has a local minimum.

6. Stud according to one of the preceding claims, wherein the first part comprises three external surfaces of a first kind and three external surfaces of a second kind, wherein the surfaces of the first kind have a lower curvature than the surfaces of the second kind. 5
7. Stud according to claim 6, wherein the surfaces of the first kind and the surfaces of the second kind are arranged in an alternating manner around the stud. 10
8. Stud according to one of claims 2 to 7, wherein the second part comprises an attachment means for attaching the second part to a shoe sole. 15
9. Stud according to claim 8, wherein the first part is adapted to be engaged with the second part, such that the first part is secured to a shoe sole by attaching the attachment means of the second part to the shoe sole. 20
10. Stud according to claim 9, wherein the first part is adapted to be entirely arranged between the second part and the shoe sole when the first part and the second part are attached to the shoe sole. 25
11. Shoe sole (13) comprising at least one stud (10) according to one of the preceding claims. 30
12. Shoe comprising at least one stud (10) according to one of claims 1 to 10, and a shoe sole (13) which is adapted 35
 - a. to receive the at least one stud (10); and
 - b. to secure the first part (11) of the stud (10) relative to the shoe sole (13) in at least two different positions, wherein in a first position the first direction (23) is oriented differently relative to the shoe sole than in a second position. 40
13. Method of manufacturing a stud (10) for a shoe, comprising at least the steps: 45
 - a. providing a first part (11) for engaging a ground;
 - b. shaping the first part (11), such that it provides for a higher traction along at least a first direction (23) compared to a second direction different from the first direction, wherein the first part (11) comprises essentially a triangular shaped cross section at the surface which is adapted to contact a shoe sole, and wherein the cross section of the first part transitions from an essentially triangular shape at its surface which is adapted to contact a shoe sole to a round shape at its opposite surface; and 50 55

c. adapting the first part (11) to be able to be secured relative to a shoe sole in at least two different positions, wherein in a first position the first direction (23) is oriented differently relative to the shoe sole than in a second position.

14. Method according to the preceding claim, wherein the stud is a stud according to one of claims 1 to 10.
15. Method according to one of claims 13 or 14, wherein the stud is injection molded or printed using a 3D-printer.

FIG 1A

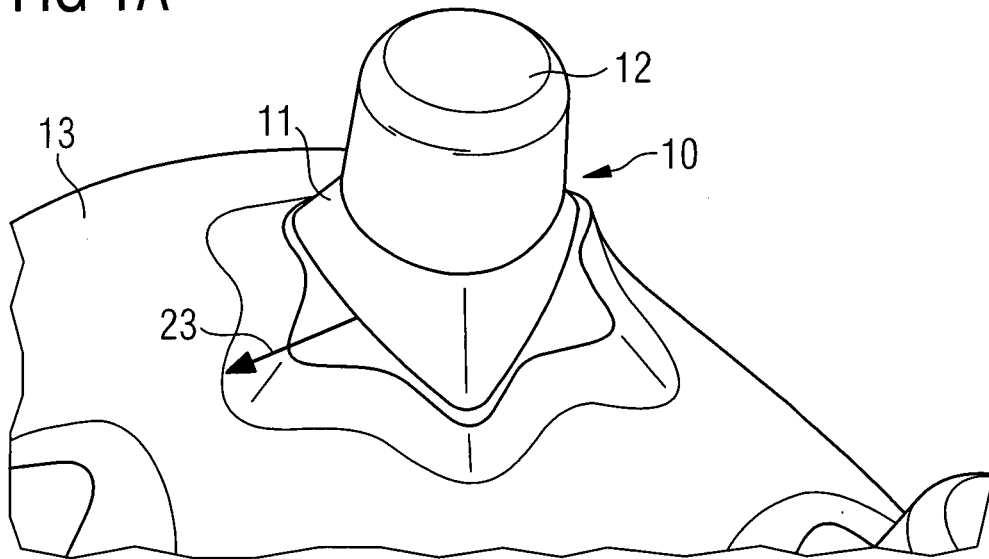


FIG 1B

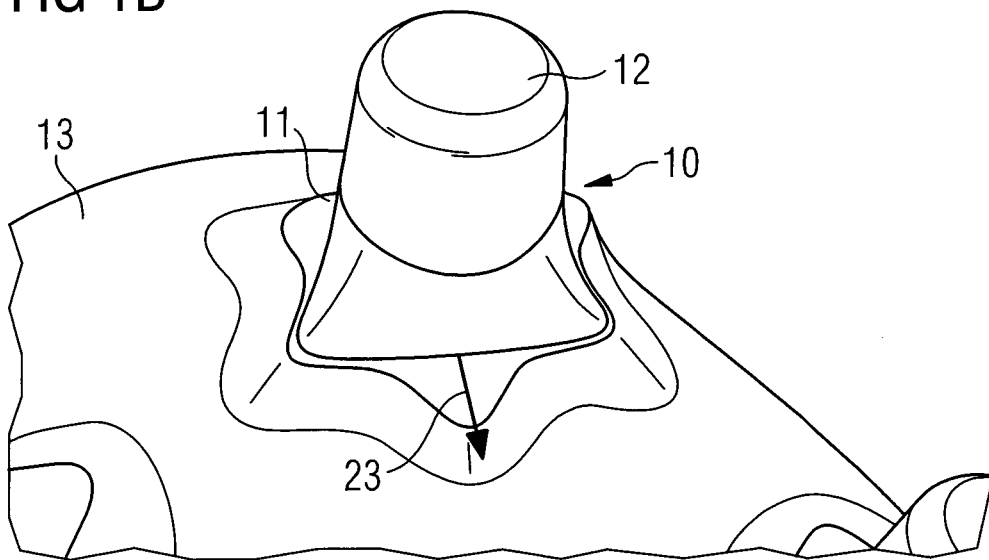


FIG 2

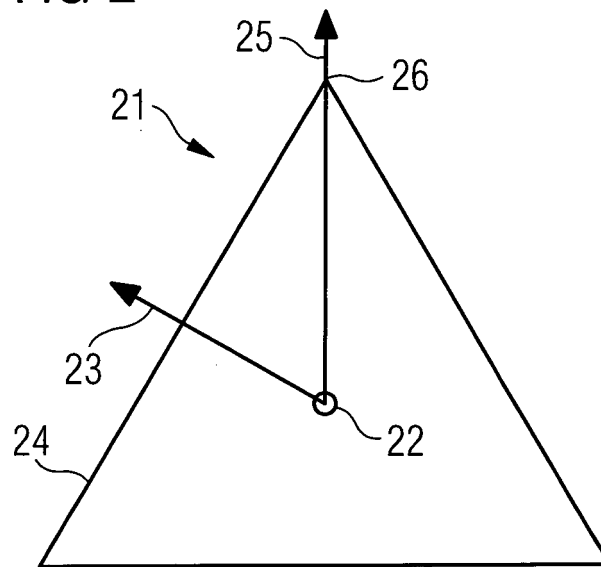


FIG 3A

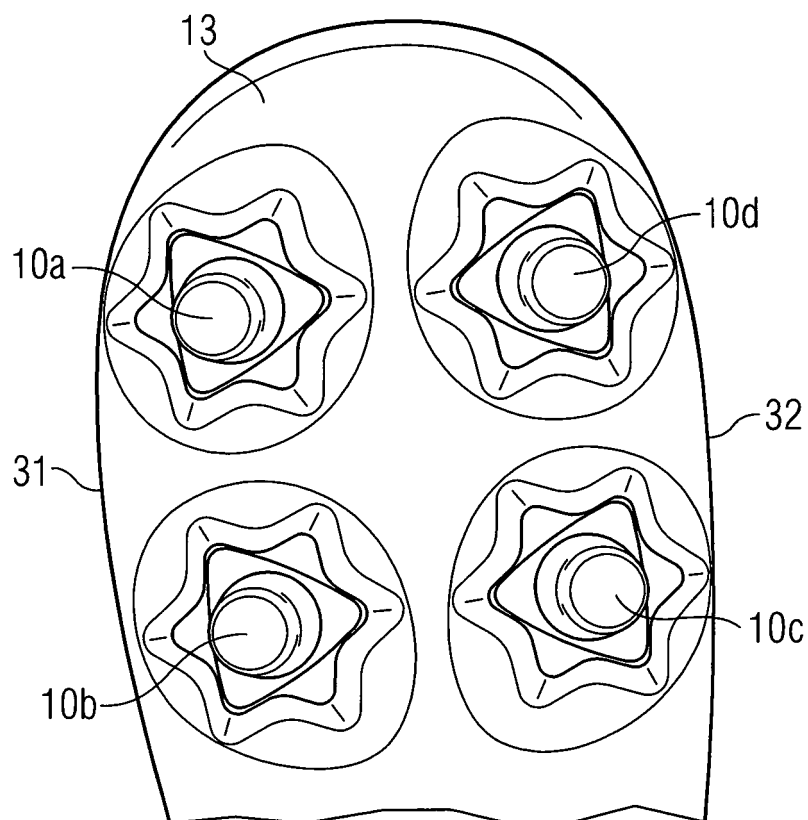


FIG 3B

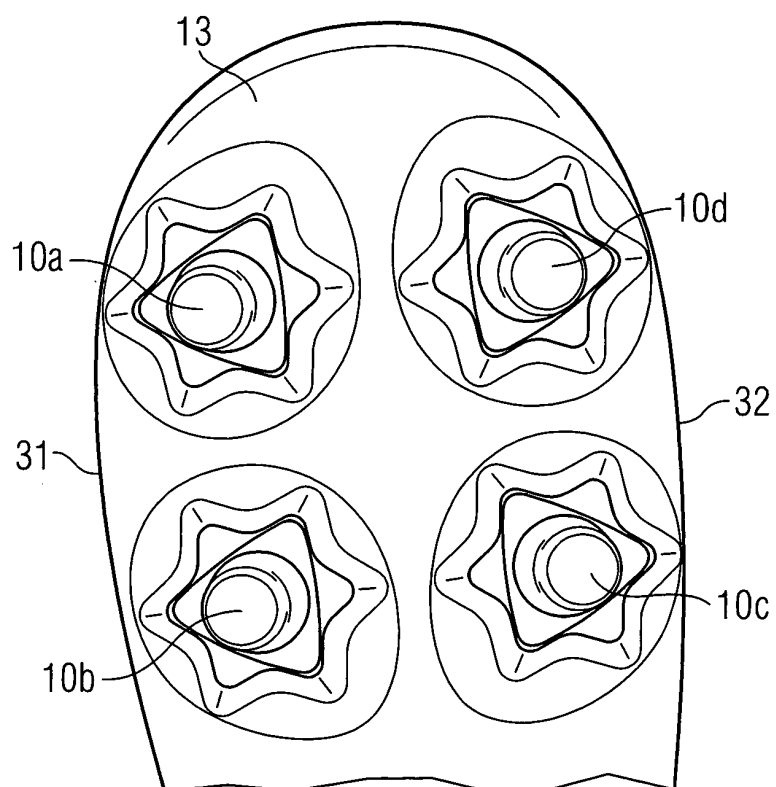


FIG 4A

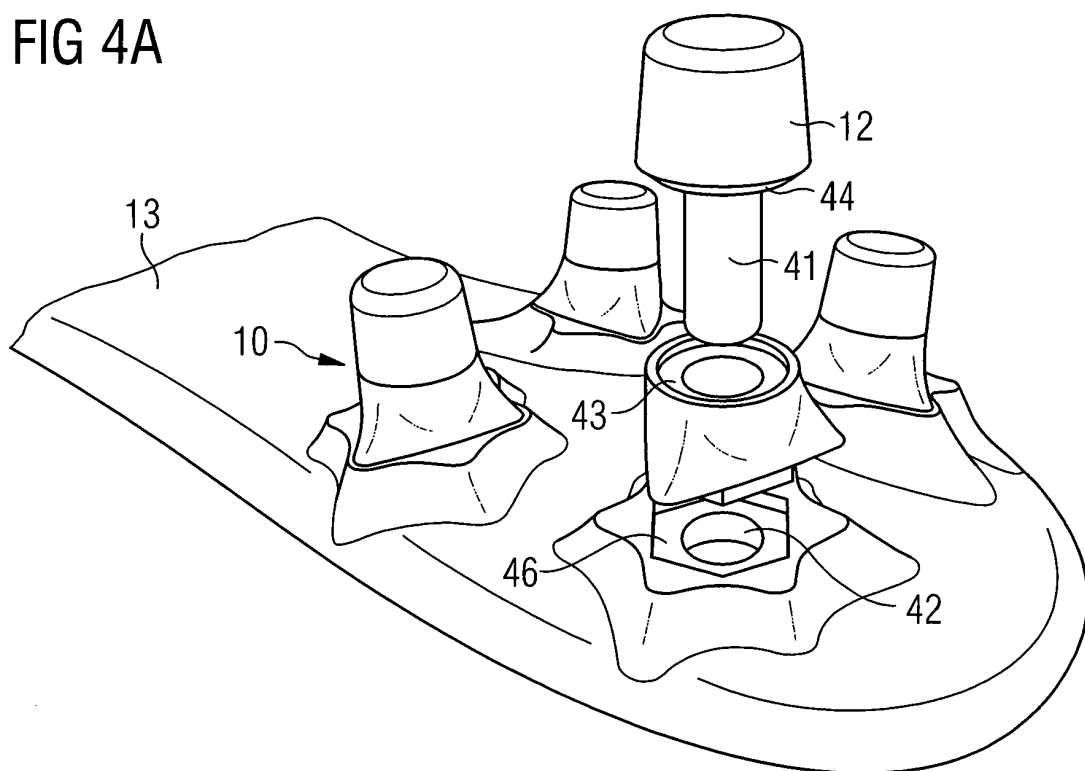


FIG 4B

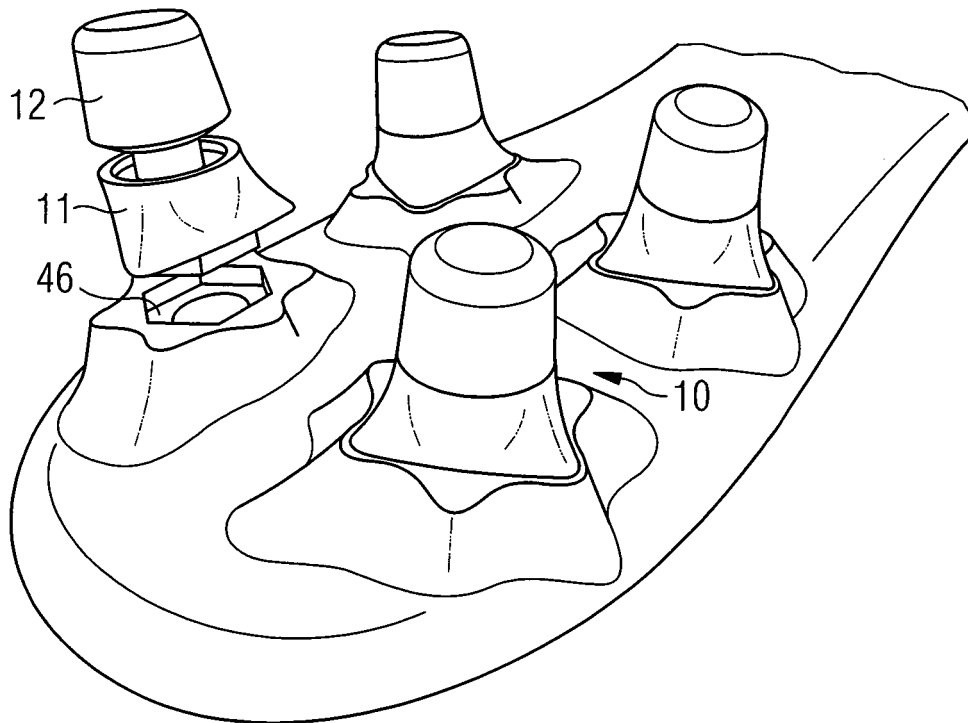


FIG 4C

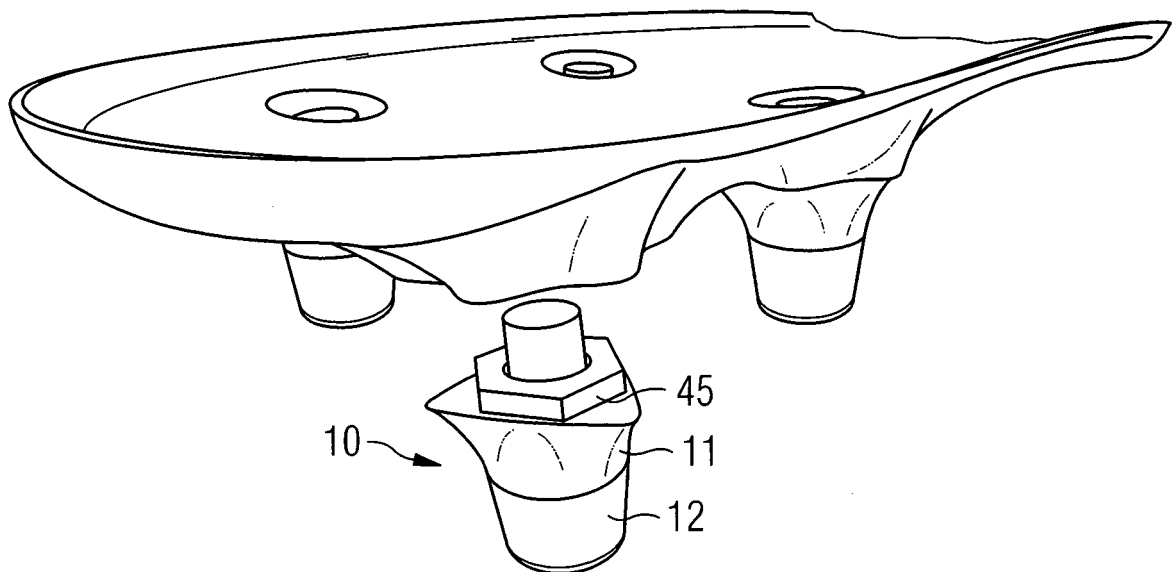


FIG 5A

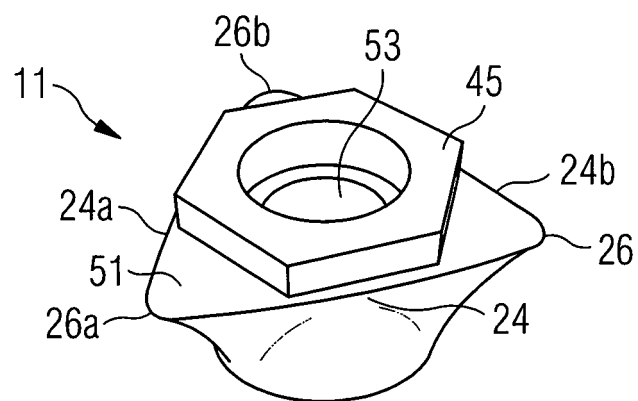


FIG 5B

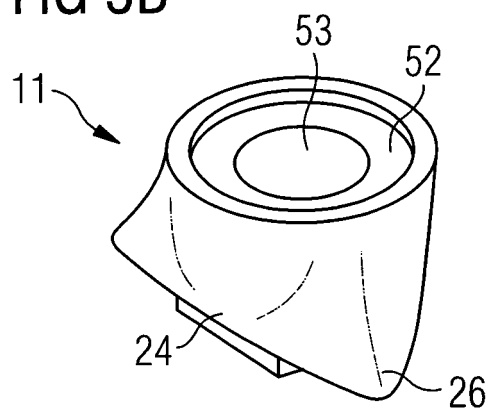


FIG 6

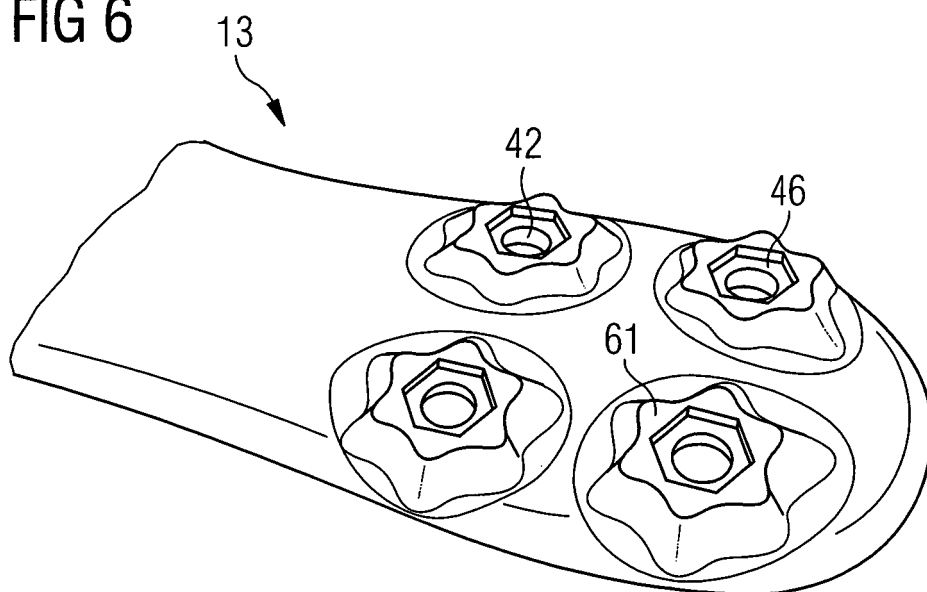


FIG 7

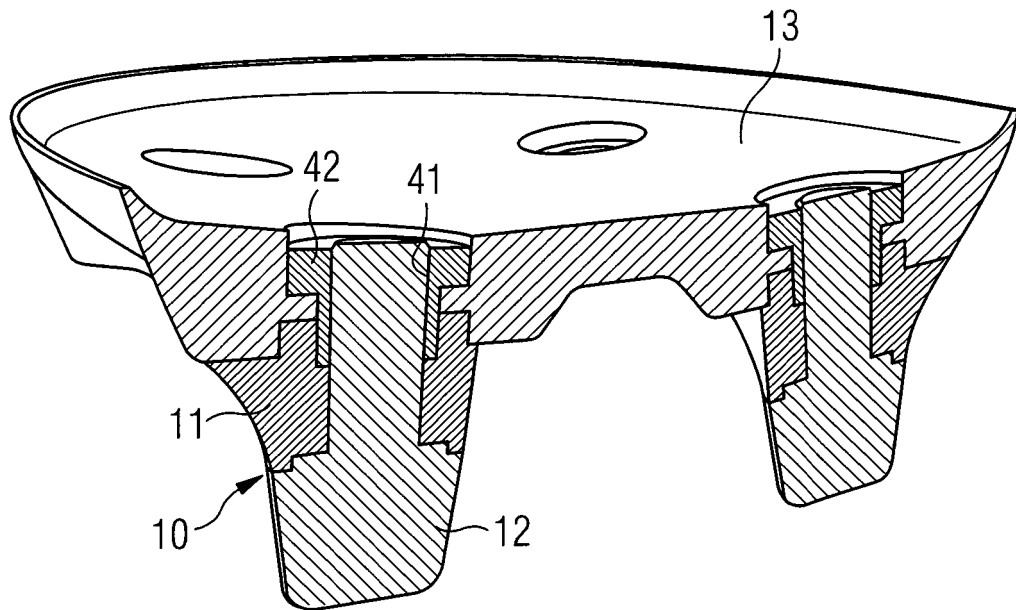


FIG 8A

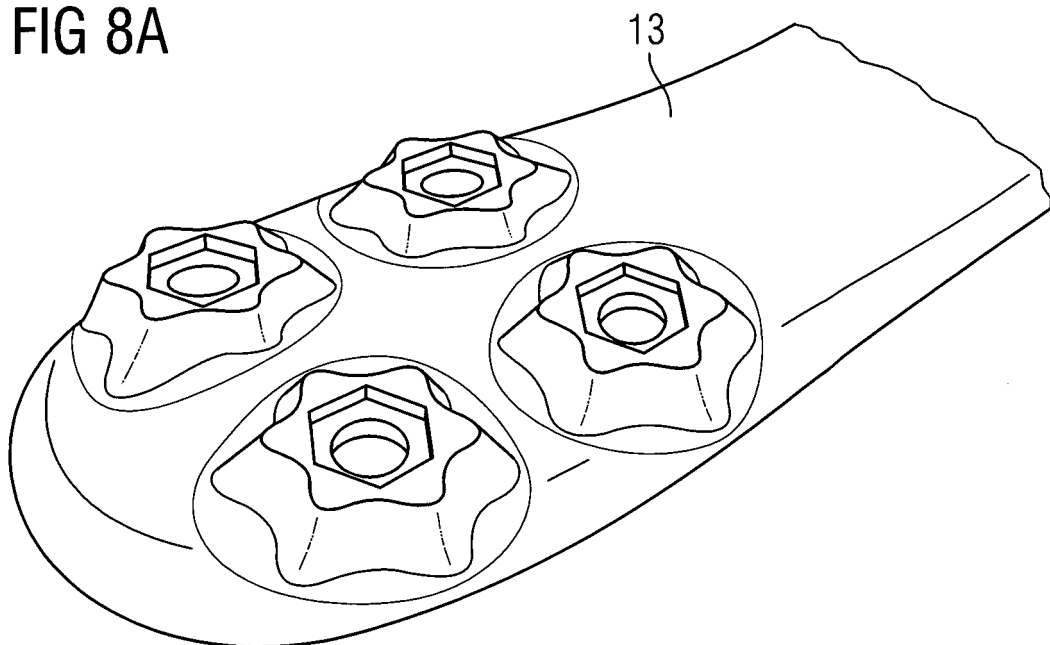


FIG 8B

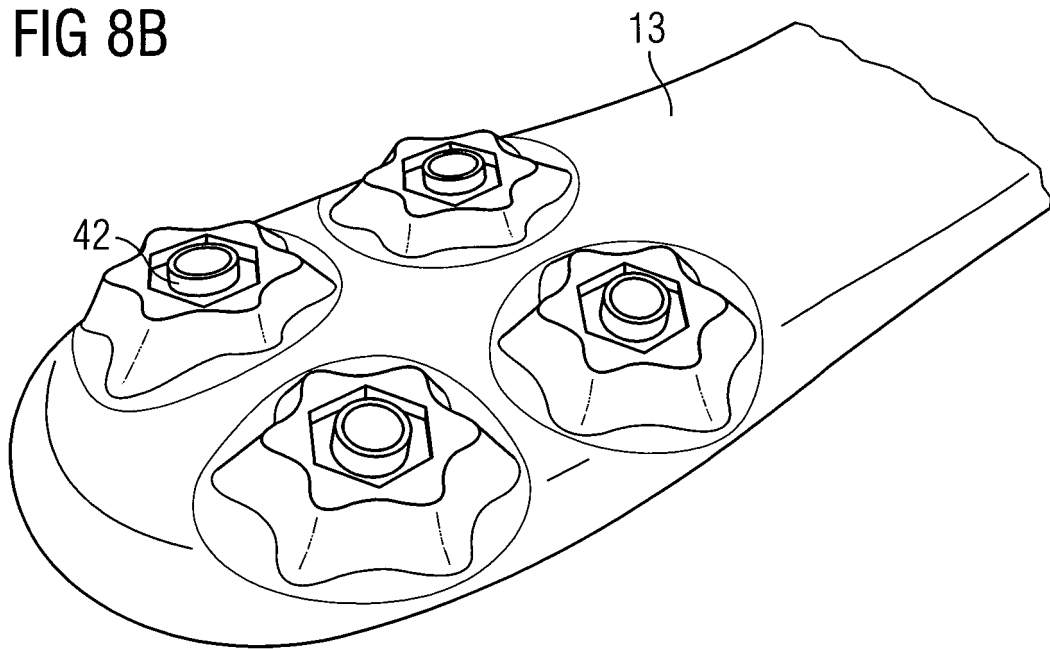


FIG 8C

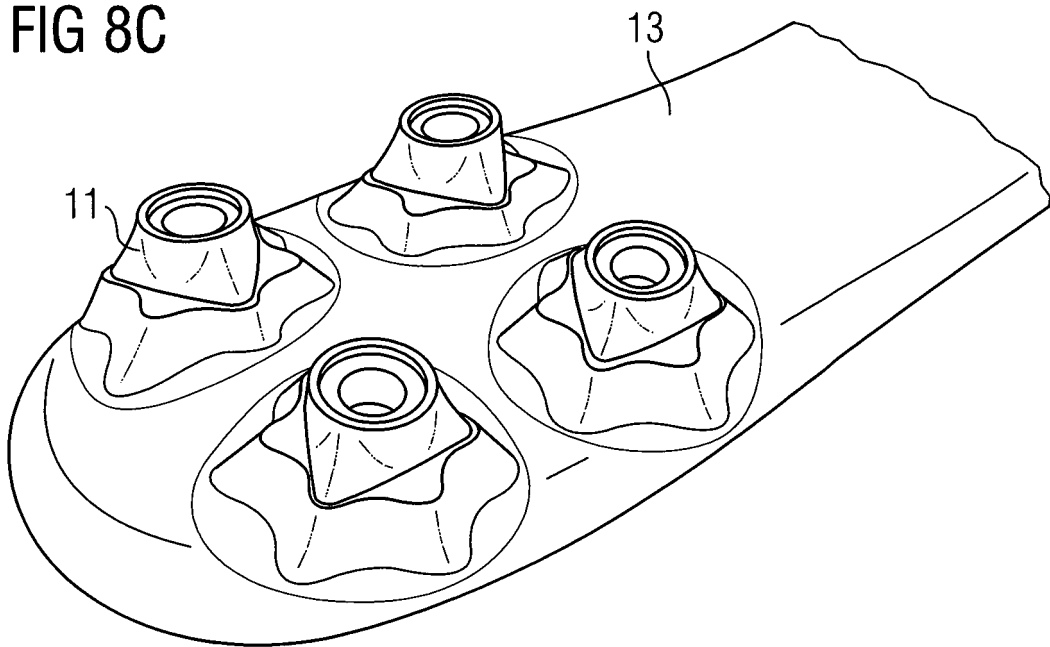
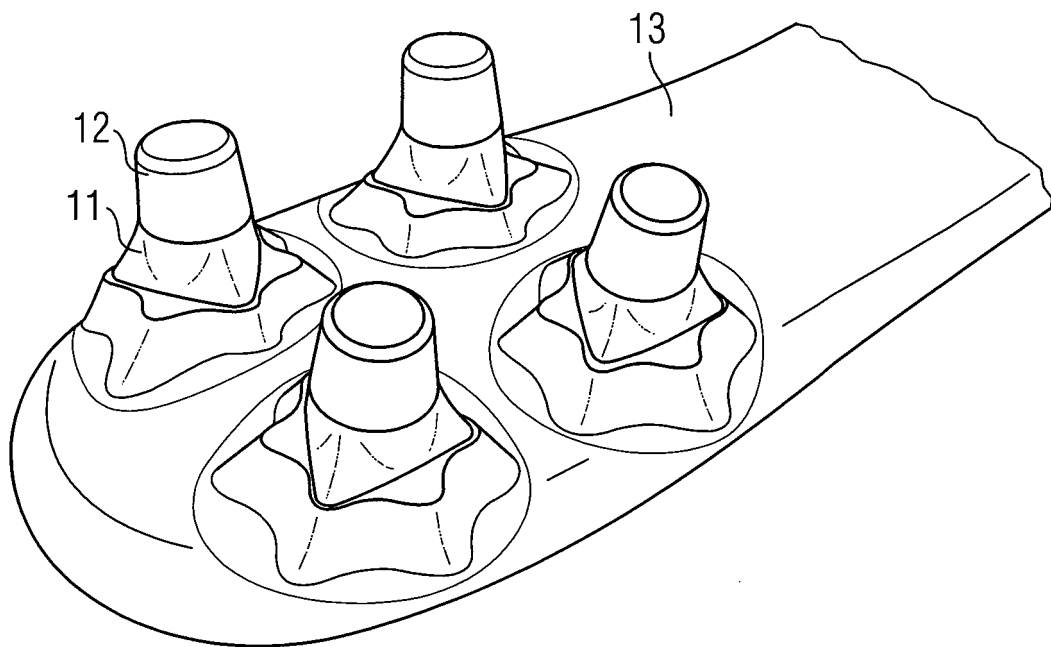


FIG 8D





EUROPEAN SEARCH REPORT

Application Number
EP 16 17 5027

5

10

15

20

25

30

35

40

45

50

55

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	EP 0 451 379 A1 (CHEN CHI MING [TW]) 16 October 1991 (1991-10-16) * abstract; page 2, column 4, lines 26-29; figures 1, 4, 6(A-E); examples *	1-15	INV. A43C15/16 A43B5/02
Y,D	DE 10 2008 025289 A1 (EIFLER CLAUS [DE]; ZORN NILS [DE]) 3 December 2009 (2009-12-03) * figures 1-5; examples *	1-15	
Y	WO 2015/073636 A1 (NIKE INNOVATE CV [US]; SCHILLER DENIS [US]) 21 May 2015 (2015-05-21) * figures 9-10 *	1,11-13	
A	US 8 925 219 B2 (NAPARUANO JOSEPH [US] ET AL) 6 January 2015 (2015-01-06) * column 1, line 63 - column 2, line 3; claims; figures *	1-15	
A	US 3 577 663 A (MERSHON HOWARD BRUCE) 4 May 1971 (1971-05-04) * claims; figures *	1-15	TECHNICAL FIELDS SEARCHED (IPC) A43B A43C
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 10 November 2016	Examiner Chirvase, Lucian
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 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 16 17 5027

5

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
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

10-11-2016

10

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0451379 A1	16-10-1991	CA 2026391 A1 EP 0451379 A1	11-10-1991 16-10-1991
-----	-----	-----	-----
DE 102008025289 A1	03-12-2009	NONE	
-----	-----	-----	-----
WO 2015073636 A1	21-05-2015	US 2016286905 A1 WO 2015073636 A1	06-10-2016 21-05-2015
-----	-----	-----	-----
US 8925219 B2	06-01-2015	US D683113 S US 2013263478 A1	28-05-2013 10-10-2013
-----	-----	-----	-----
US 3577663 A	04-05-1971	NONE	
-----	-----	-----	-----

15

20

25

30

35

40

45

50

55

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 6357146 B1 [0003]
- WO 2014022259 A1 [0004]
- US 20090211118 A1 [0005]
- DE 102008025289 A1 [0009]
- WO 2005072551 A1 [0009]
- EP 0815759 A2 [0009]