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Description

Technical field

[0001] The invention relates to a tension clamp and a rail fastening system for the detachable fastening of a rail on a rail substrate, preferably a railway sleeper.

Background of the invention

[0002] Tension clamps are used to attach a railway rail to a railway sleeper (analogous to another suitable rail substrate). Tension clamps are usually curved steel springs that push the railway rail onto the sleeper in the mounted state. The clamping force of the tension clamp is designed in such a way that welded rails are also held in position even in the event of a break and no gaps form between abutting rails to the furthest extent possible.

[0003] The tension clamp is part of an electrically insulated rail fastening system, which usually comprises the following for each sleeper or attachment point: Tension clamps, angled guide plates that form a rail channel, clamping screws with which the tension clamps are screwed and which are to be anchored in screw dowels cast in the sleeper, as well as rail intermediate bearings under the two rails, which allow elastic sinking of the rails.

[0004] For assembly, the rail fastening system is pre-assembled on the sleeper, wherein the tension clamps are initially in a pre-assembly position in which they are pre-tensioned at a certain torque. For final assembly, the tension clamps are moved from the pre-assembly position towards the rail in such a way that a rail holding section of the tension clamp presses onto the rail base and tightened at the torque for final assembly. For automated assembly, it is important that the tension clamp can be simply pushed by means of a slider without previously loosening the clamping screw.

[0005] Figure 1 is a schematic top view of a tension clamp 100 in accordance with prior art. The tension clamp 100 comprises a middle section formed by two parallel inner arms 110 and 120, which devolve in a continuous and curved manner into torsion sections 130 and 140. In the further progression, the two strands are bent towards a common connecting arm 150, which presses onto the rail base in the mounted state, whereby the rail is tensioned. The tension clamp 100 is bent in a W-shape.

[0006] In the example of Figure 1, the two inner arms 110, 120 are not connected to each other on their sides facing the rail (top side in Figure 1). EP 2 410 090 A1 discloses a deviating, nevertheless W-shaped curved tension clamp. This comprises two inner arms, which are connected to a loop on their sides facing the rail.

[0007] The curved W-shape of the tension clamp creates a spring-elastic holding force required to hold down the rail. Furthermore, other safety aspects are implemented: While the rail is held down with the two highly elastic outer spring arms, the middle section serves as additional tilt protection, which is activated when a certain force is reached and prevents the rail from tilting and lifting the rail from the sleeper. In addition, the tension clamp adapts to any deformations of the track bed that occur over time due to the spring deflection. As a result, a track equipped with tension clamps does not require regular tightening of the clamping screws.

[0008] The tension clamp 100 in accordance with Figure 1 comprises external support points 131 and 141 in the area of the vertices of the torsion sections 130 and 140 for fastening and tensioning. In the mounted state, the outer support points are in contact with an angled guide plate (not shown) and are supported on it for tensioning. Furthermore, the inner arms have 110 and 120 inner support points 111 and 121 for the clamping screw (not shown). Between the inner and outer support points 111, 121, 131, 141, i.e., between the support points of the tension clamp 100 and the force introduction points for the clamping screw, there is a lateral offset L in the direction along the mounted rail. Due to this lateral offset L, not only a bending moment occurs in the event of a load on the tension clamp 100, but also a torsional moment on the inner arms 110 and 120. In other words, the inner arms 110 and 120 are each exposed to a twisting around its own axis during tensioning of the tension clamp 100. This leads to increased wear both on the tension clamp 100 itself as well as on the clamping screw.

<u>Presentation of the invention</u>

[0009] One object of the invention is to provide a tension clamp and a rail fastening system for detachably fastening a rail on a rail substrate with improved reliability.

[0010] The object is achieved by means of a tension clamp having the features of Claim 1 and a rail fastening system with the features of Claim 11. Favourable further embodiments follow from the subclaims, the following illustration of the invention and the description of preferred exemplary embodiments.

[0011] The tension clamp according to the invention is used for the detachable attachment of a rail to a rail substrate. The rail substrate is preferably a railway sleeper but can also be another suitable rail support. The tension clamp is preferably a spring element for the non-positive elastic holding of the rail on the rail substrate. The tension clamp is, apart from a possible coating (described further below), preferably made of one piece, for example, made of steel.

[0012] The tension clamp comprises a middle section for tensioning the tension clamp on a support. The support preferably comprises an angled guide plate, which can be inserted, for example, in a recess of the rail substrate designated for this purpose. The middle section of the tension clamp is clampable by means of a clamping screw, which, for this purpose, preferably interacts with a dowel inserted into a corresponding opening of the support. The tension clamp also comprises an outer section that has a rail holding section which, in the mounted state of the tension clamp, exerts a holding force on the rail. Preferably, the rail comprises a rail base, which is a widened section of the rail in the area of the rail substrate. In this case, tensioning is carried out in such a way that the rail holding section presses onto the rail base in the mounted state of the tension clamp. The tension clamp is set up in such a way that, in the mounted state, the clamping screw exerts a clamping force onto the middle section at at least one point of force application. The clamping force is essentially directed downwards in the direction of gravity, even if deviations are possible due to an intentional, usually low inclination of the clamping screw. It is therefore assumed that the clamping force in the mounted state of the tension clamp is essentially vertically orientated. By exerting the clamping force defined in this way, the tension clamp is attached to the support on the one hand; on the other hand, an elastic deformation of the tension clamp takes place, which results in a non-positive elastic holding of the rail.

[0013] According to the invention, the middle section also comprises at least one support point, which is in contact with the support in the mounted state of the tension clamp. In other words, the tension clamp rests on the support point for tensioning on the support. This refers to a support point that is not located directly on the clamping screw, i.e., the position of the support point differs from that of the point of force application in a projection perpendicular to the clamping force, i.e., in a top view of the tension clamp. Between the support point and the point of force application, the middle section is preferably "free", i.e., does not support itself on the support in such a way that this contributes to a deformation of the tension clamp. Furthermore, the support point does not have any lateral offset relative to the point of force application due to the clamping screw. The term "lateral" refers to a direction along the extension of the rail in the mounted state. In other words, the point of force application and the support point are essentially located on a plane that is perpendicular to the extension direction of the rail.

[0014] Since the support point has no lateral offset relative to the point of force application of the clamping screw, no or a significantly reduced torsional moment acts on the middle section when clamping the tension clamp. In other words, the middle section is not subject to any twisting around its own axis. This leads to improved wear behaviour of both the tension clamp as well as the clamping screw.

[0015] Preferably, the tension clamp has no support point that is in contact with the support in the mounted state of the tension clamp and has a lateral offset relative to the point of force application. In this way, internal torsional moments of the middle section can be minimized.

[0016] Preferably, the outer section comprises at least one torsion section that connects the middle section to the rail holding section, extends from the middle section laterally (in accordance with the definition above), and has no support point with the support. The torsion section is at least one part of an elastic connection between the middle section and the rail holding section, whereby the non-positive elastic mounting described above can be implemented. Since the torsion section does not comprise a support point with the support, internal torsional moments of the middle section of the tension clamp can be effectively reduced.

[0017] The support point is hereinafter also referred to as the second support point. Preferably, the middle section has at least one further support point, which is designated as the first support point, is in contact with the support in the mounted state of the tension clamp and is in a projection perpendicular to the clamping force at the position of the point of force application, so that the first support point and the second support point relative to each other have no offset. The first support point is located in the mounted state in the area of the clamping screw. The first support point is preferably created by pressing the middle section of the tension clamp at this point by tightening the clamping screw on the support. In this way, internal torsional moments of the middle section of the tension clamp can be effectively reduced with stable and reliable mountability.

[0018] According to the invention, the middle section comprises two inner arms that extend parallel and in a projection perpendicular to the clamping force in a straight line, wherein the two inner arms each comprise a point of force application (in the sense defined above) and at least one support point that does not have any lateral offset relative to the associated point of force application. The projected extension direction of the two inner arms is preferably perpendicular to the extension direction of the rail in the mounted state of the tension clamp. The construction of the clamp can be simplified by means of two inner arms, as these can be bent, preferably in a mirror-symmetrical manner, in order to form the outer section in their further progression.

[0019] Preferably, the two inner arms each comprise a first support point and a second support point, which do not have any lateral offset relative to each other. In the mounted state of the tension clamp, the first two support points are located at the position of points of force application of the clamping screw, in a projection perpendicular to the clamping force. The first two support points are located in the area of the clamping screw. The first support points are preferably created by pressing the two inner arms at these points by tightening the clamping screw on the support. In this way, internal torsional moments of the middle section of the tension clamp can be effectively reduced with stable and reliable mounting.

[0020] Preferably, the two inner arms in the area of the respective (second) support point are bent on a plane perpendicular to the direction of extension of the rail, preferably being bent in an S-shape. By bending the two inner arms, the non-positive elastic functionality of the tension clamp can be easily implemented from a design and manufacturing standpoint.

[0021] Preferably, the outer section comprises two torsion sections, which extend accordingly from an associated inner arm laterally and connect the inner arms with the rail holding section. The one inner arm and the associated torsion section are, in this case, preferably mirror-symmetrical to the other inner arm and associated torsion section relative to a mirror plane that is perpendicular to the extension direction of the rail. The torsion sections are preferably manufactured by bending the inner arms (more precisely, their extension), whereby the non-positive elastic functionality of the tension clamp can be implemented in a simple way from a design and manufacturing standpoint.

[0022] Preferably, the two inner arm rail sides each have an inner end. This means that the two inner arms on their sides facing the rail are not connected to each other, i.e., they do not form a loop but end. In accordance with this embodiment, the two inner arms are connected at most via the outer section.

Preferably, the rail holding section comprises a connecting arm that connects the two inner arms to one another.

[0023] A detailed and preferred exemplary embodiment of a tension clamp based on a curved steel strand has the following structure (viewed in a top view, i.e., a projection perpendicular to the clamping force): Starting from the inner end of one of the two inner arms, the inner arm extends along a direction that leads away from a clamped rail. The inner arm is followed by a torsion section, which passes through a vertex bent sideways outwards and continues bent devolving into an outer arm, which preferably does not lead back exactly parallel, but approximately in the direction of the inner arm beyond the inner end and passes into the connecting arm at an outer deflection point. In the mounted state of the tension clamp, the connecting arm runs parallel to the rail and presses onto a rail base to tension the rail. Analogous to the flank of one inner arm, starting from the other inner end, the other inner arm extends along a direction that leads away from the clamped rail. The other inner arm is followed by another torsion section, which passes through a vertex bent sideways outwards and continues bent devolving into another outer arm, which preferably does not lead back exactly parallel, but approximately in the direction of the inner arm back beyond the inner end and passes into the connecting arm at another outer deflection point. The structure, in particular, the two deflection points and the two vertices preferably have the shape of a trapezoid in the projection perpendicular to the clamping force. Preferably, the two flanks are mirror-symmetrical.

[0024] Preferably, the tension clamp is at least partially surrounded by an insulating material, preferably plastic, thereby preferably being overmolded. Due to the fact that the support point (analogous to a plurality of support points) is designed without eccentricity or offset, the movement of the middle section of the tension clamp during clamping is minimized in addition to the technical effects described above. This helps to ensure that such insulation is reliable and durable. Due to the improved insulation with significantly increased electrical resistance, which is synergistically made possible by the arrangement of the support point (analogous to a plurality of support points), the tension clamp and a rail fastening system equipped with it are particularly well suited for covered tracks, which are primarily used in local transport. The background is the increased stray current problem in this area. In addition, the rail fastening system (with and without additional insulation) can be designed to be particularly flat, whereby any asphalt surface over it can be provided to be particularly thick and be capable of sustaining weight load. Due to the large contact surface of the tension clamp on the rail base, which is ensured, for example, by the connecting arm, an insulator section can be implemented as part of the above-mentioned insulation between the rail base and the tension clamp without major wear. A distinction can be made here between a first insulation of the tension clamp to the clamping screw and a second insulation of the tension clamp to the rail base, which may be constructed differently, in particular, thereby being able to meet different mechanical and/or electrical requirements.

[0025] The rail fastening system according to the invention is intended for detachably fastening a rail on a rail substrate. The rail fastening system comprises a clamping screw and a tension clamp as described above. The middle section of the tension clamp is screwed and clamped by means of the clamping screw on a support in such a way that the rail holding section exerts a holding force on the rail, wherein the clamping screw exerts a clamping force on the middle section at at least one point of force application, the support point is in contact with the support, the position of the support point differs from that of the point of force application in a projection perpendicular to the clamping force and the support point relative to the point of force application has no lateral offset.

[0026] The features, technical effects, advantages, as well as exemplary embodiments described in relation to the tension clamp apply analogously to the rail fastening system.

[0027] Preferably, the support and/or the tension clamp has means for lateral movement of the tension clamp. For example, the support comprises a groove section or a grooved plate that interacts in a toothed way with the tension clamp to implement a horizontal adjustability of the tension clamp along the rail.

[0028] Further advantages and features of the present invention are evident from the following description of preferred exemplary embodiments. The features described therein may be implemented stand-alone or in combination with one or a plurality of the features set out above, provided that the features do not contradict one another. The following description of the preferred exemplary embodiments is made with reference to the accompanying drawings.

<u>Short description of the figures</u>

[0029]

Figure 1 is a schematic top view of a tension clamp in accordance with prior art.

Figure 2 is a perspective schematic view of a tension clamp with improved support characteristics.

Figures 3a to 3c are different schematic views of the tension clamp in accordance with Figure 2, wherein Figure 3a is a top view, Figure 3b is a perspective lateral view (viewed on the rail side) and Figure 3c is a lateral view.
Figure 4 is a top view that schematically shows a rail fastening system with a clamped rail.

Figure 5 is a schematic sectional view of the rail fastening system in accordance with Figure 4.

Figure 6 is a schematic top view showing a section of the rail fastening system in accordance with Figure 4.

Detailed description of preferred exemplary embodiments

[0030] In the following, preferred exemplary embodiments are described on the basis of the figures. The same, similar or identical elements in the figures are provided with identical reference numbers, and a repetitive description of these elements is partially dispensed with in order to avoid redundancies.
[0031] Figure 2 is a perspective schematic view of a tension clamp 1, which is a spring element made of a curved steel strand. Figures 3a, 3b and 3 show further views of the tension clamp 1 in accordance with this embodiment. The tension clamp 1 comprises a middle section formed by two inner arms 10 and 20, and an outer section consisting of two torsion sections 30 and 40, two outer arms 50 and 60, and a connecting arm 70, which connects the two outer arms 50, 60. The connecting arm 70 is an example of a rail holding section which, in the mounted state of the tension clamp 1, exerts a holding force onto the rail to be fastened.
[0032] In accordance with the present embodiment, the different sections of the tension clamp 1 are diverge into each other in a continuous and curved manner in such away that a single-piece, W-shaped spring element is formed.
[0033] The structure of the tension clamp 1 in the top view of Figure 3a is in detail as follows: Starting from an inner end 11 of the one inner arm 10, the inner arm 10 extends along a direction that leads away from a possible rail (not shown in Figure 2). The inner arm 10 is followed by the torsion section 30, which runs outwardly curved through a vertex 31 and continues bent devolving into the outer

arm 50, which in the present exemplary embodiment does not return exactly parallel, but approximately in the direction of the inner arm 10 beyond the inner end 11 and passes at an outer deflection point 51 into the connecting arm 70. The connecting arm 70 runs parallel to the rail in the mounted state of the tension clamp 1 and presses on a rail base to clamp the rail. Analogous to the flank of the inner arm 10, starting from an inner end 21 of the other inner arm 20, the inner arm 20 extends along a direction that leads away from a possible rail (not shown in Figure 2). The inner arm 20 is followed by the torsion section 40, which runs outwardly curved through a vertex 41 and continues bent devolving into the outer arm 60, which in the present exemplary embodiment does not return exactly parallel, but approximately in the direction of the inner arm 20 beyond the inner end 21 and passes at an outer deflection point 61 into the connecting arm 70.

[0034] The structure, in particular, the deflection points 51, 61 and vertices 31, 41 have approximately the shape of a trapezoid in the top view of Figure 3a. However, the shape may differ from the shape shown in Figures 2, 3a to 3c. For example, the two outer arms 50 and 60 can run parallel. Furthermore, if necessary, the connecting arm 70 can be dispensed with if the rail holding section of the tension clamp 1 is constructed in another way, in particular, if the two inner arms 10, 20 have no ends 11, 21 but are connected to each other at those ends instead.

[0035] The tension clamp 1 is mirror-symmetrically formed, relative to a mirror plane, which is perpendicular to the extension of the connecting arm 70 and runs in the middle between the two inner arms 10, 20.

[0036] The two inner arms 10, 20 each comprise a flattened surface 12 and 22, which are intended for the direct or indirect (for example by means of a washer) support of the head of a clamping screw for tensioning the tension clamp 1 in the final assembly position (see Figures 4, 5 and 6). On the side of the corresponding inner arm 10, 20 opposite to the flattened surface 12, 22, the tension clamp 1 lies in the final assembly position at a first support point 13, 23 on a support (described below). Furthermore, both inner arms 10, 20 each have a second support point 14, 24, also at the underside of the tension clamp 1 (seen in final mounting position) and also for support on the support. In the top view of Figure 3a, the two support points 13, 14 (analogous to 23, 24) are essentially on a line that stands vertically on the connecting arm 70 or a rail to be clamped. In other words, the two support points 13, 14 (analogous to 23, 24) have essentially no offset. They are both located on the straight extension direction of the respective inner arm 10, 20. In particular, the torsion sections 30, 40 have no support points.

[0037] In the pre-assembled, but not yet tensioned state of tension clamp 1, the sections of the inner arms 10, 20, which are located between the two support points 14, 24, are preferably "free", i.e., they are not in contact with the support, so that the tension clamp 1 deforms during final assembly by tightening the clamping screw and can be clamped in this way. Since the two support points 13, 14 (analogous to 23, 24) have no lateral offset, no or a significantly reduced torsional moment acts on the inner arms 10 and 20 when clamping the tension clamp 1. This leads to an improved wear behaviour of both the tension clamp 1 as well as the clamping screw.

[0038] The particular arrangement of the support points 13, 14, 23, 24 is preferably achieved by the fact that the inner arms 10, 20 are each bent in a plane that runs parallel to the mirror plane defined above and contains the corresponding inner arm 10, 20 (more precisely, its centre line). The inner arms 10, 20 are in this respect preferably curved in an S-shape, as shown in Figure 3c.

[0039] Figures 4 to 6 show the final assembly position of tension clamp 1 as part of a force-locked elastic rail fastening system.

[0040] Figure 4 is a schematic top view and shows a rail 2 with a rail base 2a, which is clamped on both sides by means of a tension clamp 1. Rail 2 is located in a recess 3a (see Figure 5) of a sleeper 3 (or another suitable rail support). The rail fastening system has an angled guide plate 4, which is respectively screwed to the sleeper 3 with a clamping screw 5. The non-positive elastic mounting of the rail base 2a is carried out via the tension clamp 1 shown above, which is clamped by the clamping screw 5 via a washer 5a. The angled guide plate 4 has a contact surface that is set up for the support points of the tension clamp 1, in particular for supporting the support points 13, 23, 14, 24.

[0041] In a pre-assembly position not shown, the clamping screws 5 is tightened at a provisional tightening torque, for example, about 50 Nm, and the tension clamp 1 is in a position offset by rail 2.

[0042] If tension clamp 1 is moved from the pre-assembly position towards the rail 2 into the final assembly position, the tension clamp 1 is in a position shown in Figures 4 to 6. The clamping screw 5 comes into contact with the flattened surfaces 12, 22 of the two inner arms 10, 20 via the washer 5a, and the connecting arm 70 slides over the rail base 2a. The two inner arms 10, 20 of the tension clamp 1 come to rest at a short distance from the rail base 2a (or come into contact with it), whereby tilt protection is given. Subsequently, the clamping screw 5 is tightened at the final tightening torque in such a way that the tension clamp 1 is tensioned and the connecting arm 70 presses at the desired force on the rail base 2a.

[0043] From the sectional view of Figure 5, it is evident that the shaft of the clamping screw 5, after it has passed between the two inner arms 10, 20 of the tension clamp 1, penetrates the angled guide plate 4 and engages into a dowel 6 inserted into a corresponding opening of the sleeper 3. Force is applied to the tension clamp 1 from above when tightening the clamping screw 5, whereby the rail base 2a is clamped and the tension clamp 1 is tensioned.

[0044] In accordance with the exemplary embodiment of Figures 4 to 6, a separate insulation 7 between the tension clamp 1 and the angled guide plate 4 and the rail base 2a is provided. The electrical insulation 7 is, for example, made of plastic, preferably being sprayed on or overmolded, whereby the tension clamp 1 is at least partially surrounded by the insulation. A differentiation can be made here between a first insulation 7a of the tension clamp 1 to the clamping screw 5 and a second insulation 7b of the tension clamp 1 to the rail base 2a, which can be constructed differently, in particular, being able to satisfy different mechanical and/or electrical requirements. For the constructive solution, concerning insulation 7, it is important that a movement of the middle area of the tension clamp 1, in particular, the inner arms 10, 20, is excluded or at least greatly reduced. This requirement is fulfilled by the above arrangement of support points 13, 14, 23, 24 without eccentricity or lateral offset.

[0045] Due to the improved insulation with significantly increased electrical resistance, which is synergistically made possible by the arrangement of support points 13, 14, 23, 24, the rail fastening system is particularly well suited for covered tracks, which are primarily used in local transport. The background of this entails the increased stray current problem in this area.

[0046] In addition, the rail fastening system can be designed to be particularly flat, whereby any asphalt surface over it can be provided to be particularly thick and be capable of sustaining weight load. Due to the large contact surface of the tension clamp 1 on the rail base 2a, which is ensured by the connecting arm 70, an insulator section can be implemented as part of the above-mentioned insulation 7 between the rail base 2a and the tension clamp 1 without major wear.

[0047] In order to realize a horizontal adjustability of the tension clamp 1 along the rail 2, the angled guide plate 4 can be equipped with a groove section or a grooved plate 8. What a toothing of this kind can look like is particularly clear from Figure 6.

[0048] Where applicable, all individual features shown in the exemplary embodiments can be combined and/or exchanged without going beyond the scope of the invention.

Reference list

[0049]

1	tension clamp
2	rail
2a	rail base
3	sleeper
3a	recess
4	angled guide plate
5	clamping screw
5a	washer
6	dowel
7	insulation
7a	first insulation
7b	second insulation
8	grooved plate
10	inner arm
11	inner end
12	flattened surface
13	first support point
14	second support point
20	inner arm
21	inner end
22	flattened surface
23	first support point
24	second support point
30	torsion section
31	vertex
40	torsion section
41	vertex

50	outer arm
51	deflection point
60	outer arm
61	deflection point
70	connecting arm
100	tension clamp
110	inner arm
111	support point
120	inner arm
121	support point
130	torsion section
131	support point
140	torsion section
141	support point
150	connecting arm

Patentkrav

1. Spændeklemme (1) til aftagelig fastgørelse af en skinne (2) på et skinneunderlag, som har et midterafsnit til fastspænding af spændeklemmen (1) på en base, som foretrukket er eller omfatter en vinkelføringsplade (4), ved hjælp af en spændeskrue (5) og et yderafsnit, som har et skinneholdeafsnit (70), som i monteret tilstand af spændeklemmen (1) udøver en holdekraft på skinnen (2), hvor

spændeklemmen (1) er udformet sådan, at spændeskruen (5), i monteret tilstand, ved det mindst ene kraftangrebspunkt udøver en spændekraft på midterafsnittet, og

midterafsnittet har to indvendige arme (10, 20), som strækker sig parallelt og i en projektion vinkelret på spændekraften i lige linje,

kendetegnet ved, at

de to indvendige arme (10, 20) hver har et kraftangrebspunkt og mindst et kontaktpunkt (14, 24), som i spændeklemmens (1) monterede tilstand er i kontakt med basen, hvis position adskiller sig fra kraftangrebspunktets i en projektion vinkelret på spændekraften, og som i forhold til kraftangrebspunktet ingen sideværts forskydning har.

2. Spændeklemme (1) ifølge krav 1, **kendetegnet ved, at** den ikke har et kontaktpunkt, som i spændeklemmens (1) monterede tilstand er i kontakt med basen og i forhold til kraftangrebspunktet har en sideværts forskydning.

3. Spændeklemme (1) ifølge krav 1 eller 2, **kendetegnet ved, at** yderafsnittet mindst har et torsionsafsnit (30, 40), som forbinder midterafsnittet med skinneholdeafsnittet (70), strækker sig sideværts fra midterafsnittet og intet kontaktpunkt med basen har.

4. Spændeklemme (1) ifølge et af de foregående krav, **kendetegnet ved, at** kontaktpunktet (14, 24) er at andet kontaktpunkt, og midterafsnittet desuden har mindst et første kontaktpunkt (13, 23), som i spændeklemmens (1) monterede tilstand er i kontakt med basen og befinder sig i en projektion vinkelret på spændekraften på kraftangrebspunktets position, sådan at det første kontaktpunkt (13, 23) og det andet kontaktpunkt (14, 24) ingen forskydning har i forhold til hinanden.

5. Spændeklemme (1) ifølge krav 4, **kendetegnet ved, at** de to indvendige arme (10, 20) hver har et første kontaktpunkt (13, 23) og et andet kontaktpunkt (14, 24), som ikke har en sideværts forskydning i forhold til hinanden.

6. Spændeklemme (1) ifølge et af de foregående krav, **kendetegnet ved, at** de to indvendige arme (10, 20) i området for det respektive kontaktpunkt (14, 24) i et plan vinkelret på skinnens (2) udstrækningsretning, er buede, foretrukket i S-form.

7. Spændeklemme (1) ifølge et af de foregående krav, **kendetegnet ved, at** yderafsnittet har to torsionsafsnit (30, 40), som tilsvarende strækker sig sideværts fra en tilhørende indvendig arm (10, 20) og forbinder de indvendige arme (10, 20) med skinneholdeafsnittet (70), hvor den ene indvendige arm (10) og det tilhørende torsionsafsnit (30) er udformet spejlsymmetrisk med den anden indvendige arm (20) og tilhørende torsionsafsnit (40), i forhold til et spejlniveau, som er vinkelret på skinnens (2) udstrækningsretning.

8. Spændeklemme (1) ifølge et af de foregående krav, **kendetegnet ved, at** de to indvendige arme (10, 20) på skinnesiden hver har en indvendig ende (11, 21).

9. Spændeklemme (1) ifølge et af de foregående krav, **kendetegnet ved, at** skinneholdeafsnittet (70) har en forbindelsesarm, som bringer de to indvendige arme (10, 20) i forbindelse med hinanden.

10. Spændeklemme (1) ifølge et af de foregående krav, **kendetegnet ved, at** denne i det mindste delvist er omgivet, foretrukket indkapslet, af et isolerende materiale, foretrukket plast.

11. Skinnefastgørelsessystem til aftagelig fastgørelse af en skinne (2) på et skinneunderlag, som har en spændeskrue (5) og en spændeklemme (1) ifølge et af de foregående krav, hvis midterafsnit ved hjælp af spændeskruen (5) er fastskruet og fastspændt sådan på en base, at skinneholdeafsnittet (70) udøver en holdekraft på skinnen (2), hvor

spændeskruen (5) på mindst et kraftangrebspunkt udøver en spændekraft på midterafsnittet, og

kontaktpunktet (14, 24) er i kontakt med basen, kontaktpunktets (14, 24) position adskiller sig fra kraftangrebspunktets i en projektion vinkelret på spændekraften, og kontaktpunktet (14, 24) i forhold til kraftangrebspunktet ingen sideværts forskydning har.

12. Skinnefastgørelsessystem ifølge krav 11, **kendetegnet ved, at** basen og/eller spændeklemmen (1) har mekanismer til sideværts bevægelse af spændeklemmen (1), foretrukket har basen et rilleafsnit eller en rilleplade (8), som ved indgreb arbejder sammen med spændeklemmen (1).

Fig.1

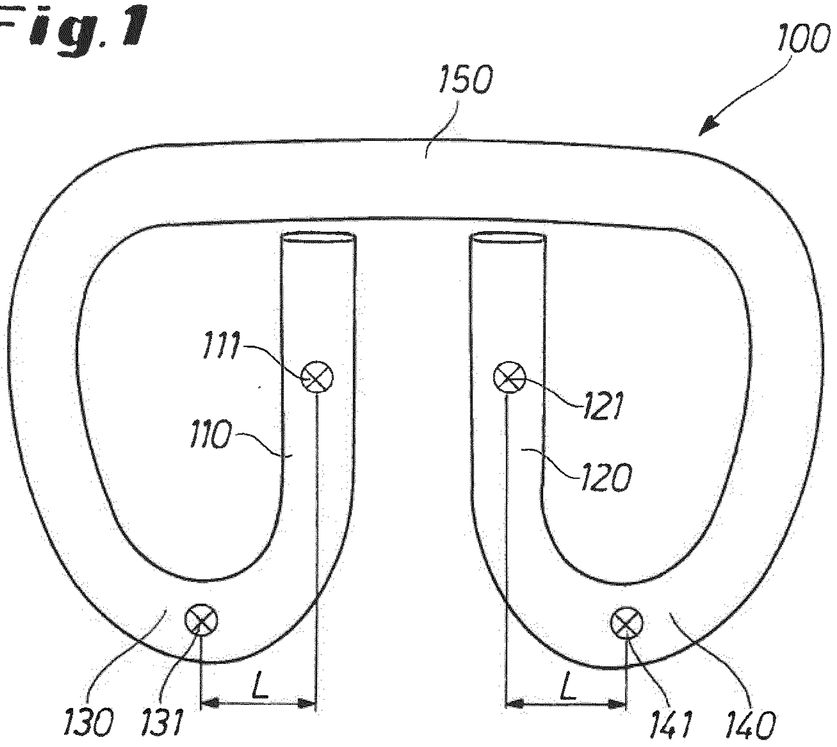
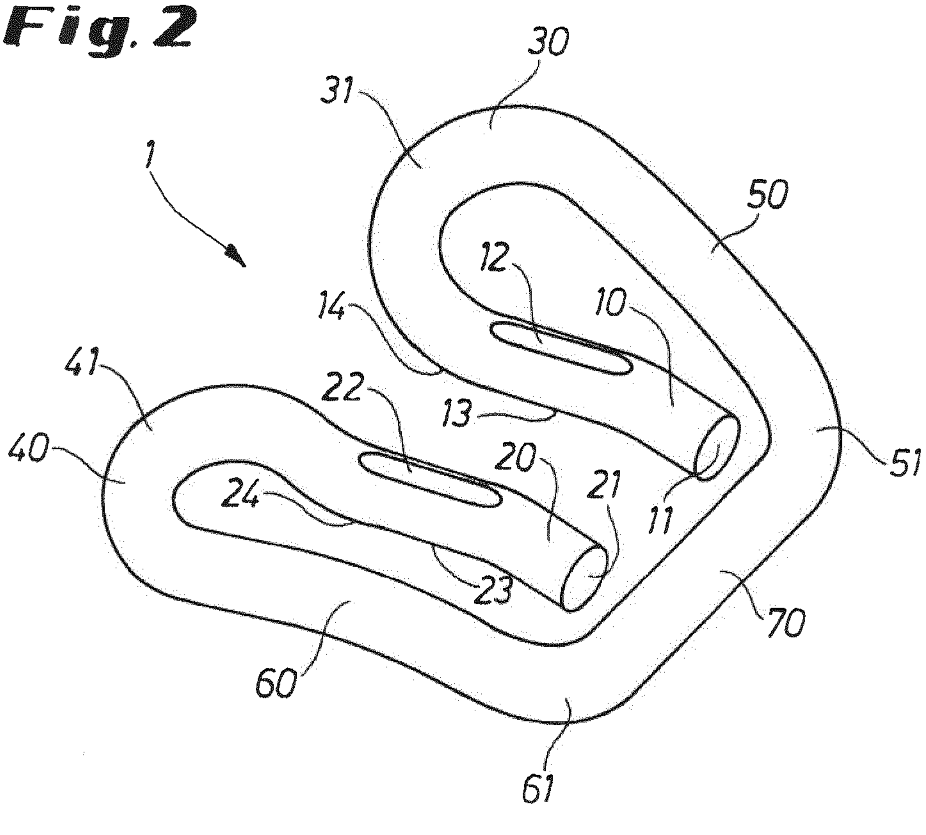

100
150
111
121
110
120
130
131
L
L
141
140

Fig.2


30
31
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50
12
10
14
41
22
13
40
20
21
51
24
11
23
70
60
61

Fig. 3a

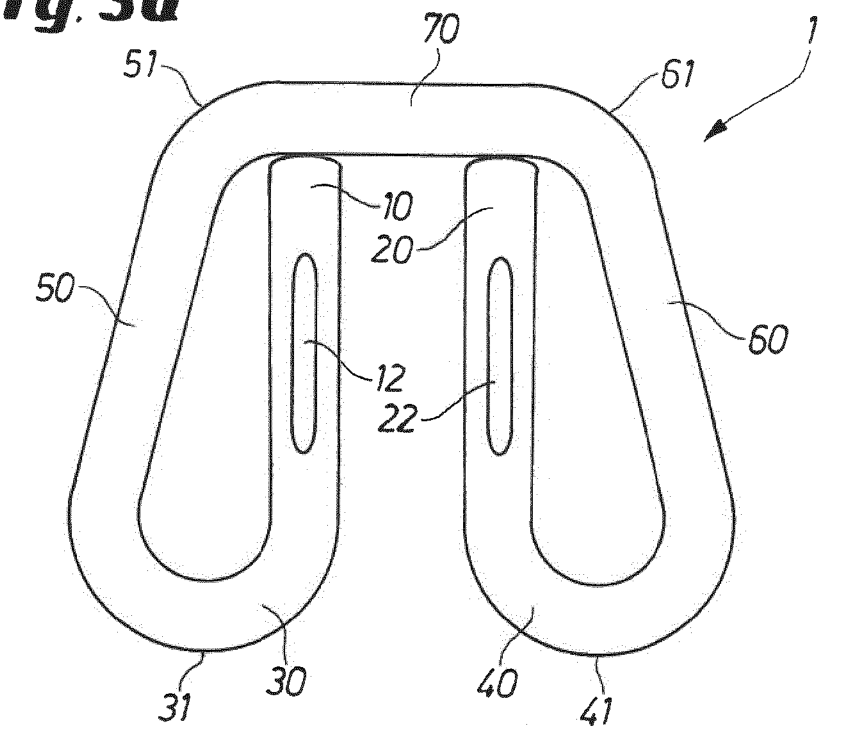

Fig. 3b

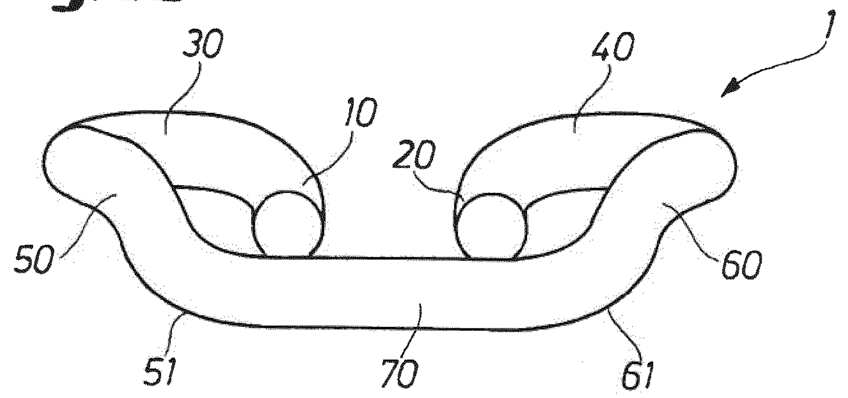

Fig. 3c

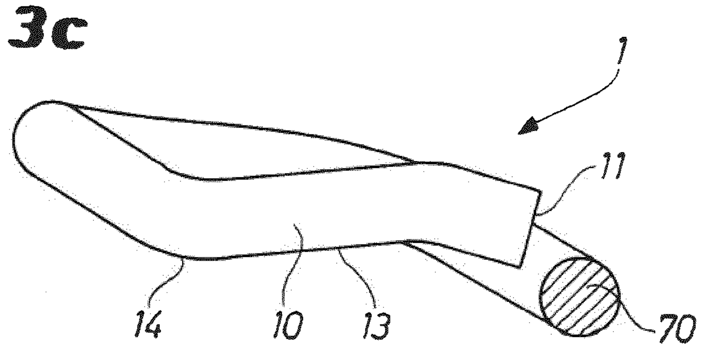

Fig.4

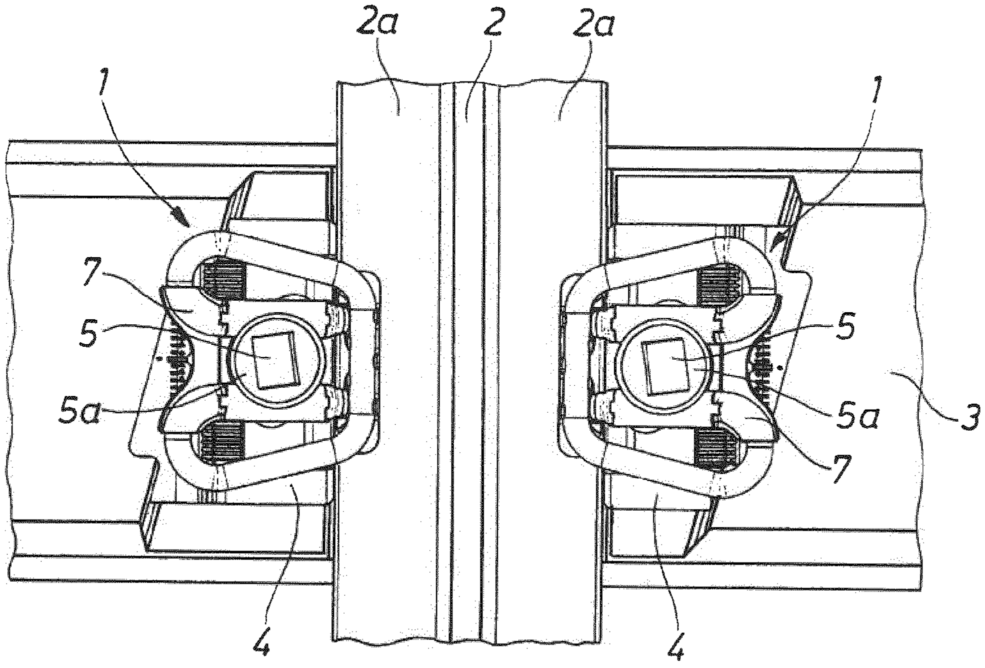

Fig.5

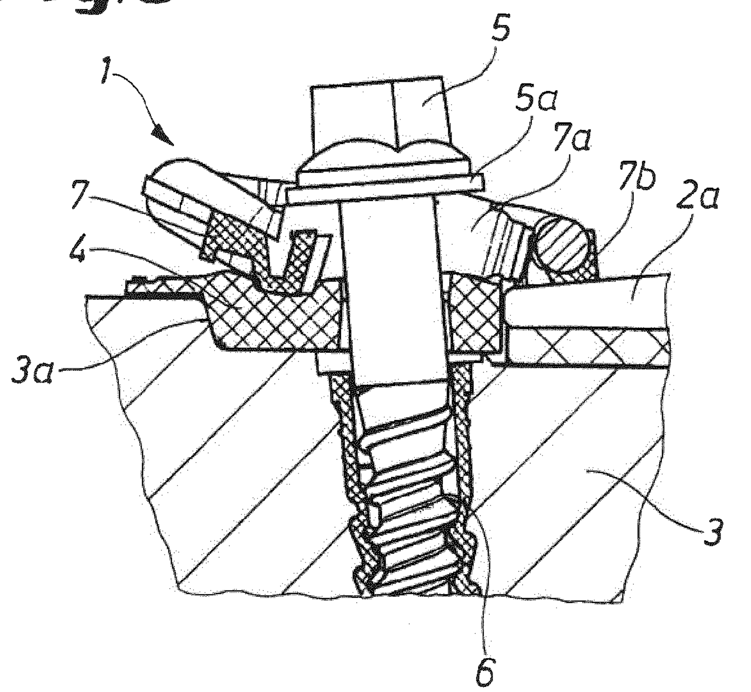

Fig. 6