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(54) **Stud**

(57) A stud 100 for a releasable mounting to a shoe is clipped into the shoe and comprises in a mounted state a contact surface 111 in contact with the shoe, wherein the contact surface 111 has at least two essentially opposite recesses 112a, 112b for engagement of a removal tool. The at least two essentially opposite recesses 112a,

112b of the contact surface 111 respectively comprise a first engagement surface 113a, 113b inclined with respect to a removal direction 130 of stud 100, wherein the absolute values of the inclination angles α_1 , α_2 formed by the first engagement surfaces 113a, 113b with the removal direction 130 are greater than 0 degree and less than 90 degrees.

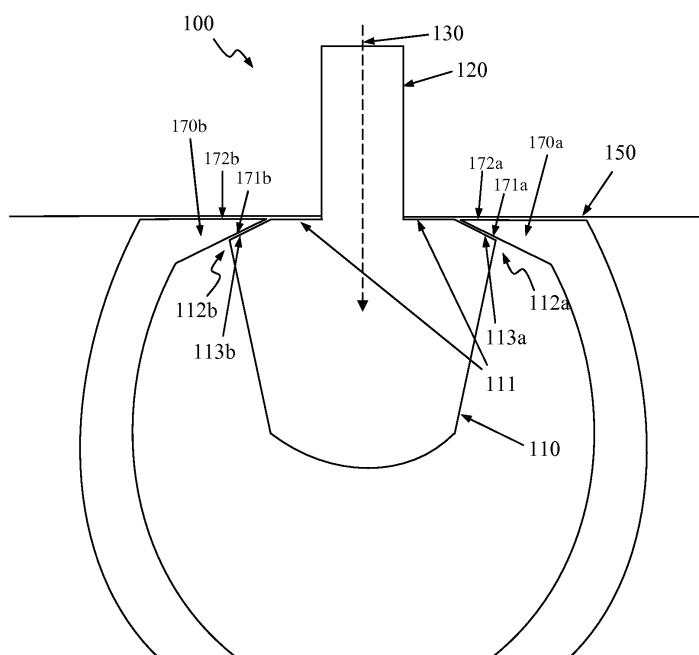


Fig. 1a

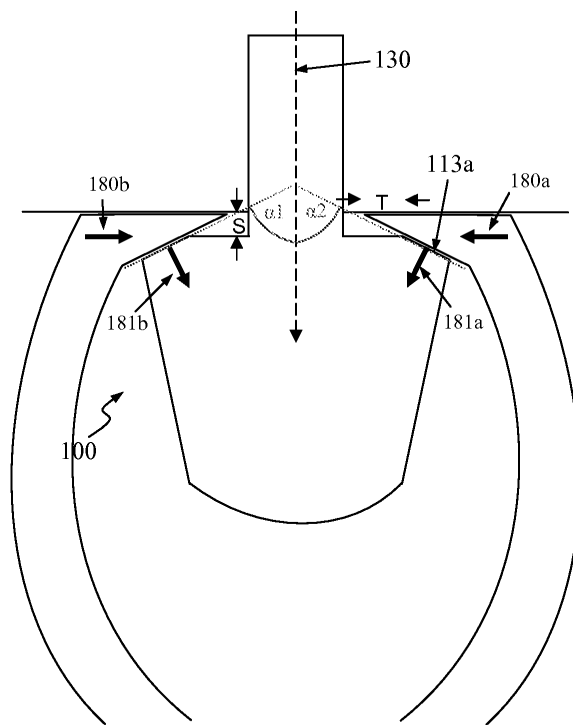


Fig. 1b

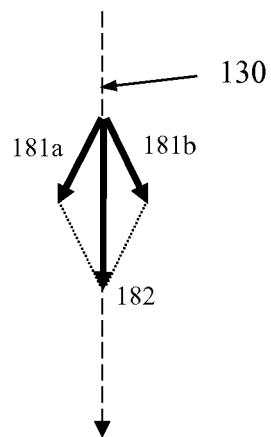


Fig. 1c

Description

1. Technical Field

[0001] The present invention relates to a stud for a shoe, a shoe with a stud and a removal tool for a stud.

2. The prior art

[0002] Studded shoes, which are used in particular for football, primarily have to provide good grip with a soft ground surface such as grass. To this end, studded shoes are equipped with studs which penetrate the ground and prevent slipping of the studded shoe across the ground.

[0003] However, different ground conditions require different studs in order to provide an adjustment to varying weather conditions and ground properties. To this end, different embodiments of exchangeable studs are known from the prior art.

[0004] Exchangeable studs, however, put high demands on the mounting system used. On the one hand, the studs have to be fixed to the shoe in a manner that they can withstand high loads, for example during football, without disengaging. On the other hand, they should be removable without high effort, so that they can be exchanged quickly and effortlessly if necessary.

[0005] Screw in studs, which have been known for a long time, provide a firm connection with the shoe due to the use of screws, and they can be removed without high effort using an appropriate screw tool. However, exchanging them is time-consuming due to the required screwing out and screwing in of the studs.

[0006] In contrast, a clip mounting of a stud enables a much faster exchange. DE 101 63 999 A1 describes a stud which engages with a spring arranged in the sole of the shoe and which can be released with a tool by a quarter turn.

[0007] Such a removal of the stud is not possible with asymmetric studs which comprise an oblong mounting element for mounting to the shoe, in order to secure the stud against rotation. Such an asymmetric stud is described in US 2006/0179688 which can be removed from its mounting with an appropriate tool by pulling in a direction orthogonal to the sole. The stud comprises recesses for engagement of the appropriate tool. The removal of the stud requires a force which is greater than the mounting force used to fasten the stud in the mounting. This limits the mounting force since the mounting force must not be greater than the force a wearer of the shoe can exert for pulling out the studs. This may lead to a stud which is fixed with an insufficient mounting force and which may unintentionally disengage due to high loads.

[0008] US 6,722,061 B2 and US 6,941,684 B2 describe a stud with two recesses which can be engaged with a tool with two corresponding projections. The tool exerts a leverage force in order to remove the stud from the mounting. However, the lever movement cants the

stud since the lever movement essentially is a rotational movement and the leverage forces therefore do not act in the direction in which the stud is removed from its mounting. This lever movement may damage the stud and the stud mounting, especially when frequently repeated.

[0009] Similarly, US 3,566,489 describes exchangeable spikes for a running shoe which can be released from a clip mounting using a tool. The tool partly encompasses the spike and exerts a leverage force to the spike, whereby it is released. However, also in this case, the spike is canted due to the lever movement.

[0010] The DE 200 07 813 U1 shows in Fig. 5 a stud 3 with a recess 62 which is engaged by a wedge 60 from a corresponding removal tool shown in fig. 4. This action of the removal tool presses core 33 outwards so that the stud is released from its locking. Again, the stud may be canted during removal. Further, the stud is complex and requires, for example, a movable core for locking the stud.

[0011] The solutions for studs with clip mounting known from the prior art therefore have various disadvantages. On the one hand, they require considerable forces for releasing the stud, which in addition leads to an undesired limitation of the mounting forces of the stud. The suggested tools for removing the stud cant the stud during removal which requires additional forces and which further limits the mounting forces available for fixing the stud. This causes a risk of injury and damage.

[0012] The present invention is therefore based on the problem to provide a stud for a shoe and a corresponding removal tool to overcome at least partially the disadvantages described above.

3. Summary of the invention

[0013] The present invention solves this problem by a stud for releasable mounting to a shoe according to claim 1. In one embodiment, the stud is clipped into the shoe and comprises a contact surface which contacts the shoe when mounted and which has at least two essentially opposite recesses for engagement of a removal tool. The at least two essentially opposite recesses of the contact surface each comprise first engagement surfaces inclined with respect to a removal direction of the stud wherein the absolute values of the inclination angles formed by the first engagement surfaces with the removal direction are greater than 0 degree and less than 90 degrees.

[0014] Recesses are designated as "essentially opposite recesses" if subject to manufacturing tolerances they are located opposite to one another.

[0015] The inclined first engagement surfaces located at the essentially opposite recesses of the studs lead to a fundamentally different principle of operation compared to studs known from the prior art. Due to the inclination of the first engagement surfaces, the inclined first engagement surfaces facilitate the deflection of two oppos-

ing forces acting in a direction essentially orthogonal to the removal direction, into a direction orthogonal to the first engagement surfaces. The combination of these deflected forces results in a combined force in the removal direction. The inclination of the engagement surfaces further enables a conversion of the forces exerted by the removal tool, so that even with a manual actuation of the removal tool a considerable force in removal direction can be achieved. In contrast to the prior art, the stud can be removed from its mounting, for example by a child, without a great force. In addition, the stud does not cant when being removed, so that no additional forces are required to overcome the canting. In contrast to this, prior art tools require considerable pulling or leverage forces in the removal direction and corresponding counter forces for holding the shoe which usually requires two hands. No such counter forces are required with studs according to the invention.

[0016] The inventive solution not only enables that the stud can be removed from its mounting in a comfortable way, but that it can also be fastened to the shoe more securely with considerably greater mounting forces than prior art studs since greater forces can be exerted in the removal direction with little effort.

[0017] During operation, the removal tool is supported by the shoe in the area of the recesses of the stud and therefore, in contrast to the prior art, can be used with almost any shoe regardless of the shape of the shoe in the area around the stud.

[0018] In a preferred embodiment, the first engagement surfaces of the essentially opposite recesses are oppositely inclined with respect to each other. Preferably, the absolute values of the inclination angles formed by the first engagement surfaces with the removal direction are essentially equal. This enables a simple shape of the removal tool since its engagement means can be symmetrically formed. In addition, due to its symmetric shape the removal tool can engage the stud in two possible ways.

[0019] It is further preferred that the magnitude of the inclination angles which are formed by the first engagement surfaces with the removal direction are greater than 45 degrees. This causes a reduction in the amount of movement of the removal tool needed to move the stud in the removal direction. Thereby the force exerted on the stud is correspondingly increased, so that also the mounting force used to hold the stud in place on the shoe can be increased by a corresponding amount.

[0020] In a preferred embodiment, the stud comprises an oblong, non-rotationally symmetric shape, wherein the at least two opposite recesses are arranged at the longitudinal sides of the stud. The advantages of the present invention for oblong studs with their asymmetric shape are particularly evident since studs with this shape usually cannot be screwed into a shoe. However, the present invention can also be applied to circular, rotationally symmetric studs which have the advantage of saving time for exchanging the studs.

[0021] It is further preferred that the stud is formed so as to be clipped into a shoe. Using a clip mounting, a stud can be fastened and removed to and from a shoe particularly quickly. A clip mounting is therefore advantageous in situations in which studs have to be exchanged quickly.

[0022] In a preferred embodiment, the stud further comprises first mounting means for mounting the stud to the shoe. Further, the at least two essentially opposite recesses are respectively arranged in the area of the mounting means. This arrangement further reduces the risk that the stud cants during removal.

[0023] In a preferred embodiment of the stud, the first mounting means interacts with second mounting means of the shoe during clipping or latching or snapping the stud into the shoe so that the stud can be removed from the shoe by break-away forces acting in a direction parallel to the contact surfaces only if the break-away forces amount to more than 1000 N.

[0024] A further aspect of the present invention relates to a shoe which comprises at least one receptacle for a stud as previously described.

[0025] A further aspect of the present invention relates to a removal tool for removing a stud as previously described. The removal tool comprises in a first embodiment at least two essentially opposite wedge-like engagement means for engaging the at least two essentially opposite recesses of the contact surface of the stud being in contact with the shoe. The at least two essentially opposite wedge-like engagement means each comprise second engagement surfaces which are formed so that they exert force on the stud in the removal direction during a movement of the removal tool into the essentially opposite recesses.

[0026] The advantages of this removal tool result from its effect during removal of a stud from its mounting as described above. Due to its wedge-like engagement means, the removal tool is reliably guided during engagement with the two essentially opposite recesses of the stud which makes the application of the removal tool very simple. In particular, the second engagement surfaces exert a force on the stud in the removal direction, so that the stud does not cant during removal.

[0027] In a preferred embodiment, the second engagement surfaces of the removal tool are oppositely inclined with respect to each other. Since the first engagement surfaces of the stud are preferably oppositely inclined with respect to each other, the movement of the wedge-like engagement means of the removal tool into the essentially opposite recesses of the stud can be transformed into a resulting force in the removal direction.

[0028] In a preferred embodiment, the second engagement surfaces are formed so that they can be moved in a direction which is essentially parallel to the two first engagement surfaces of the stud during use of the removal tool. This enables a particularly effective power transmission from the second engagement surfaces to the first engagement surfaces.

[0029] Preferably, the removal tool is further formed so that during use the at least two wedge-like engagement means move towards each other in an essentially straight direction. Such a movement of the at least two wedge-like engagement means can, for example, be effected by a pliers-like movement of the removal tool which can be carried out by a user in a particularly simple way with one hand. Thereby, the removal tool is guided, as mentioned above, into the recesses and along the inclined engagement surfaces. In contrast to this, a conventional removal of a stud with pliers requires a pulling force or leverage force in the removal direction applied by one hand and an opposite force for retaining the shoe applied by the other hand. This causes a risk of injuries, for example strains of muscles in the area of the arms and the shoulders. Applying a leverage force to the stud causes canting and may damage the stud.

[0030] It is further preferred if the removal tool is formed so that the movement of the two wedge-like engagement means in a straight direction is essentially orthogonal to the removal direction. As already explained above, movement of the wedge-like engagement means in opposing directions both of which are orthogonal to the removal direction of the stud leads to a resulting force on the stud in the removal direction as a result of deflection of the forces through the inclined first and second engagement surfaces.

[0031] In a preferred embodiment, the at least two wedge-like engagement means each comprise third engagement surfaces which are formed so that they move along a shoe surface during use of the removal tool. During its movement, the removal tool is supported by the shoe surface by means of the third engagement surfaces, so that the necessary counter force for removing the stud from its mounting is generated.

[0032] In a further embodiment, in a closed state of the removal tool the at least two wedge-like engagement means are spaced apart from each other. This avoids damage to the stud.

[0033] Further embodiments of the stud according to the invention are described in further dependent claims.

4. Short description of the accompanying figures

[0034] In the following, aspects of the present invention are described in more detail with reference to the accompanying figures. These figures show:

- Fig. 1a, 1b: schematic illustrations of cross-sections of a presently preferred embodiment of a stud;
- Fig. 1c: vector representation of the resulting forces during release of the stud;
- Fig. 2: schematic illustration of a cross-section through a sole with studs according to the invention;

Fig. 3: a schematic illustration of a cross-section of a presently preferred embodiment of a stud and a removal tool;

5 Fig. 4: a perspective view of an embodiment of a removal tool; and

Fig. 5: a perspective view of a cross section of an embodiment of a stud and a receptacle for a stud.

5. Detailed description of preferred embodiments

[0035] In the following, embodiments and modifications of the present invention are explained with respect to a stud for a shoe and a removal tool. The invention can be used for all kinds of shoes with exchangeable studs, for example shoes for football, golf, rugby, hockey, American football, baseball, hiking, mountain climbing and other sports. It is also conceivable to use the studs as exchangeable spikes for running shoes. Further applications could be working shoes and security shoes.

[0036] Fig. 1a and 1b show a schematic illustration of a cross-section of a presently preferred embodiment of a stud 100 of the invention and illustrate principles of the invention which enable the stud 100 to be removed reliably and with minimal effort from its mounting. Stud 100 comprises a stud body 110 and a projection 120 which are only schematically illustrated in this view. A detailed illustration of an embodiment of a stud can be found in fig. 5. The shape of projection 120 determines a removal direction 130 for stud 100, together with the corresponding mounting means of the shoe.

[0037] Stud 100 is mounted to a shoe at a shoe surface 150. Shoe surface 150 may comprise parts of the sole of a shoe and / or means for mounting stud 100. Stud 100 comprises a contact surface 111 which is in contact with shoe surface 150. Contact surface 111 comprises two recesses 112a, b. Recesses 112a, b comprise first engagement surfaces 113a, b which are inclined with respect to the removal direction 130. In the embodiment of fig. 1a, b, the engagement surfaces 113a, b are straight and oppositely inclined with respect to each other. As illustrated in fig. 1b, the absolute values of the angles α and β formed by the two engagement surfaces 113a, b with the removal direction 130 are essentially equal. In further embodiments (not illustrated), the first engagement surfaces 113a, b may be curved, preferably uniform and convex.

[0038] In order to remove the stud 100 from its mounting, a removal tool with wedge-like engagement means 170a, b is used which engages recesses 112a, b, as shown in fig. 1a and 1b. The wedge-like engagement means 170a, b comprise second engagement surfaces 171a, b and third engagement planes 172a, b. The angles between the second engagement surfaces 171a, b and the third engagement surfaces 172a, b essentially correspond to the respective angles between the first engage-

ment surfaces 113a,b and shoe surface 150 of the shoe. In the embodiment of fig. 1a,b, the second engagement surfaces 171a,b and the third engagement surfaces 172a,b are straight. In other embodiments (not illustrated), the second engagement surfaces 171a,b and the third engagement surfaces 172a,b may be curved, preferably uniformly curved.

[0039] A greater force for releasing the stud can be obtained if the curvatures of the surfaces sliding on each other do not correspond. For example, shoe plane 150 can be straight and the third engagement surfaces 172a,b can be curved, or the first engagement surfaces 113a,b can be straight and second engagement surfaces 171a,b can be curved. The greater the curvature, the longer the path in removal direction 130 and thus the greater the force exerted on the stud.

[0040] For releasing stud 100 from its mounting, wedge-like engagement means 170a,b are moved in directions 180a,b. Engagement means 170a,b are thereby supported on shoe surface 150 by means of the third engagement surfaces 172a,b and exert a force in directions 181a,b orthogonal to the first engagement surfaces 113a,b by means of their second engagement surfaces 171a,b. This can be recognized in fig. 1c where the resulting direction 182 is essentially parallel to removal direction 130 if the first engagement surfaces 113a,b have the same inclination angles α_1, α_2 with respect to removal direction 130.

[0041] Due to the inclination of the first engagement planes 113a,b and the cooperation of engagement means 170a,b with first engagement surfaces 113a,b, movement 180a,b of engagement means 170a,b in opposing directions both of which are essentially orthogonal to the removal direction 130 leads to a resulting force 182 in removal direction 130. The result of the movement 180a,b of engagement means 170a,b in opposite directions can be recognized in fig. 1b where stud 100 has moved a distance S in removal direction 130. In contrast to the prior art which teaches a force in removal direction 130, movement of engagement means 170a,b in opposite directions both of which are orthogonal to the removal direction 130 has particular advantages and can be realized, for example, with a pliers-like removal tool which can be used with only a single hand.

[0042] As illustrated in fig. 1b, stud 100 moves by a distance S in removal direction 130 when engagement means 170a,b are moved by distance T in directions 180a,b.

[0043] The transformation ratio T/S depends on the inclination angles α_1, α_2 of the first engagement surfaces 113a,b with respect to removal direction 130. An inclination of first engagement surfaces 113a,b of about 45° leads to a transformation ratio T/S of about 1. If the inclination is greater than 45° , the transformation ratio T/S is larger than 1, i.e. engagement surfaces 170a,b move a distance which is greater than the distance moved by stud 100 in removal direction 130. In this case, the force exerted on stud 100 is larger by a corresponding factor,

since like a lever the resulting force in removal direction 130 depends on the ratio T/S. The flatter the first engagement surfaces 113a,b (i.e. the greater the inclination angles α_1, α_2), the longer the distance T, but also the smaller the force required for releasing the stud. Conversely, the steeper the first engagement surfaces 113a,b (i.e. the smaller the inclination angles α_1, α_2), the shorter the distance T, but also the greater the force required for releasing the stud. At inclination angles α_1, α_2 of 45° the transformation ratio T/S is 1, since the covered distances T and S are equal.

[0044] By making the inclination angles α_1, α_2 larger than 45° , the mounting force which fixes stud 100 in the shoe can be increased, without requiring a correspondingly higher force for removing the stud. As a result, stud 100 can be even more securely fixed to the shoe.

[0045] In further embodiments (not illustrated), stud 100 comprises more than two recesses. In all embodiments, the recesses and their engagement surfaces are formed so that engagement of a corresponding removal tool leads to a resulting force essentially in removal direction.

[0046] As a result, the stud according to the invention can be fastened in the shoe with a significantly higher mounting force than studs known from the prior art. Experiments in the laboratories of applicant have demonstrated that the stud can be separated from the shoe by break-away forces acting in a direction parallel to the contact plane only if the break-away forces are larger than 1000 N. This is more than 30% higher than for prior art studs.

Fig. 2 is a cross section of a sole 101 with studs 200. The figure shows recesses 112a,b of stud 200. In this embodiment, stud 200 is arranged on projections 201 of a sole 101. Nevertheless, stud 200 can be removed from its mounting using engagement means 170a,b shown in fig. 1 since engagement means 170a,b are supported by shoe surface 150. This would be difficult with lever tools known from the prior art which are supported by areas of the sole outside contact surface 111 of stud 200. This is, since in the embodiment of fig. 2 the area outside contact surface 11 is strongly curved so that it is difficult to find a support for a lever in this area.

Fig. 3 is a schematic illustration of a cross section of a presently preferred embodiment of a stud 200' and a removal tool 300 which is formed as a pliers-like tool. Removal tool 300 can be used in a comfortable way with one hand.

[0047] Removal tool 300 comprises wedge-like engagement means 370a,b having second engagement surfaces 371a,b and third engagement surfaces 372a,b. The second engagement surfaces 371a,b are essentially straight in this embodiment while the third engagement surfaces 372a,b are slightly curved. This curvature avoids damaging the sole since the third engagement

surfaces 372a,b can easily slide along the sole. In addition, this curvature extends the distance S (cf. fig. 1b) so that a smaller distance T is required for releasing the stud.

[0048] The contact area between the third engagement surfaces 372a,b and shoe surface 150 provides a means for distributing the force of removal tool 300 over the shoe surface 150. The larger the contact area, the smaller the pressure on shoe surface 150 and therefore the risk of local deformations of shoe surface 150 is lower.

[0049] When removal tool 300 is used, engagement means 370a,b move essentially in a straight line towards each other. Thereby, removal tool 300 exerts a force essentially orthogonal to the removal direction 130 (cf. fig. 1a,b) of stud 200'.

[0050] In one embodiment, there is an intermediate space between wedge-like engagement means 370a,b in a closed state of removal tool 300. This limits the range in which removal tool 300 exerts a force on the stud 200' to a distance which is required to release stud 200' from its mounting, for example to overcome a spring force (cf. fig. 5). This limited range prevents damage to stud 200' by the removal tool 300.

Fig. 4 shows a perspective view of a further embodiment of a removal tool 400 which has wedge-like engagement means 470a,b arranged on a pliers-like tool. Fig. 4 further shows second engagement surfaces 471a,b and third engagement surfaces 472a,b. Second engagement surfaces 471a,b are essentially straight in this embodiment, while third engagement surfaces 472a,b are slightly curved.

Fig. 5 shows a perspective view and a cross section of an embodiment of a stud 500 and a stud receptacle 550. Stud 500 comprises a stud body 510 and a projection 520 as well as recesses 512 for engagement of a removal tool. Recesses 512 are arranged in the area of projection 520 in order to avoid canting when removing stud 500 from stud receptacle 550.

[0051] Stud receptacle 550 comprises an indentation 560 for receiving projection 520 of stud 500. Stud receptacle 550 is closed by a closure 570 having an opening 575. Closure 570 is arranged on the side of stud receptacle 550 directed towards stud 500. Opening 575 corresponds to the contour of projection 520 and additionally provides a secure seat of stud 500 in stud receptacle 550. Stud receptacle 550 can be arranged in the sole area of the shoe and can be fixed thereto.

[0052] Projection 520 of stud 500 has an oblong shape and is therefore secured against rotation when mounted in stud receptacle 550. Projection 520 comprises a circumferential ridge 522 and a circumferential groove 521 for fixing stud 500 in stud receptacle 550. Spring 555 of stud receptacle 550 engages groove 521. During engaging and releasing of stud 500, a resistance of circumferential ridge 522 of projection 520 with respect to spring 555 of stud receptacle 550 has to be overcome. In order

to adjust the removal force of stud 500, either the geometry of circumferential ridge 522 or the spring constant of spring 555 can be modified. The steeper and/or the higher the circumferential ridge 522 and/or the greater the spring constant, the greater is the resistance to be overcome and the greater is the required removal force in order to release stud 500.

[0053] In addition, the present invention can be advantageously applied to rotationally symmetric studs. In an embodiment which also can be used independently of the embodiments described above, a rotationally symmetric stud comprises a contact surface which contacts the shoe when mounted and at least two recesses for engagement of a removal tool. The at least two recesses of the contact surface each comprise first engagement surfaces inclined with respect to a removal direction of the stud, wherein the absolute values of the inclination angles formed by the first engagement surfaces with the removal direction of the stud are greater than 0 degree and less than 90 degrees. It is preferred that the at least two recesses are evenly spaced at the boundary of the contact surface.

[0054] A corresponding removal tool for removing a stud comprises in an embodiment at least two wedge-like engagement means for engaging the at least two recesses of the contact surface of the stud being in contact with the shoe. The at least two wedge-like engagement means each comprise second engagement surfaces which are formed so that they exert force on the stud in the removal direction during a movement of the removal tool into the essentially opposite recesses.

Claims

1. Stud (100, 200, 200', 500) for a releasable mounting to a shoe, wherein the stud (100, 200, 200', 500) is clipped into the shoe and comprises in a mounted state a contact surface (111), wherein the contact surface (111) is in contact with the shoe and has at least two essentially opposite recesses (112a, 112b, 512) for engagement of a removal tool (300, 400), wherein the at least two essentially opposite recesses (112a, 112b, 512) of the contact surface (111) respectively comprise a first engagement surface (113a, 113b) inclined with respect to a removal direction (130) of the stud (100, 200, 200', 500), wherein the absolute values of the inclination angles (α_1 , α_2) formed by the first engagement surfaces (113a, 113b) with the removal direction (130) are greater than 0 degree and less than 90 degrees.
2. Stud (100, 200, 200', 500) according to claim 1, wherein the first engagement surfaces (113a, 113b) of the at least two essentially opposite recesses (112a, 112b, 512) are oppositely inclined with respect to each other.

3. Stud (100, 200, 200', 500) according to claim 1 or 2, wherein the absolute values of the inclination angles (α_1 , α_2) formed by the first engagement surfaces (113a, 113b) with the removal direction (130) are essentially equal. 5
4. Stud (100, 200, 200', 500) according to one of the preceding claims, wherein the absolute values of the inclination angles (α_1 , α_2) formed by the first engagement surfaces (113a, 113b) with the removal direction (130) are greater than 45 degrees and less than 90 degrees. 10
5. Stud (100, 200, 200', 500) according to one of the preceding claims, wherein the stud (100, 200, 200', 500) has an oblong shape and wherein the at least two essentially opposite recesses (112a, 112b, 512) are arranged at the longitudinal sides of the stud (100, 200, 200', 500). 15
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6. Stud (100, 200, 200', 500) according to one of the preceding claims, wherein the stud (100, 200, 200', 500) comprises first mounting means (120, 520) for mounting the stud (100, 200, 200', 500) to the shoe. 25
7. Stud (100, 200, 200', 500) according to claim 6, wherein during mounting of the stud to the shoe the first mounting means (120, 520) interacts with second mounting means (555, 560, 570, 575) of the shoe so that the stud (100, 200, 200', 500) can be separated from the shoe by a break-away force acting in a direction which is parallel to the contact surface (111) only if the force is greater than 1000 N. 30
8. Shoe, comprising at least one receptacle (550) for a stud (100, 200, 200', 500) according to one of the claims 1 - 7. 35
9. Removal tool (300, 400) for removing a stud (100, 200, 200', 500) according to one of the claims 1 - 6 from a shoe, comprising: 40
 - a. at least two essentially opposite wedge-like engagement means (170a, 170b, 370a, 370b, 470a, 470b) for engaging the at least two essentially opposite recesses (112a, 112b, 512) in the contact surface (111) of the stud (100, 200, 200', 500), 45
 - b. wherein the at least two essentially opposite wedge-like engagement means (170a, 170b, 370a, 370b, 470a, 470b) comprise second engagement surfaces (171a, 171b, 371a, 371b, 471a, 471b) which are formed so that they exert force on the stud (100, 200, 200', 500) in the removal direction (130) during a movement of the wedge-like engagement means into the two essentially opposite recesses (112a, 112b, 512). 50
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10. Removal tool (300, 400) according to claim 9, wherein the second engagement surfaces (171a, 171b, 371a, 371b, 471a, 471b) are oppositely inclined with respect to each other.
11. Removal tool (300, 400) according to claim 9 or 10, wherein the two second engagement surfaces (171a, 171b, 371a, 371b, 471a, 471b) are movable in a direction which is essentially parallel to the first engagement surfaces (113a, 113b) of the stud (100, 200, 200', 500) during use of the removal tool (300, 400).
12. Removal tool (300, 400) according to one of the claims 9 - 11, wherein the removal tool (300, 400) is further formed so that during use of the removal tool (300, 400) the at least two essentially opposite wedge-like engagement means (170a, 170b, 370a, 370b, 470a, 470b) move towards each other in an essentially straight direction (180a, 180b).
13. Removal tool (300, 400) according to claim 12, wherein the removal tool (300, 400) is further formed so that the movement of the two essentially opposite wedge-like engagement means (170a, 170b, 370a, 370b, 470a, 470b) in a straight direction (180a, 180b) is essentially orthogonal to the removal direction (130).
14. Removal tool (300, 400) according to one of the claim 9 - 13, wherein the at least two essentially opposite wedge-like engagement means (170a, 170b, 370a, 370b, 470a, 470b) further comprise third engagement surfaces (172a, 172b, 372a, 372b, 472a, 472b) which are formed so that during use of the removal tool (300, 400) they slide along a shoe surface (150) of the shoe directed towards the stud.
15. Removal tool (300, 400) according to one of the claims 9 - 14, wherein in a closed state of the removal tool (300, 400) there is a space between the at least two essentially opposite wedge-like engagement means (170a, 170b, 370a, 370b, 470a, 470b).

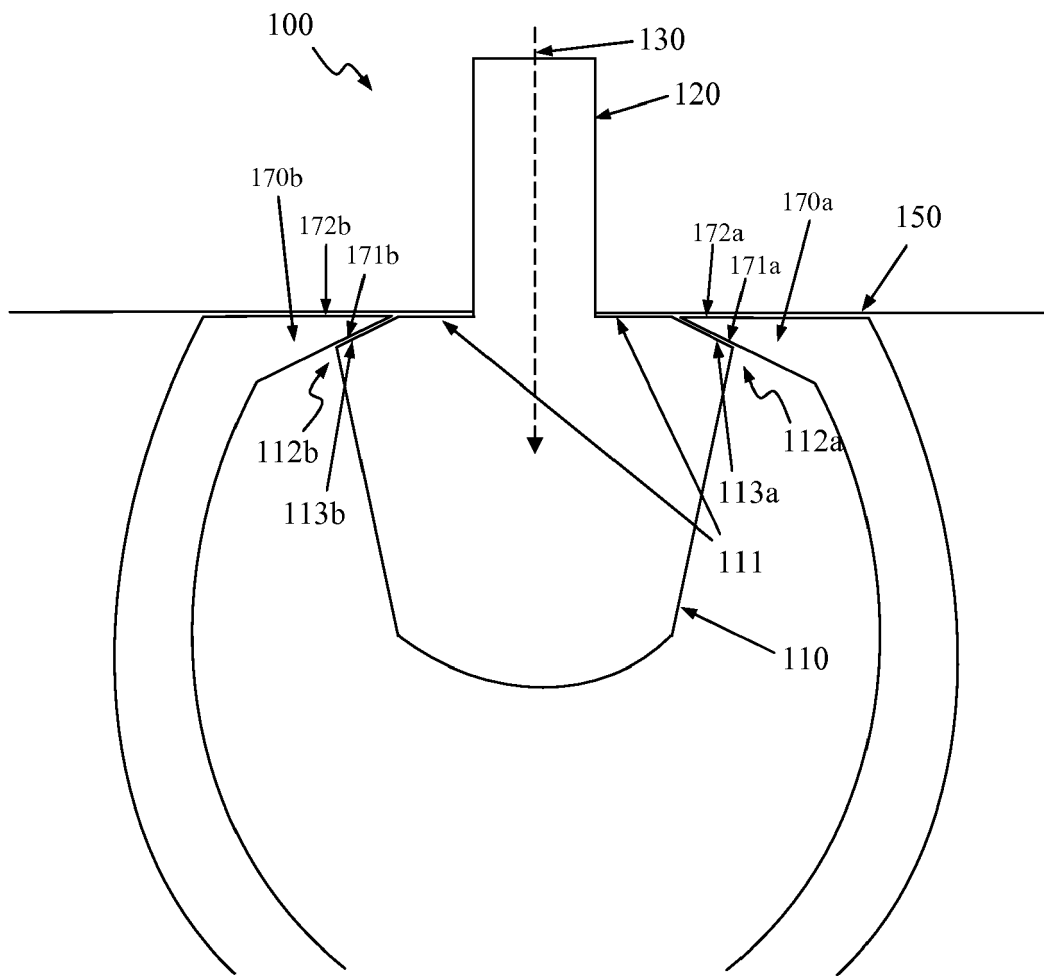


Fig. 1a

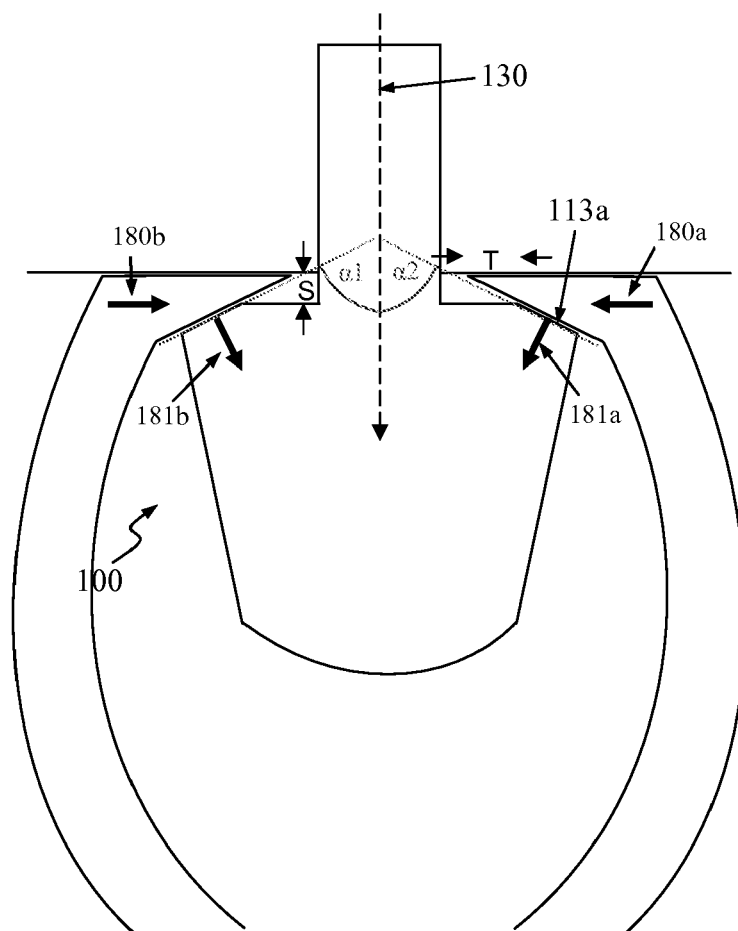


Fig. 1b

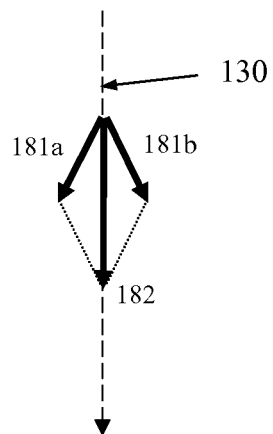


Fig. 1c

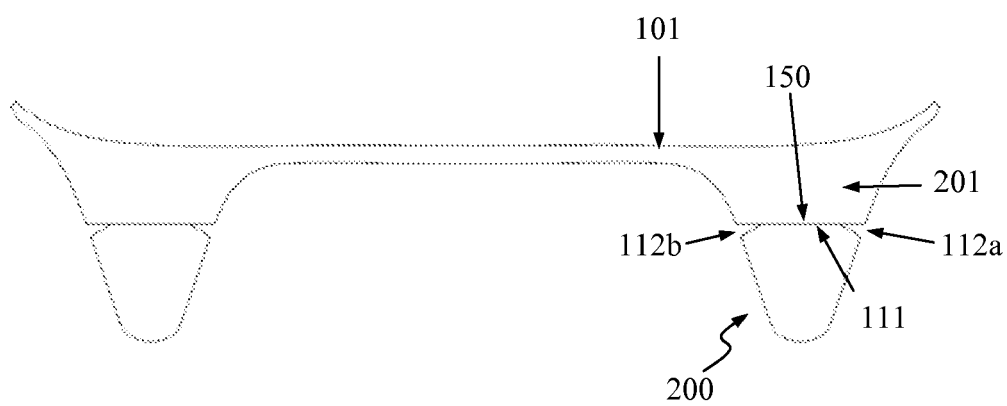


Fig. 2

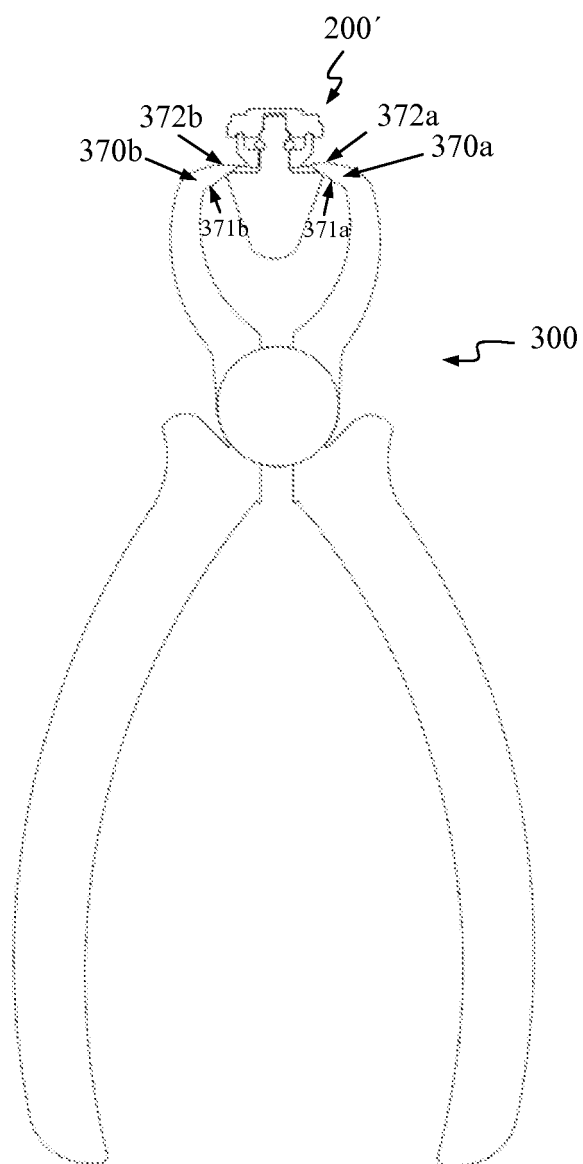


Fig. 3

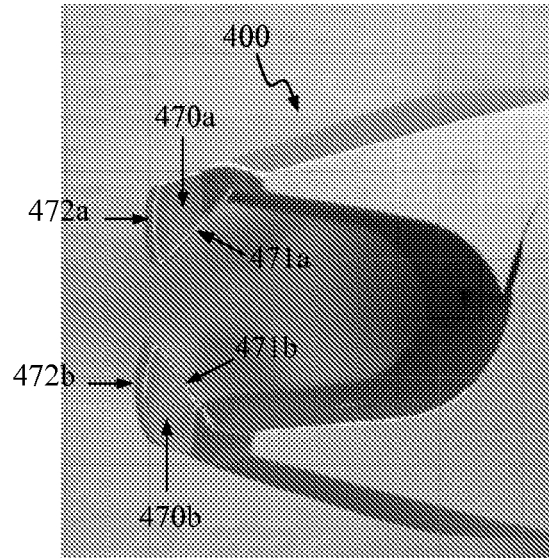


Fig. 4

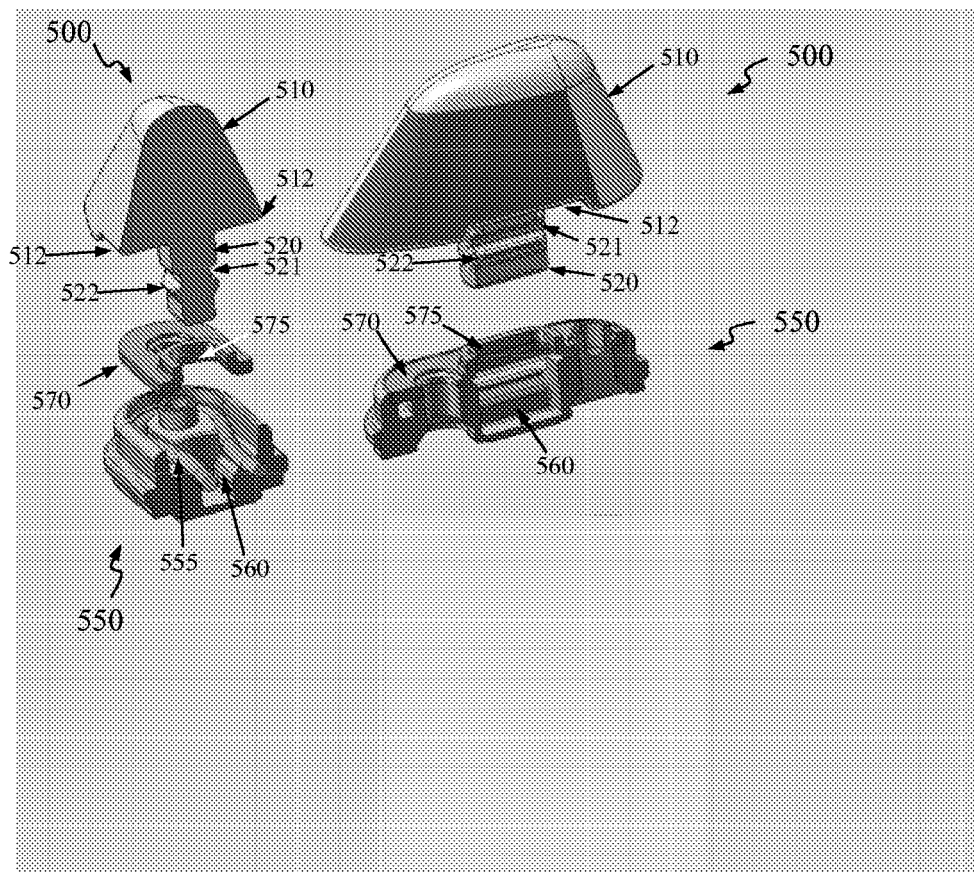


Fig. 5



EUROPEAN SEARCH REPORT

Application Number
EP 10 16 0040

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
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Place of search		Date of completion of the search	Examiner
Munich		17 August 2010	Tejada Biarge, Diego
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			

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17-08-2010

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