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(54) RAPIER AND GRIPPER WEAVING MACHINE

GREIFERWEBMASCHINE

LANCE ET MACHINE À TISSER À PINCE

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Description

[0001] The invention relates to a rapier for a gripper weaving machine, wherein the rapier comprises a gripper band and a wear-resistant element arranged at the front end of the rapier. In addition, the invention relates to a wear-resistant element for such a rapier and a gripper weaving machine with such a rapier.

[0002] With gripper weaving machines, also referred to as rapier weaving machines, a gripper is attached at the front end of a rapier for moving the gripper through the shed. A rapier for a gripper weaving machine usually comprises a flexible gripper band or a relatively stiff gripper band, also referred to as a gripper bar. The gripper band is generally made substantially of a reinforced and relatively flexible material, such as epoxy with carbon fibers. The front end of the rapier is generally intended for guiding the rapier and is usually reinforced and of a stiff design in order to ensure a good guiding of the rapier through the shed. Also, the front end of the rapier is generally reinforced and of a stiff design in order to ensure a secure and tight mounting of the gripper at the front end of the rapier.

[0003] During weaving, the front end of the rapier is the first part of the rapier which enters the shed and the first part that makes contact with the warp threads and/or with guide hooks which guide the gripper and/or the rapier in the shed, resulting in wear at the front end. In addition, the wear can be negatively affected by an eccentricity of the weight of the gripper arranged at the front end, which causes torsional forces in the rapier and may cause unintended contact with the guide hooks and the warp threads, which may also cause further wear of the rapier and the guide hooks.

[0004] EP 1 586 683 A2 describes a gripper band made of a reinforced synthetic material on which layers of wear-resistant material are provided in order to extend the service life of the gripper band.

[0005] It is known in the prior art to provide a wear-resistant element at the front end of the rapier in order to extend the service life of the rapier. The wear-resistant element is generally made of wear-resistant material and is reinforced and of a stiff design. The wear-resistant element is usually intended for guiding the rapier. A wear-resistant element can be added to the rapier permanently, for example by welding, gluing or casting, as described in WO 2008/155105, but when the wear-resistant element is worn down and replacement is required, than the rest of the rapier is lost as well. It is therefore advantageous to provide a replaceable wear-resistant element which can be replaced while the rest of the rapier, more particularly the gripper band, can further be used.

[0006] EP 1 013 806 B1 describes a rapier with a gripper, which comprises a gripper band, a support plate with a stiff structure and a wearing plate in order to protect the underside of the gripper. The elements are screwed together.

[0007] EP 0 623 694 B2 and JP U 60-60482 each describe a rapier, formed in two different parts, which comprises a base part and a exchangeable part which is made of a different material and can be connected to the base part, wherein the exchangeable part has a profiled insert which accommodates a profiled end part of the base part.

[0008] The combinations of wear-resistant elements and gripper bands known from the prior art have the disadvantage that the alignment and the stiffness between the wear-resistant element and the rest of the rapier, more particularly the gripper band, is not ensured. Each of the known solutions always has the risk that the wear-resistant element is incorrectly aligned with respect to the gripper band during an assembly, for example due to an imprudent fastening, dirt, a defective screw or by a small deformation. This is particularly disadvantageous when the wear-resistant element of the rapier can come into contact with warp threads or with guide hooks, wherein both the incorrectly aligned wear-resistant element, the gripper band, the warp threads and/or the guide hooks may be damaged.

[0009] US 3,580,291 describes a feeding gripper comprising a main body made of a plastic material and having an upper jaw and a lower jaw for receiving a weft yarn therebetween. The main body is fixed within a support made of the same plastic material, which support is in turn mounted at the end of a strap that causes the alternate movement of the gripper.

[0010] It is an object of the present invention to provide a rapier which comprises a gripper band with a stiff top and a wear-resistant element which is connected removably to the stiff top of the gripper band, wherein the wear-resistant element is connected to the stiff top reiiabiy and correctly aligned with respect to the gripper band.

[0011] This object is solved by a rapier, a weaving machine and a wear resistant element with the features of claims 1, 10 and 11.

[0012] According to the invention, the rapier comprises a gripper band and a wear-resistant element which is added to the gripper band, wherein the gripper band comprises a stiff top to which the wear-resistant element can be connected, wherein the stiff top and the wear-resistant element have complementary connecting parts which comprise a tongue and a recess, wherein the tongue can be introduced into the recess by sliding it in an introduction direction and wherein the tongue is held in the recess in a form-fitted manner in the directions other than the introduction direction, more particularly in the directions perpendicular to the introduction direction. A gripper can be attached to the stiff top and to the wear-resistant element by means of fastening elements which are positioned in zones which do not coincide with connecting parts of the wear-resistant element or with connecting parts of the stiff top.

[0013] According to the invention, a wear-resistant element for a rapier comprising a gripper band is also provided, which can be connected to a stiff top of the gripper band, wherein the stiff top and the wear-resistant element

have complementary connecting parts which comprise a tongue and a recess, wherein the tongue can be introduced into the recess by sliding it in an introduction direction and wherein the tongue is held in the recess in a form-fitted manner in the directions other than the introduction direction, more particularly in the directions perpendicular to the introduction direction. A gripper can be attached to the wear-resistant element by means of fastening elements which are positioned in zones which do not coincide with connecting parts of the wear-resistant element.

[0014] According to the invention, a gripper weaving machine with a rapier according to the invention is also provided.

[0015] In the context of the invention, an element which is made of a material having a higher wear- resistance than the gripper band under identical conditions is referred to as a wear-resistant element. According to preferred embodiments, a wear-resistant element is made of a fiber-reinforced polyamide, wherein the fibers comprise for example carbon fibers, glass fibers or aramide fibers. The wear-resistant element may also comprise additives which improve wear- resistance, such as polytetrafluoroethylene (Teflon).

[0016] In the context of the invention, "to be held form-fitted" means that a connection is established wherein the tongue and the recess are held in a certain mutual position which is determined by the shape of the connecting parts which form the connection between both.

[0017] In the context of the invention, "stiff top" means a top of a gripper band which is of a sufficiently stiff design, for example is sufficiently reinforced, in order to allow a connection of a wear-resistant element with the gripper band and in order to allow a good guiding of the gripper band through the shed.

[0018] By means of the connection according to the invention, the wear-resistant element can easily be connected to the stiff top by a relative movement of both parts in the introduction direction. The form-fitted connection with recess and tongue allows a perfect alignment between the gripper band and the wear-resistant element and the thus formed rapier has a stiffness which is comparable to that of a rapier made in one piece. For this reason, screws or other fixing elements for fastening the gripper band and the wear-resistant element to one another can be omitted in the connecting zone. Avoiding the use of fixing elements in the connecting zone between the wear-resistant element and the gripper band is advantageous since local weaknesses at the location of the connection, for example resulting from openings, screw holes and the like, are avoided. This also allows to connect the wear-resistant element removably to the gripper band.

[0019] Both the stiff top and the wear-resistant element are provided with openings for fastening elements in order to fasten a gripper to the stiff top and to the wear-resistant element. In order to be fastened, the wear-resistant element and the gripper band are connected by a relative movement in the introduction direction, this is preferably the longitudinal direction of the gripper band. This is achieved, for example, by sliding the wear-resistant element on the stiff top. Subsequently, the gripper is attached to both the wear-resistant element and to the gripper band. After the gripper has been attached, an unintended relative movement between the wear-resistant element and the gripper band is prevented this way. Preferably, the gripper is fastened by means of screws, so that the gripper and/or the wear-resistant element can always easily be replaced if necessary. According to the invention, a quick and simple assembly of the rapier is possible, wherein both an incorrect alignment of the wear-resistant element is prevented and the use of adhesive is superfluous. The fastening elements are positioned in zones which do not coincide with the connecting parts of the wear-resistant element and of the stiff top, in other words which do not coincide with the surroundings of the recess and the tongue, in order not to weaken the connecting parts. According to one embodiment, the screws which are used for an attachment of the gripper are not situated in the connecting zone for connecting the wear-resistant element and the stiff top.

[0020] According to one embodiment, the wear-resistant element is provided with a recess into which an elongate tongue, which protrudes from the stiff top of the gripper band, can be introduced in the introduction direction. In order to connect the wear-resistant element to the stiff top, the elongate tongue is slid into the recess, wherein the tongue and the recess function as positioning elements for aligning the wear-resistant element. In this manner, a connection is formed wherein the wear-resistant element is held in a substantially form-fitted manner in each direction other than the introduction direction. A wear-resistant element with a recess and a tongue arranged to a stiff top of a gripper band are easy to manufacture.

[0021] Preferably, the gripper band is formed integrally with the stiff top. As a result thereof, the wear-resistant element can be fastened to the gripper band without any possible incorrect alignment and a loss of stiffness of the rapier is prevented.

[0022] According to a preferred embodiment, the introduction direction coincides with the longitudinal direction of the rapier, more particularly, the introduction direction coincides with the axis of movement of the rapier, wherein the wear-resistant element and/or the stiff top of the gripper band are moved mutually along the axis of movement of the rapier in order to form the connection. This allows to design both the recess and the tongue with limited dimensions while still a form-fitted connection is possible that prevents any incorrect alignment.

[0023] According to another embodiment, a tolerance, more particularly a certain positive play between the tongue and the recess is minimized, for example a play chosen in the order of magnitude up to 0.2 mm, for example a play of approximately 0.05 mm to 0.1 mm. In other words, the wear-resistant element and the gripper

band are formed in such a manner that a play is so small that any possible incorrect alignment is prevented. Preferably, a play may be such that an assembly of the wear-resistant element to the gripper band remains easily possible, wherein, according to one embodiment, the connection between the gripper band and the wear-resistant element is fixed, for example is fixed by means of screws which are fitted at a distance from the recess and the tongue.

[0024] According to another embodiment, the connection between the gripper band and the wear-resistant element is fixed with adhesive, preferably using an adhesive which can be unfastened, for example, can be thermally unfastened. According to one embodiment, the wear-resistant element and the gripper band are securely attached by means of adhesive which is introduced into the recess. According to other embodiments, the adhesive is added in chambers provided in the side walls of the gripper band and/or in the side walls of the wear-resistant element, in such a manner that the play between the gripper band and the wear-resistant element is not increased when space is provided for the adhesive.

[0025] According to a preferred embodiment, a tolerance between the tongue and the recess is chosen so that a clamping connection is formed between the wear-resistant element and the gripper band, so that fixing elements such as screws, or the use of adhesive are superfluous. In this case, the tolerance is chosen so that a clamping connection of a certain clamping force is achieved. If the tongue and the recess do not have smooth side walls, a clamping connection can already be achieved with a minimal positive play. However, it is also possible to choose a negative play to achieve a desired clamping stress. In this case, the negative play can be, for example, between 0.01 and 0.1 mm, for example approximately 0.05 mm. By means of such a clamping connection, the tongue is clamped in the recess, so that the tongue is also held in the recess in a form-fitted manner. This also has the advantage that a stiff connection between the gripper band and the wear-resistant element is achieved.

[0026] According to preferred embodiments, at least the wear-resistant element is provided with guide elements, in particular with a guide groove and/or a guiding surface for guiding the gripper during the movement through the shed, in particular through the warp threads and/or the guide hooks. Preferably, near the guide elements of the rapier, fastening elements and/or fixing elements are avoided since in particular screws can cause excessive wear to guide hooks or can damage warp threads. When guide hooks are used, it is therefore preferred to use only screws when fixing the connection between the wear-resistant element and the gripper band and/or when attaching the gripper in a zone which is not used to guide the gripper band and/or the wear-resistant element. A connection according to the invention allows to fasten the wear-resistant element easily to the gripper band at the location of the guide elements without using screws, without any possible incorrect alignment and without a loss of stiffness at the location of the connecting parts of the gripper band and the wear-resistant element.

[0027] According to one embodiment, the recess of the wear-resistant element is provided with a continuous surrounding peripheral wall which defines an internal space in the wear-resistant element. The recess is provided with a, for example, rectangular cross section comprising four side walls which make contact with the side walls of the tongue in order to form a form-fitted connection. In order to form a clamping connection, these side walls may be designed in such a manner that they are, for example, entirely or partly parallel to the introduction direction and have a small play or tolerance between the tongue and the recess. In this case, at the location of the side walls of the tongue, the tongue is substantially surrounded by the side walls of the internal space in the wear-resistant element. A rectangular cross section also has the advantage that it not only makes an accurate alignment in the longitudinal direction of the rapier possible, but also makes an accurate radial alignment with respect to the longitudinal direction of the gripper band possible. The abovementioned cross section may also be shaped differently, for example be a square cross section, a triangular cross section, a polygonal cross section or any other cross section which allows a form-fitted connection.

[0028] According to another embodiment, the wear-resistant element comprises a recess and a slot in the introduction direction which allow for a tongue with a T-shaped cross section to be introduced into the recess and to be held in the recess in a form-fitted manner in the directions other than the introduction direction. In this case, the wear-resistant element is provided with a slot at the peripheral wall of the recess which extends in the introduction direction from the recess and which allows to connect the wear-resistant element to a stiff top which is provided with a T-shaped tongue. In the context of the invention, a tongue having a T-shaped cross section with a base bar and a transverse bar is referred to as a T-shaped tongue. When connecting the stiff top to the T-shaped tongue and the wear-resistant element, the transverse bar extends through the slot, while the base bar is held in the recess in a form-fitted manner. The stiffness of a stiff top which comprises a T-shaped tongue is increased by the additional material which is added compared to a tongue which has a rectangular cross section. The slot preferably extends from the peripheral wall of the recess up to a side wall of the wear-resistant element which allows an accurate manufacture of the wear-resistant element, in particular when the wear-resistant element is produced by means of injection-molding. In this case, a core in the mold, which is required to shape the recess in the wear-resistant element, can be supported during injection-molding.

[0029] According to a preferred embodiment, the wear-resistant element is not only held in all directions other than the introduction direction by the tongue which is held in the recess in a form-fitted manner, but is also held so

that the wear-resistant element is prevented from turning with respect to the gripper band, more particularly is prevented from rotating about an axis parallel to the introduction direction. As a result thereof, the wear-resistant element is positioned in a well-defined radial angular position with respect to an axis in the introduction direction and a rotation about this axis is prevented.

[0030] According to a preferred embodiment, the tongue is provided on the gripper band and the recess is provided in the wear-resistant element. This allows to manufacture the gripper band together with the tongue from fiber-reinforced material, wherein the fibers extend in the longitudinal direction of the gripper band. This allows to produce a stiff tongue having a small cross section. In this case, the recess of the wear-resistant element has a larger cross section than the tongue, which allows to use a wear-resistant element made of a material which is less stiff, as the larger cross section ensures a stiff wear-resistant element.

[0031] Below, embodiments of the invention are described in more detail with reference to the following diagrammatic drawings, in which identical or similar parts are denoted by the same reference numerals:

Figure 1 schematically shows a perspective view of a stiff top of a gripper band and of a wear-resistant element before being connected;

Figure 2 schematically shows a perspective view of a stiff top and a wear-resistant element from Figure 1 after being connected;

Figure 3 schematically shows a perspective view of a stiff top and of a wear-resistant element from Figure 2 to which a gripper is attached;

Figure 4 schematically shows a cross section along the transverse plane IV from Figure 3 together with a guide hook shown schematically;

Figure 5 schematically shows a cross section along the longitudinal plane V from Figure 2 of the stiff top and of the wear-resistant element from Figure 2;

Figure 6 schematically shows a cross section along the transverse plane IV from Figure 3 of the wear-resistant element;

Figure 7 schematically shows a perspective view of a second embodiment of a stiff top and of a wear-resistant element before being connected;

Figure 8 schematically shows a perspective view of the stiff top and of the wear-resistant element from Figure 7 after being connected;

Figure 9 schematically shows a cross section along the transverse plane IX from Figure 8;

Figure 10 schematically shows a cross section similar to the cross section from Figure 5 of a stiff top and of a wear-resistant element according to a third embodiment;

Figure 11 shows a top view of a rapier according to a fourth embodiment.

[0032] Figures 1 to 5 show a first embodiment of a rapier 1 comprising a gripper band 2 provided with a stiff top 10 and with a wear-resistant element 20 which can be connected removably to the stiff top 10. Figure 1 shows a view of the stiff top 10 and of the wear-resistant element 20 before these are connected. The stiff top 10 comprises an elongate tongue 11 which extends beyond the stiff top 10, while the wear-resistant element 20 comprises a recess 21 which can cooperate with the tongue 11. Figure 2 shows a view wherein the stiff top 10 and the wear-resistant element 20 are connected. Figure 3 shows a view of a rapier 1, wherein on the stiff top 10 and on the wear-resistant element 20 a gripper 3 is connected to the rapier 1. In this case, the gripper 3 is attached near the front end 4 of the rapier 1, where the wear-resistant element 20 is also fitted. Figure 4 shows a cross section at the tongue 11 and the recess 21 of the stiff top 10 and shows how the wear-resistant element 20 is guided by a guide hook 5. Such a guide hook 5 is described in more detail in WO 2006/037619. Figure 5 shows a longitudinal section of the tongue 11 of the stiff top 10 and of the recess 21 of the wear-resistant element 20 while they are mutually connected.

[0033] The stiff top 10 is integrally formed with a gripper band 2. In the illustrated embodiment, the introduction direction I coincides with the longitudinal direction L of the gripper band 2, in other words the introduction direction I runs parallel to the longitudinal direction L. In order to connect the wear-resistant element 20 to the stiff top 10, the tongue 11 is introduced into the recess 21 of the wear-resistant element 20. When the tongue 11 has been introduced, the wear-resistant element 20 and the stiff top 10 are aligned perfectly with respect to one another.

[0034] The stiff top 10 and the wear-resistant element 20 have complementary connecting parts 6 and 7, respectively, more particularly the tongue 11 and the recess 21. The connecting part 6 comprises a tongue 11 which protrudes from the stiff top 10, while the connecting part 7 comprises a recess 21 provided in the wear-resistant element 20. The tongue 11 and the recess 21 can be mutually connected, more particularly can be connected removably to one another. To this end, the tongue 11 can be introduced into the recess 21 by sliding it in an introduction direction I. When introduced into the recess 21, the tongue 11 is held in the recess 21 in a form-fitted manner in the directions other than the introduction direction I and so that a turning with respect to the gripper band is prevented, more particularly, that a rotation about an axis 37 parallel to the introduction direction I is prevented.

[0035] As shown in Figures 4 to 6, contact surfaces 30 are formed by means of the connecting parts 6 and 7, which allow the tongue 11 to be held in the recess 21 in a form-fitted manner. In this case, the play between the tongue 11 and the recess 21 is minimized, for example a play in the order of magnitude of 0.05 mm between the

contact surfaces 30. The contact surfaces 30 are formed by the side walls 16 of the tongue 11 of the connecting part 6 and the peripheral wall 27 of the recess 21 of the connecting part 7. In this embodiment, at the stiff top 10 the connecting part 6 comprises aside from the tongue 11 also a profiling 12 and, at the wear-resistant element 20 the connecting part 7 comprises aside from the recess 21 also a profiling 22, which is adapted to the profiling 12, as is indicated in Figure 1. The profilings 12 and 22 are formed so as to be complementary and are advantageous in order to improve a connection between the gripper band 2 and the wear-resistant element 20, in particular in order to counteract a bending moment A or B, as indicated in Figure 1, which may be exerted on the tongue 11.

[0036] After the introduction, a gripper 3 can be attached to the stiff top 10 and to the wear-resistant element 20, as is illustrated in Figure 3. To this end, both the stiff top 10 and the wear-resistant element 20 are provided with openings 13, 23. The gripper 3 can be attached by using fastening elements 14, 24 which are introduced through the openings 13, 23. The attachment of the gripper 3 to the gripper band 2 also fixes the connection between the stiff top 10 and the wear-resistant element 20. This also prevents that the wear-resistant element 20 of the stiff top 10 can slide with respect to the gripper band 2 in the introduction direction I during use, more particularly during weaving.

[0037] The location of the openings 13, 23 is chosen in such a manner as to ensure that the fastening elements 14 or 24, which are formed, for example, by screws, are positioned in zones 15 and 25, which are indicated by dashed lines in Figure 2, which zones 15, 25 do not coincide with the connecting parts 6 and 7, more particularly do not penetrate into the connecting zone of the recess 21 of the wear-resistant element 20 or do not extend at the tongue 11 of the stiff top 10. This can be seen in the section shown in Figure 4.

[0038] As can best be seen in Figure 4, the wear-resistant element 20 is provided with a guide groove 26 which cooperates with a guide element 8 which is provided on a guide hook 5 of a weaving machine. The location of the openings 13, 23 is also chosen to ensure that the fastening elements 14, 24 do not interfere with a guide hook 5.

[0039] As can best be seen in Figure 6, the recess 21 of the wear-resistant element 20 comprises a continuous surrounding peripheral wall 27 which determines an internal space 28 in the wear-resistant element 20 which forms the recess 21. The peripheral wall 27 also determines the contact surfaces 30, as indicated in Figure 4, in which there is contact with the side walls 16 of the tongue 11 as is indicated in Figure 1.

[0040] Figures 7 and 9 show a second embodiment of a stiff top 10 and of a wear-resistant element 20 which can be connected removably to the stiff top 10. Figure 7 shows a view of the stiff top 10 and of the wear-resistant element 20 before the two are connected. Figure 8 shows the stiff top 10 and the wear-resistant element 20 when they are connected. Figure 9 shows a cross section of the stiff top 10 and of the wear-resistant element 20 according to this second embodiment at the tongue 11 and the recess 21, more particularly along the plane IX from Figure 8.

[0041] The stiff top 10 and the wear-resistant element 20 according to the second embodiment differ from those of the first embodiment with regard to their shape. According to the second embodiment, a tongue 11 with a T-shaped cross section comprising a base bar 17 and a transverse bar 18 is arranged to the stiff top 10. The recess 21 has a slot 29 in the peripheral wall 27 which can cooperate with the transverse bar 18 of the stiff top 10 when connecting the stiff top 10 and the wear-resistant element 20. The T-shaped tongue 11 is introduced into the recess 21 in the introduction direction I, wherein the transverse bar 18 of the tongue 11 extends through the slot 29, while the base bar 17 is held substantially in a form-fitted manner in the recess 21. The transverse bar 18 is advantageous with regard to the stiffness of the T-shaped tongue 11. In this embodiment, contact surfaces 33 are formed by the side walls 31 of the base bar 17 of the connecting part 6 and the peripheral wall 27 of the recess 21 of the connecting part 7 which is complementary thereto and by the side walls 32 of the transverse bar 18 of the connecting part 6 and the side walls 34 of the slot 29 of the connecting part 7 which are complementary thereto. In this case, the slot 29 extends both in the introduction direction I and transverse to the introduction direction I from the peripheral wall 27 of the recess 21 and up to a side wall of the wear-resistant element 20, more particularly both in the longitudinal direction L and transverse to the longitudinal direction L of the rapier 1 and as illustrated in Figure 8, up to the top side wall 35 of the wear-resistant element 20.

[0042] Figure 10 shows a third embodiment of a stiff top 10 with a tongue 11 and a wear-resistant element 20 which can be connected removably thereto. In this case, a further variant of a tongue 11 and a recess 21 is shown, wherein the tongue 11 has two successive parts 19 and 36 with mutually different cross sections and wherein the recess 21 is designed in a corresponding manner in order to form a form-fitted connection, more particularly, a form-fitted connection with complementary connecting parts 6 and 7. In this embodiment, chambers 9 are formed between the wear-resistant element 20 and the tongue 11, into which adhesive can be pushed which is used to fix the connection between the wear-resistant element 20 and the stiff top 10. According to a variant (not shown), these chambers 9 may comprise openings which are open onto the surroundings in order to allow that an excess of adhesive flows off and is be removed during an assembly.

[0043] Figure 11 shows another embodiment, wherein the tongue 11 comprises anchoring elements 38 which can cooperate with anchoring e!e-ments 40 of the recess 21. During an introduction into the recess 21, the anchor-

ing elements 38 can resiliently move towards one another until they can cooperate with anchoring elements 40. This allows to anchor the form-fitted connection which is formed between the tongue 11 and the recess 21. In order to allow that the wear-resistant element 20 is removed from the gripper band 2 again, openings 39 may be provided in the wear-resistant element 20 in order to remove the anchoring elements 38 of the tongue 11 from the anchoring elements 40 of the recess 21, more particularly to push them towards one another in such a manner that the tongue 11 can be removed from the recess 21 again.

[0044] According to a variant (not shown), the wear-resistant element 20 may comprise a tongue which can cooperate with a recess provided at the location of the stiff top 10 of the gripper band 2. In this case, the tongue and the recess can cooperate with one another in a similar manner to that described above in order to form a form-fitted connection in the directions other than the introduction direction I between the gripper band 2 and the wear-resistant element 20.

[0045] According to a variant (not shown), in addition to the tongue 11 and the recess 21 cooperating therewith, a second or subsequent tongue may also be provided which is arranged parallel to the tongue 11 and which can cooperate with a second or subsequent recess which is also arranged parallel to the recess 21. In this manner, it is possible to achieve a good alignment by means of different relatively small tongues, for example by placing these a distance apart from each other in the longitudinal direction of the rapier.

[0046] According to another variant (not shown), both the stiff top 10 and the wear-resistant element 20 may each be provided with a tongue and a recess, wherein the tongue of the stiff top 10 cooperates with the recess of the wear-resistant element 20 and the tongue of the wear-resistant element 20 cooperates with the recess of the stiff top 10.

[0047] The rapier 1, the wear-resistant element 20 and the gripper weaving machine according to the invention defined in the claims are not limited to the exemplary embodiments represented and described by way of example, but may also comprise variants and combinations thereof which fall within the claims.

Claims

1. A rapier for a gripper weaving machine which comprises a gripper band (2) and a wear-resistant element (20) which is added to the gripper band (2), wherein the gripper band (2) comprises a stiff top (10) to which the wear-resistant element (20) can be connected, wherein the stiff top (10) and the wear-resistant element (20) comprise complementary connecting parts (6, 7) which comprise a tongue (11) and a recess (21), wherein the tongue (11) can be introduced into the recess (21) by sliding it in an introduction direction (I) and wherein the tongue (11) is held in the recess (21) in a form-fitted manner in the directions other than the introduction direction (I), **characterized in that** a gripper (3) can be attached to the stiff top (10) and to the wear-resistant element (20) by fastening elements (14, 24) which are positioned in zones (15, 16) which do not coincide with a connecting part (6) of the wear-resistant element (20) or with a connecting part (7) of the stiff top (10).

2. The rapier as claimed in claim 1, **characterized in that** the wear-resistant element (20) comprises the recess (21) into which the elongate tongue (11), which protrudes from the stiff top (10), can be introduced in the introduction direction (I).

3. The rapier as claimed in claim 1 or 2, **characterized in that** the stiff top (10) is integrally formed with the gripper band (2).

4. The rapier as claimed in one of claims 1 to 3, **characterized in that** the introduction direction (I) coincides with the longitudinal direction (L) of the rapier (1).

5. The rapier as claimed in one of claims 1 to 4, **characterised in that** a tolerance and/or play between the tongue (11) and the recess (21) is minimized.

6. The rapier as claimed in one of claims 1 to 5, **characterized in that** the tongue (11) is held in the recess (21) in a form-fitted manner by a clamping connection.

7. The rapier as claimed in one of claims 1 to 6, **characterized in that** the wear-resistant element (20) comprises the recess (21) which comprises a continuous surrounding peripheral wall (27) which determines an internal space (28) in the wear-resistant element (20).

8. The rapier as claimed in one of claims 1 to 6, **characterized in that** the wear-resistant element (20) comprises the recess (21) and a slot (29) in the introduction direction (I) which allows for the tongue (11) with a T-shaped cross section to be introduced into the recess (21) and to be held in the recess (21) in a form-fitted manner in the directions other than the introduction direction (I).

9. The rapier as claimed in one of claims 1 to 8, **characterized in that** the tongue (11) is held in the recess (21) in a form-fitted manner in such a manner that turning with respect to the gripper band (2) is prevented, more particularly that a rotation about an axis (37) parallel to the introduction direction (I) is prevented.

10. A gripper weaving machine, **characterized in that** the gripper weaving machine comprises a rapier (1) as claimed in one of claims 1 to 9.

11. Use of a wear-resistant element in a rapier for a gripper weaving machine as claimed in one of claims 1 to 9, which rapier comprises a gripper band (2), wherein the wear-resistant element (20) is connected to a stiff top (10) of the gripper band (2) of a rapier (1), wherein the stiff top (10) and the wear-resistant element (20) comprise complementary connecting parts (6, 7) which comprise a tongue (11) and a recess (21), wherein the tongue (11) is introduced into the recess (21) by sliding it in an introduction direction (I) and wherein the tongue (11) is held in the recess (21) in a form-fitted manner in the directions other than the introduction direction (I), **characterized in that** a gripper (3) is attached to the wear-resistant element (20) by fastening elements (14, 24) which are positioned in zones (15, 16) which do not coincide with a connecting part (6) of the wear-resistant element (20).

12. Use of the wear-resistant element as claimed in claim 11, **characterized in that** the connecting part (7) of the wear-resistant element (20) comprises the recess (21) that comprises a continuous surrounding peripheral wall (27) which determines an internal space (28) in the wear-resistant element (20).

13. Use of the wear-resistant element as claimed in claim 11 or 12, **characterized in that** the connecting part (7) of the wear-resistant element (20) comprises the recess (21) and a slot (29) in the introduction direction (I) which allows for the tongue (11) with a T-shaped cross section provided at the gripper band (2) to be introduced into the recess (21) and to be held in the recess (21) in a form-fitted manner in the directions other than the introduction direction (I).

14. Use of the wear-resistant element as claimed in one of claims 11 to 13, **characterized in that** the tongue (11) is held in the recess (21) in a form-fitted manner in such a manner that turning with respect to the gripper band (2) is prevented, more particularly that a rotation about an axis (37) parallel to the introduction direction (I) is prevented.

Patentansprüche

1. Eine Lanze für eine Greiferwebmaschine, umfassend ein Greiferband (2) und ein verschleissfestes Element (20), das an das Greiferband (2) angefügt ist, wobei das Greiferband (2) eine steife Spitze (10) umfasst, mit der das verschleissfeste Element (20) verbunden werden kann, wobei die steife Spitze (10) und das verschleissfeste Element (20) komplementäre Verbindungsteile (6, 7) umfassen, die eine Zunge (11) und eine Aussparung (21) umfassen, wobei die Zunge (11) in die Aussparung (21) eingeführt werden kann, indem sie in einer Einführungsrichtung (I) eingeschoben wird, und wobei die Zunge (11) in den anderen Richtungen als der Einführungsrichtung (I) formschlüssig in der Aussparung (21) gehalten wird, **dadurch gekennzeichnet, dass** ein Greifer (3) an die steife Spitze (10) und an das verschleissfeste Element (20) durch Befestigungselemente (14,24) angebracht werden kann, die in Bereichen (15, 16) positioniert werden, die nicht mit einem Verbindungsteil (6) des verschleissfesten Elements (20) oder mit einem Verbindungsteil (7) der steifen Spitze (10) zusammenfallen.

2. Die Lanze nach Anspruch 1, **dadurch gekennzeichnet, dass** das verschleissfeste Element (20) die Aussparung (21) umfasst, in die die längliche Zunge (11), die aus der steifen Spitze (10) ragt, in der Einführungsrichtung (I) eingeführt werden kann.

3. Die Lanze nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** die steife Spitze (10) einteilig mit dem Greiferband (2) ausgebildet ist.

4. Die Lanze nach einem der Ansprüche 1 bis 3, **dadurch gekennzeichnet, dass** die Einführungsrichtung (I) mit der Längsrichtung (L) der Lanze (1) zusammenfällt.

5. Die Lanze nach einem der Ansprüche 1 bis 4, **dadurch gekennzeichnet, dass** eine Toleranz und/oder ein Spiel zwischen der Zunge (11) und der Aussparung (21) minimiert wird.

6. Die Lanze nach einem der Ansprüche 1 bis 5, **dadurch gekennzeichnet, dass** die Zunge (11) durch eine Klemmverbindung formschlüssig in der Aussparung (21) gehalten wird.

7. Die Lanze nach einem der Ansprüche 1 bis 6, **dadurch gekennzeichnet, dass** das verschleissfeste Element (20) die Aussparung (21) umfasst, die eine durchgängige umgebende periphere Wand (27) umfasst, die einen Innenraum (28) in dem verschleissfesten Element (20) bestimmt.

8. Die Lanze nach einem der Ansprüche 1 bis 6, **dadurch gekennzeichnet, dass** das verschleissfeste Element (20) die Aussparung (21) und einen Schlitz (29) in die Einführungsrichtung (I) umfasst, um zu ermöglichen, dass die Zunge (11) mit einem T-förmigen Querschnitt in den anderen Richtungen als der Einführungsrichtung (I) in die Aussparung (21) eingeführt und formschlüssig in der Aussparung (21) gehalten wird.

9. Die Lanze nach einem der Ansprüche 1 bis 8, **dadurch gekennzeichnet, dass** die Zunge (11) formschlüssig in der Aussparung (21) so gehalten wird, dass Drehen mit Bezug auf das Greiferband (2) verhindert wird, insbesondere, dass eine Drehung um eine Achse (37) parallel zur Einführungsrichtung (I) verhindert wird.

10. Eine Greiferwebmaschine, **dadurch gekennzeichnet, dass** die Greiferwebmaschine eine Lanze (1) nach einem der Ansprüche 1 bis 9 umfasst.

11. Verwendung eines verschleissfesten Elements in einer Lanze für eine Greiferwebmaschine nach einem der Ansprüche 1 bis 9, welche Lanze ein Greiferband (2) umfasst, wobei das verschleissfeste Element (20) mit einer steifen Spitze (10) des Greiferbands (2) einer Lanze (1) verbunden ist, wobei die steife Spitze (10) und das verschleissfeste Element (20) komplementäre Verbindungsteile (6, 7) umfassen, die eine Zunge (11) und eine Aussparung (21) umfassen, wobei die Zunge (11) in die Aussparung (21) eingeführt wird, indem sie in einer Einführungsrichtung (I) eingeschoben wird, und wobei die Zunge (11) in den anderen Richtungen als der Einführungsrichtung (I) formschlüssig in der Aussparung (21) gehalten wird, **dadurch gekennzeichnet, dass** ein Greifer (3) an das verschleissfeste Element (20) durch Befestigungselemente (14, 24) angebracht ist, die in Bereichen (15, 16) positioniert werden, die nicht mit einem Verbindungsteil (6) des verschleissfesten Elements (20) zusammenfallen.

12. Verwendung des verschleissfesten Elements nach Anspruch 11, **dadurch gekennzeichnet, dass** der Verbindungsteil (7) des verschleissfesten Elements (20) die Aussparung (21) umfasst, die eine durchgängige umgebende periphere Wand (27) umfasst, die einen Innenraum (28) in dem verschleissfesten Element (20) bestimmt.

13. Verwendung des verschleissfesten Elements nach Anspruch 11 oder 12, **dadurch gekennzeichnet, dass** der Verbindungsteil (7) des verschleissfesten Elements (20) die Aussparung (21) und einen Schlitz (29) in die Einführungsrichtung (I) umfasst, um zu ermöglichen, dass die an dem Greiferband (2) vorgesehene Zunge (11) mit einem T-förmigen Querschnitt in den anderen Richtungen als der Einführungsrichtung (I) in die Aussparung (21) eingeführt und formschlüssig in der Aussparung (21) gehalten wird.

14. Verwendung des verschleissfesten Elements nach einem der Ansprüche 11 bis 13, **dadurch gekennzeichnet, dass** die Zunge (11) formschlüssig in der Aussparung (21) so gehalten wird, dass Drehen mit Bezug auf das Greiferband (2) verhindert wird, insbesondere, dass eine Drehung um eine Achse (37) parallel zur Einführungsrichtung (I) verhindert wird.

Revendications

1. Une lance pour une machine à tisser à pinces comprenant un ruban de pince (2) et un élément résistant à l'usure (20) qui est ajouté au ruban de pince (2), dans laquelle le ruban de pince (2) comprend une pointe rigide (10), à laquelle l'élément résistant à l'usure (20) peut être connecté, dans laquelle la pointe rigide (10) et l'élément résistant à l'usure (20) comprennent des parties de connexion (6, 7) complémentaires comprenant une langue (11) et une encoche (21), dans laquelle la langue (11) peut être insérée dans l'encoche (21) en la faisant glisser dans une direction d'insertion (I) et dans laquelle la langue (11) est maintenue dans l'encoche (21) d'une manière forme fermée dans des directions différentes de la direction d'insertion (I), **caractérisée en ce qu'**une pince (3) peut être fixée sur la pointe rigide (10) et sur l'élément résistant à l'usure (20) par des éléments de fixation (14, 24) qui sont positionnés dans des zones (15, 16) qui ne coïncident pas avec une partie de connexion (6) de l'élément résistant à l'usure (20) ou avec une partie de connexion (7) de la pointe rigide (10).

2. La lance selon la revendication 1, **caractérisée en ce que** l'élément résistant à l'usure (20) comprend l'encoche (21) dans laquelle la langue (11) allongée, laquelle fait saillie de la pointe rigide (10), peut être insérée dans la direction d'insertion (I).

3. La lance selon la revendication 1 ou 2, **caractérisée en ce que** la pointe rigide (10) est formée intégralement avec le ruban de pince (2).

4. La lance selon l'une quelconque des revendications 1 à 3, **caractérisée en ce que** la direction d'insertion (I) coïncide avec la direction longitudinale (L) de la lance (1).

5. La lance selon l'une quelconque des revendications 1 à 4, **caractérisée en ce qu'**une tolérance et/ou un jeu entre la langue (11) et l'encoche (21) est minimisé.

6. La lance selon l'une quelconque des revendications 1 à 5, **caractérisée en ce que** la langue (11) est maintenue dans l'encoche (21) d'un manière forme fermée par un accouplement à pression.

7. La lance selon l'une quelconque des revendications 1 à 6, **caractérisée en ce que** l'élément résistant à l'usure (20) comprend l'encoche (21) qui comprend une paroi périphérique (27) entourant continue qui

détermine un espace interne (28) dans l'élément résistant à l'usure (20).

8. La lance selon l'une quelconque des revendications 1 à 6, **caractérisée en ce que** l'élément résistant à l'usure (20) comprend l'encoche (21) et une coulisse (29) dans la direction d'insertion (I), qui permet pour la langue (11) avec une section transversale en forme de T à être insérée dans l'encoche (21) et à être maintenue dans l'encoche (21) d'une manière forme fermée dans la direction différente de la direction d'insertion (I).

9. La lance selon l'une quelconque des revendications 1 à 8, **caractérisée en ce que** la langue (11) est maintenue dans l'encoche (21) d'une manière forme fermée de telle sorte que la rotation par rapport au ruban de pince (2) est prévenue, plus particulièrement qu'une rotation autour d'un axe (37) parallèle à la direction d'insertion (I) est prévenue.

10. Une machine à tisser à pinces, **caractérisée en ce que** la machine à tisser à pinces comprend une lance (1) selon l'une quelconque des revendications 1 à 9.

11. Usage d'un élément résistant à l'usure dans une lance pour une machine à tisser à pinces selon l'une quelconque des revendications 1 à 9, laquelle lance comprend un ruban de pince (2), dans lequel l'élément résistant à l'usure (20) est connecté sur une pointe rigide (10) du ruban de pince (20) d'une lance (1), dans lequel la pointe rigide (10) et l'élément résistant à l'usure (20) comprennent des parties de connexion (6, 7) complémentaires comprenant une langue (11) et une encoche (21), dans lequel la langue (11) est insérée dans l'encoche (21) en la faisant glisser dans une direction d'insertion (I) et dans lequel la langue (11) est maintenue dans l'encoche (21) d'une manière forme fermée dans des directions différentes de la direction d'insertion (I), **caractérisée en ce qu'**une pince (3) est fixée sur l'élément résistant à l'usure (20) par des éléments de fixation (14, 24) qui sont positionnés dans des zones (15, 16) qui ne coïncident pas avec une partie de connexion (6) de l'élément résistant à l'usure (20).

12. Usage de l'élément résistant à l'usure selon la revendication 11, **caractérisé en ce que** la partie de connexion (7) de l'élément résistant à l'usure (20) comprend l'encoche (21) qui comprend une paroi périphérique (27) entourant continue qui détermine un espace interne (28) dans l'élément résistant à l'usure (20).

13. Usage de l'élément résistant à l'usure selon la revendication 11 ou 12, **caractérisé en ce que** la partie de connexion (7) de l'élément résistant à l'usure (20) comprend l'encoche (21) et une coulisse (29) dans la direction d'insertion (I), qui permet pour la langue (11) avec une section transversale en forme de T prévue sur le ruban de pince (2) à être insérée dans l'encoche (21) et à être maintenue dans l'encoche (21) d'une manière forme fermée dans des directions différentes de la direction d'insertion (I).

14. Usage de l'élément résistant à l'usure selon l'une quelconque des revendications 11 à 13, **caractérisé en ce que** la langue (11) est maintenue dans l'encoche (21) d'une manière forme fermée de telle sorte que la rotation par rapport au ruban de pince (2) est prévenue, plus particulièrement qu'une rotation autour d'un axe (37) parallèle à la direction d'insertion (I) est prévenue.

Fig. 1

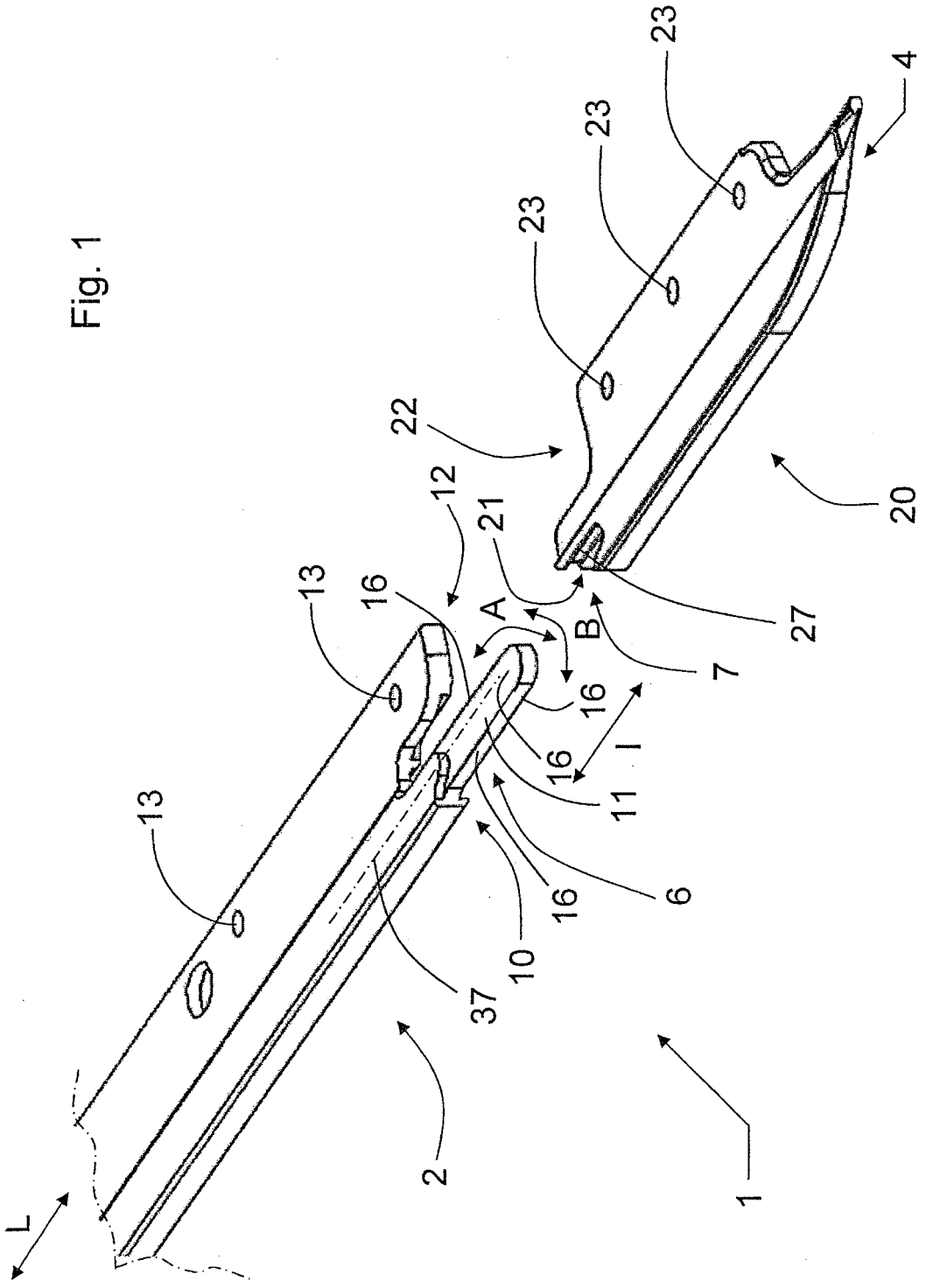


Fig. 2

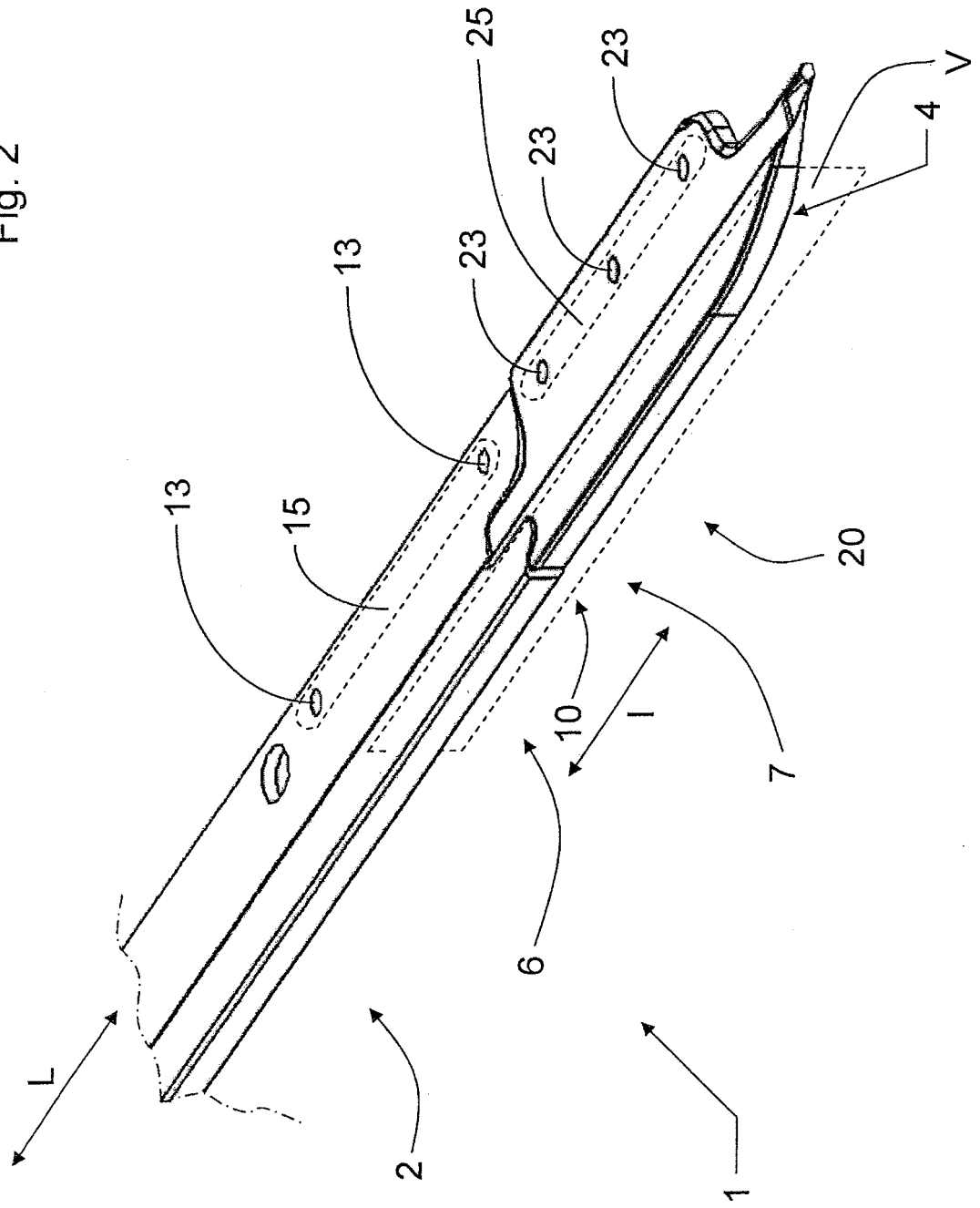
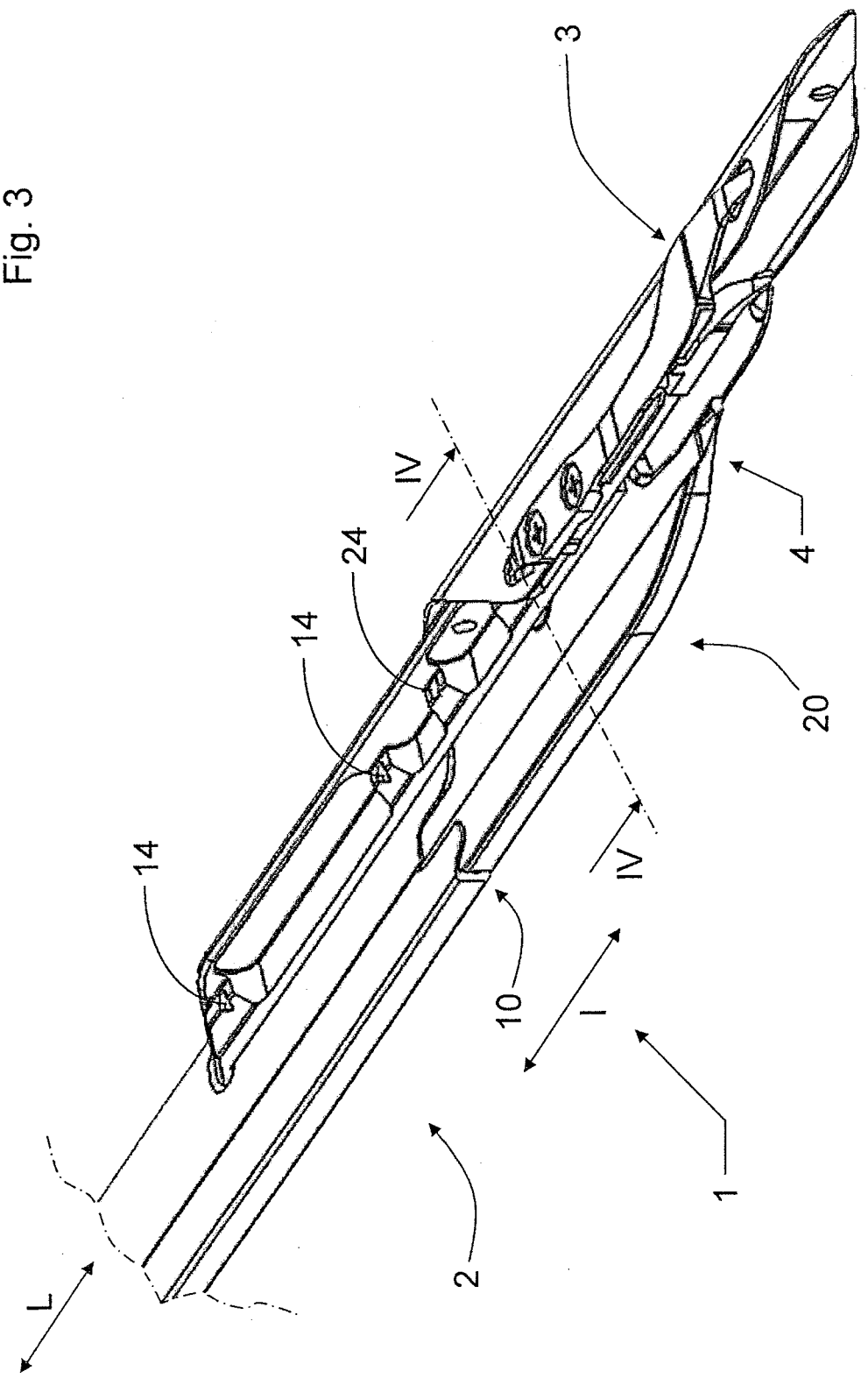


Fig. 3



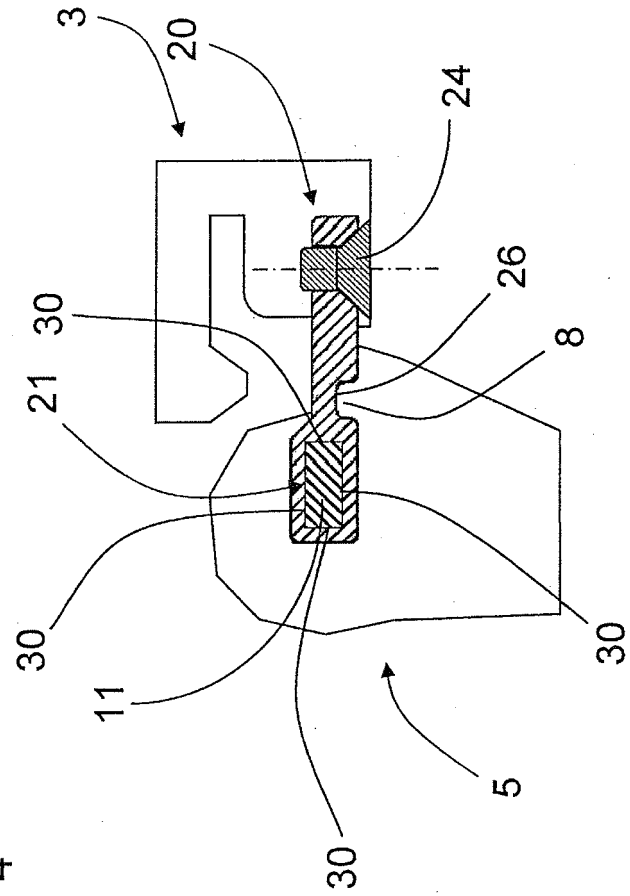

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Fig. 4

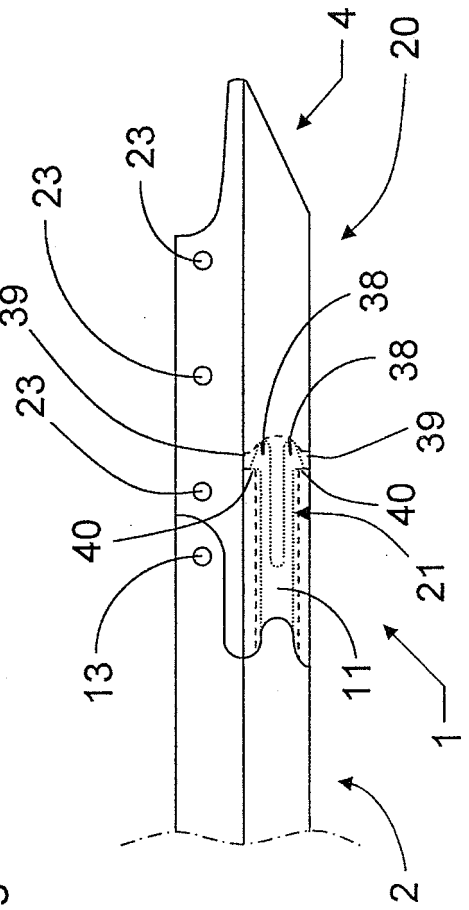
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Fig. 11

Fig. 5

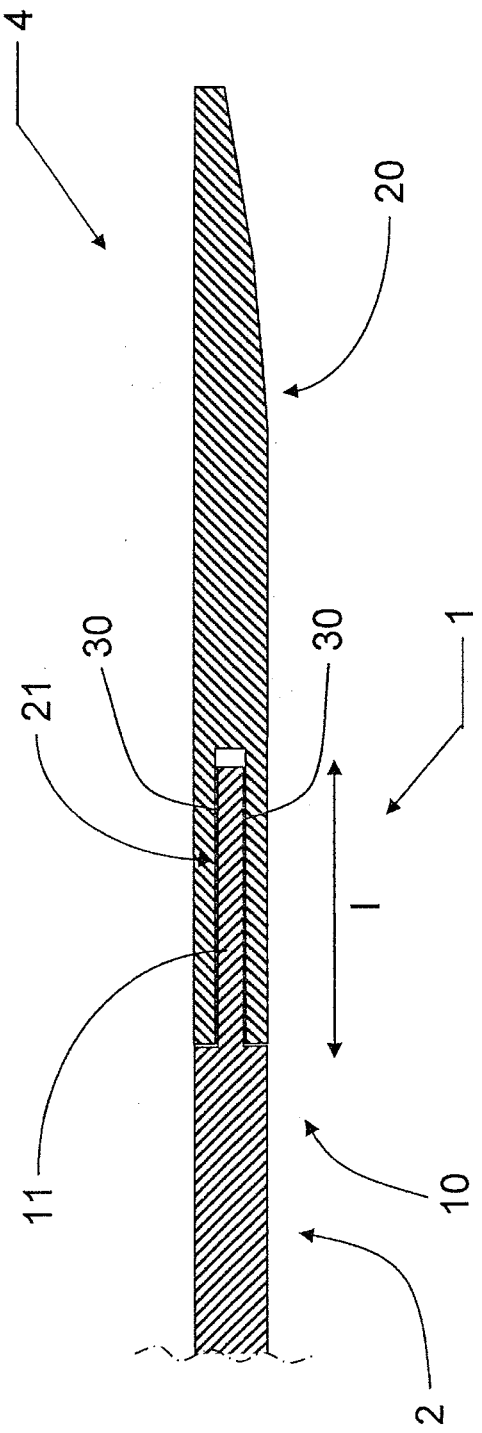

Fig. 10

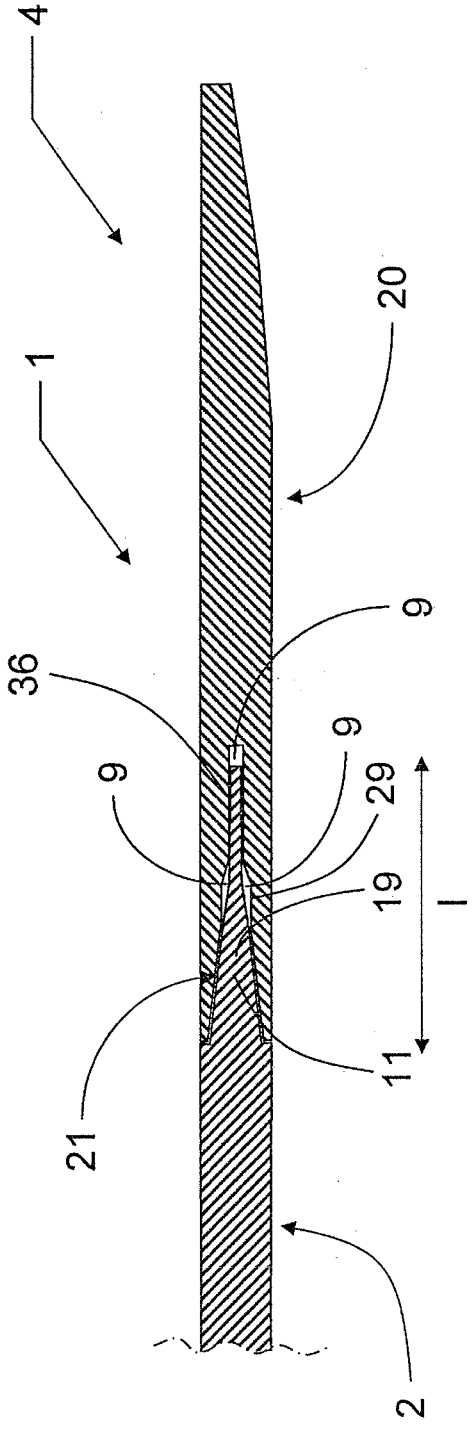

Fig. 9

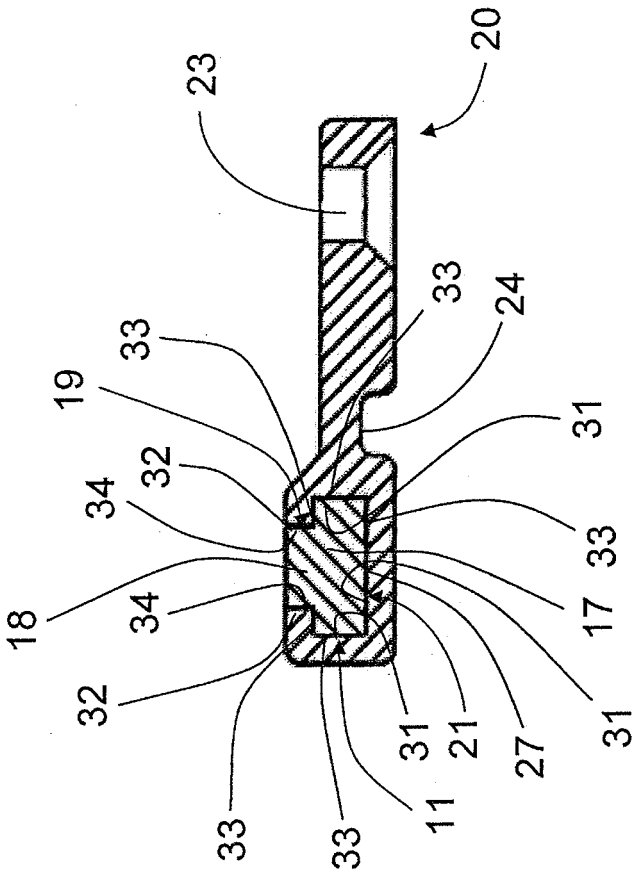
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Fig. 6

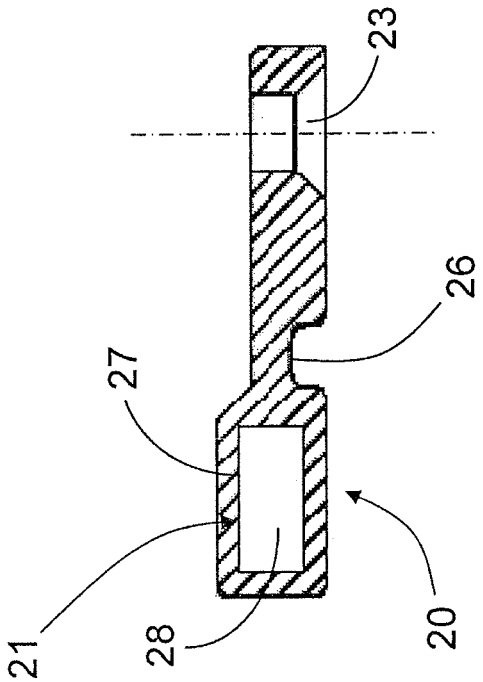
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Fig. 7

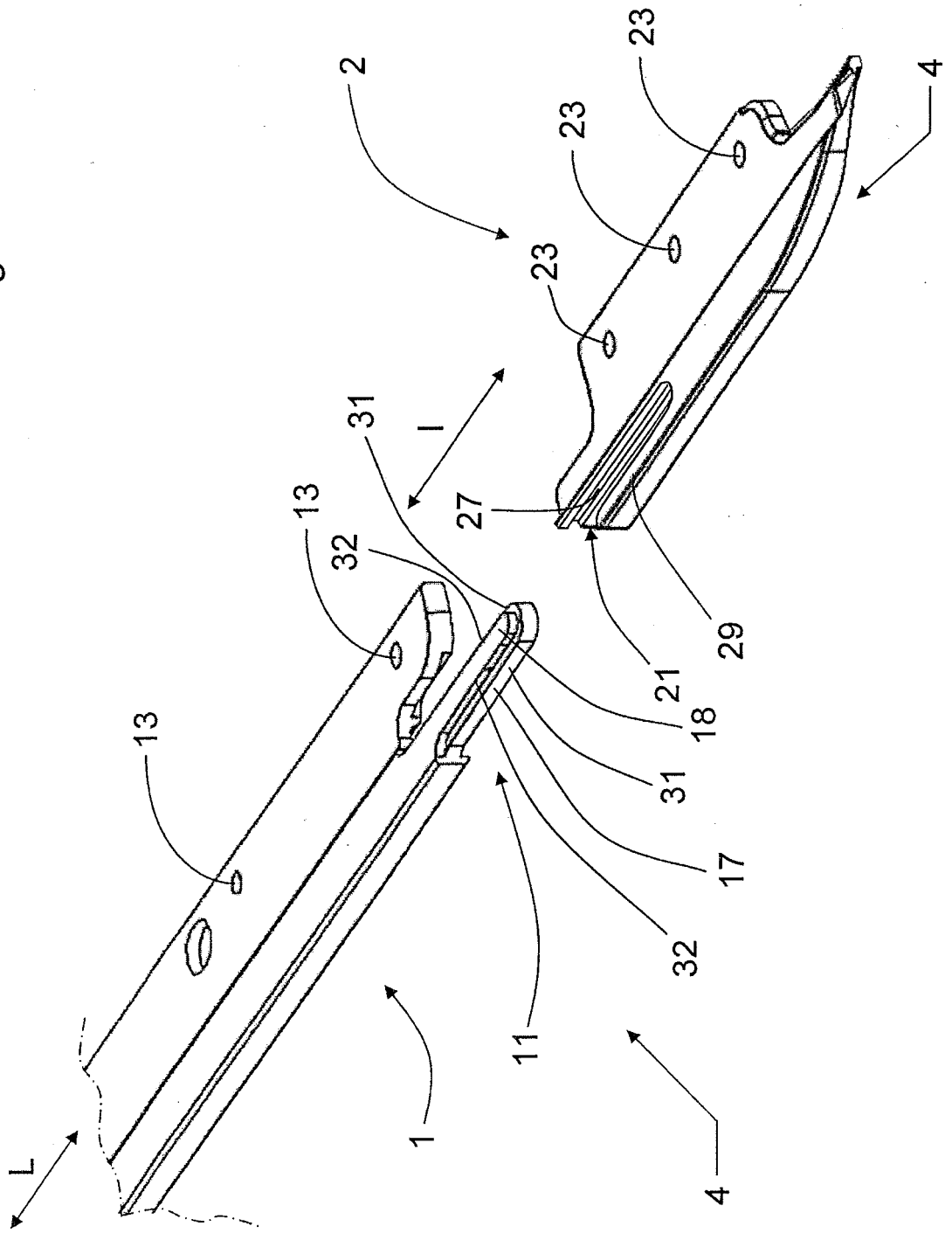
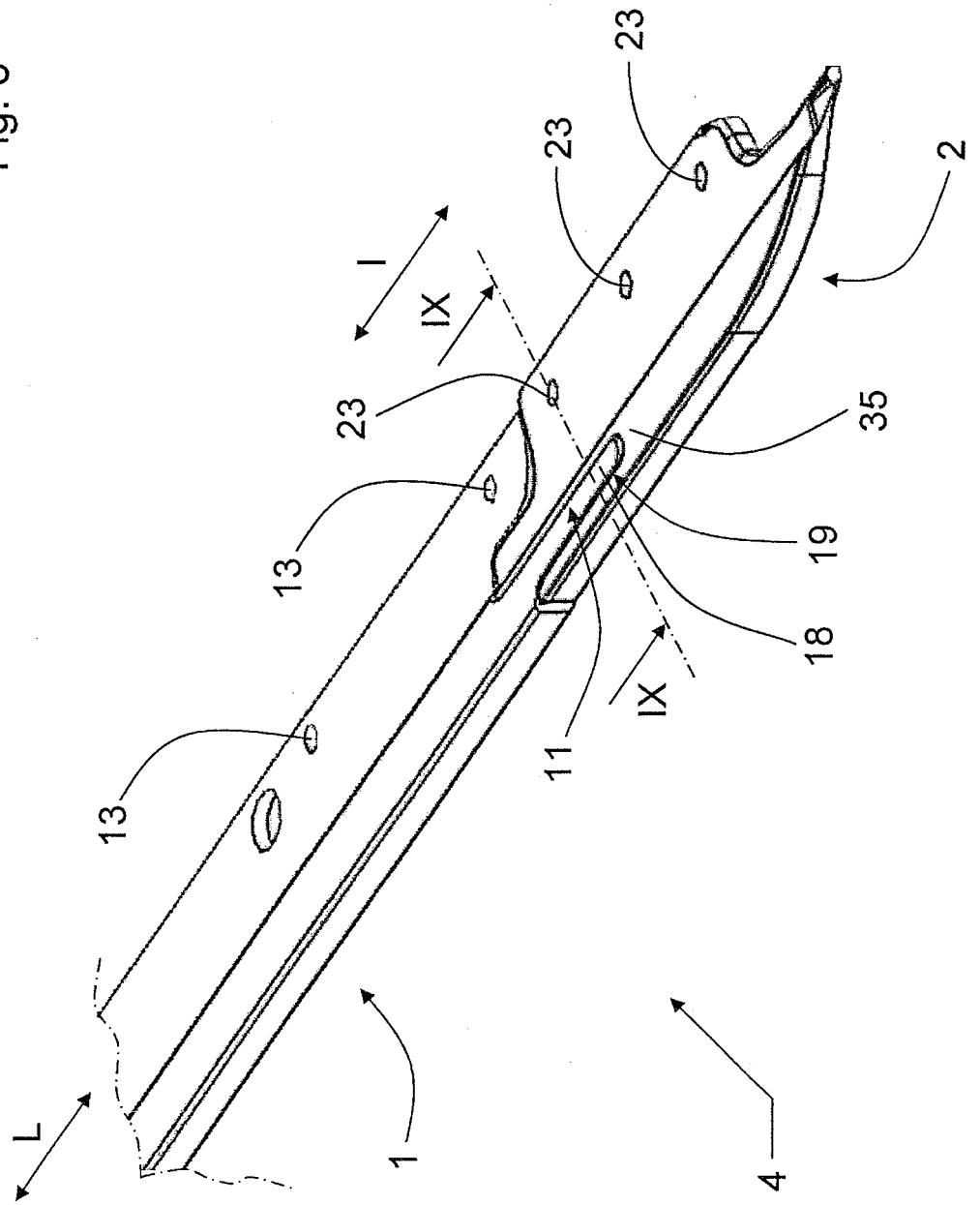


Fig. 8



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