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(54) **CLAMPING TOOL**

KLEMMWERKZEUG

OUTIL DE SERRAGE

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Description

TECHNICAL FIELD

[0001] The subject disclosure relates to a clamping tool, more particular to a clamping tool configured to clamp an object with a defined clamping force.

BACKGROUND ART

[0002] Clamping tools are well known (e.g. screw clamps) and have long been in use on a large scale. However, a screw clamp requires that a screwthreaded spindle is rotated by a handle to effect the clamping. However, due to friction in the spindle, the torque exerted on the handle is not a good indication of the clamping force.

[0003] Lever clamps facilitate the clamping operation, the clamping force is transmitted through sliding surfaces and the release and the return movement of the pressure plunger is complicated.

[0004] GB762818 discloses a clamp comprising a slide having at one of its ends an arm which acts as an abutment or anvil for a plunger. The plunger is movable axially in another arm which is slidable along the slide. A lever between a stem of the plunger and a clamping lever is pivoted integral with the other arm.

[0005] Elegant ladies' shoes and boots with raised or high heels do not generally have a very long life expectancy. To repair a damaged heel, the shoe has to be secured in a holding device, for example a clamping tool.

[0006] A requirement for clamping a shoe is that the clamping force is high enough to keep the shoe in place when repairing the shoe heel with a heel repair patch and that the clamping force is not so high that the material of the shoe sole is permanently damaged by the clamping force. The clamping force corresponds to the pressure of the clamping tool acting on the inner side and outer side of the shoe sole in N/m². If the pressure is too high, a print of the clamping surface will be pressed in the material of the sole. When the friction of the clamping surfaces by the clamping force is too low, forces acting on the shoe while repairing could result in rotation or shifting of the shoe between the clamping surfaces of the clamping tool resulting in possible scratches on the upper or lower surface of the sole.

[0007] DE42244C represents the closest prior art and discloses a clamp for carpenters. An arm can be moved on a bracket, which carries a rotatable pressure lever at its free end. Swinging of the lever causes a corresponding displacement of a pressure block.

[0008] US2019789A1 discloses an adjustable support for clamps, wherein a clamp can rotate about a pin relative to a holder.

[0009] DE2613673A1 discloses a clamping device with a clamp which has a first rectangular arm and a second rectangular arm with a clamping jaw. The second arm extends at an angle to the first arm and is adjustable in the longitudinal direction of the first arm.

SUMMARY OF INVENTION

[0010] It is an object of the present technology to provide a clamping tool that overcomes shortcomings of the prior art clamping tools and which improves at least one of: ease of use, durability, easy and economical in cost to manufacture and defined clamping force.

[0011] According to an aspect of the subject technology, this object is achieved by a clamping tool having the features of claim 1. Advantageous embodiments and further ways of carrying out the present technology may be attained by the measures mentioned in the dependent claims.

[0012] A clamping tool according to the subject technology comprises a main frame provided with a slide rail and a coupling structure. A first clamping surface structure is mechanically coupled to the main frame. The coupling structure is configured to be moved along the slide rail and to be secured to the slide rail. A straight line action clamp is attached to the coupling structure. A plunger of the straight line action clamp is movable axially in a passage of a base member of the straight line action clamp in a direction parallel to the moving direction of the coupling arrangement along the slide rail. A lever which is mechanically coupled to a proximal end of the plunger controls the movement of the plunger. A second clamping surface structure is mechanically coupled to a distal end of the plunger of the straight line action clamp. An elevation arranged on the plunger defines the maximum displacement of the plunger in the base member when moving the lever from a clamp position of to a release position and vice versa. The clamping tool is configured such that when the second clamping surface structure is positioned without pressure against the first clamping surface structure in the release position and the coupling structure is secured to the slide rail, a defined clamping force is exerted between the first and second clamping surface structures after the handle is moved from the release position to the clamp position.

[0013] These features provides clamping tool that exerts on an object a clamping force within a defined limited range which does not depend on the thickness or size of the object between the first and the second clamping surfaces of the clamping tool. This allows exerting a clamping force on the product sufficient to prevent the object from movement or rotation of the object in the clamping tool but not too high to damage the outer surface of the object. This is an important requirement for a clamping tool which will be used to repair for example the heel of high heel shoe. When the clamping force is too high, a 3D-footprint of the clamping surface will remain visible as the material of the outer surface will not recover from the too high clamping force. By defining the length of the path of the plunger from release position to the clamp position, the resilience in the structure of the clamp defines the clamp force and not the force exerted on the handle to clamp the object.

[0014] In an embodiment, the elevation is an elongated

body coupled at one end to the distal end of the plunger and at the other end to the second surface structure. This feature provides a simple construction to define the maximal length of the path of movement of the plunger and thus the maximal clamping force.

[0015] In an embodiment, at least one detachable C-shaped ring with a predefined thickness is positioned around the plunger in the space between the elevation and the base member of the straight line action clamp. This feature enables to reduce the maximal clamping force in a defined way without changing the coupling structure between the plunger and the second clamping surface structure.

[0016] In an embodiment, another straight line action clamp is attached to the coupling structure and is configured to secure the position of the coupling structure on the slide rail. The use of an action clamp ensures that the coupling structure is always secured on the sliding rail when the lever or handle of the action clamp is in the press position.

[0017] According to the invention, the clamping tool further comprises an orientation adjusting member. A free end of the slide rail is coupled to the orientation adjusting member. The orientation adjusting member is configured to rotate the main frame around a rotation axis parallel to the moving direction of the coupling structure along the slide rail. The orientation adjusting member enables to change the orientation of the object without changing the position of the object between the first and second clamping surface. This is very useful when the object can be clamped in structure of the main frame in limited specific positions, which is the case when the object is a high heeled shoe or boot. As the first clamping surface is positioned near the heel, the shoe can be positioned in the main frame in only two ways. By the orientation adjusting member any side of the heel can be turned upwards.

[0018] According to the invention, the orientation adjusting member comprises a self-locking structure for securing the orientation. This has the advantage that no additional handling is needed to secure the main frame in an orientation. In a further embodiment, the orientation adjusting member is released by pulling the main frame away from the orientation adjusting member in a direction parallel to the rotation axis.

[0019] In an embodiment, the main frame is a curved square bar. A squared bar provides directly the slide rail of the main frame. Furthermore, it enables a structure which curvature and dimensions define the deflection and corresponding tension force in the main frame between the position of coupling structure and the first clamping surface when pushing the first clamping surface a predefined distance away from the coupling structure, which predefined distance is defined by the movement of the plunger when positioning the lever of the straight line action clamp from the release position to the clamp position. In a further embodiment, the curved square bar is made from a 10 x 10 mm bar of blank unalloyed con-

struction steel of type S235JRC+C. Such a bar is relative easy to bend in the desired shape without degrading the strength of the steel and providing the requested characteristic with respect to tension force build up in the mainframe as a function of the relative movement from the first clamping surface away from the coupling structure of the clamping tool. A main frame having a question-mark like shape has been found very easy and cheap to manufacture while providing a main frame with the desired tension force due to deflection of the main frame when pushing away the first clamping surface from the coupling structure.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] These and other aspects, properties and advantages will be explained hereinafter based on the following description with reference to the drawings, wherein like reference numerals denote like or comparable parts, and in which:

Fig. 1 shows schematically a perspective view of an embodiment of a clamping tool;

Fig. 2 shows schematically a top view of the embodiment in Fig. 1;

Fig. 3 shows schematically a side view of the embodiment in Fig. 1;

Fig. 4 shows schematically a perspective view of the clamping tool with the straight line action clamp in clamp position;

Fig. 5 shows schematically a perspective view of the clamping tool with the straight line action clamp in release position;

Fig. 6 shows schematically a perspective view of the orientation adjusting member;

Fig. 7 shows schematically a perspective view of the embodiment in Fig. 1 wherein the main frame is rotated 45 degrees;

Fig. 8 shows a partial sectional view of the first straight line action clamp in clamp position; and,

Fig. 9 shows a partial sectional view of the first straight line action clamp in release position.

DESCRIPTION OF EMBODIMENTS

[0021] It is noted that the drawings are schematic, not necessarily to scale and that details that are not required for understanding the present subject technology may have been omitted. The terms "upward", "downward", "below", "above", and the like relate to the embodiments as oriented in the drawings, unless otherwise specified or functionally required. Further, elements that are at least substantially identical or that perform an at least substantially identical function are denoted by the same numeral.

[0022] Fig. 1 shows schematically a perspective view of an embodiment of a clamping tool 100 according to the present subject technology. The clamping tool 100

comprises: a main frame 102, a coupling structure 104, a first clamping surface structure 106, a second clamping surface structure 108, a first straight line action clamp 112, a second straight line action clamp 114, an orientation adjustment member 116, and a support structure 118, 120. Fig. 1 further shows a high heeled shoe 180 clamped in the clamping tool 100.

[0023] The main frame 102 is a curved square bar made from a 10 x 10 mm bar of blank unalloyed construction steel. Preferably, the type of construction steel is S235JRC+C. This type of steel provides the desired function with respect to tension force in the main frame between first clamping surface and the coupling structure 104 when pushing the first clamping surface 106 a defined distance away from the coupling structure 104. After the squared 10 x 10 mm blank unalloyed bar of construction steel has been bended into the desired shape of the main frame, the bar is coated to prevent rusting of the curved bar. Furthermore, said type of steel is almost not sensitive to metal fatigue due to the changing tension forces in the bar by frequently clamping and releasing a product between the first and second clamping surface. The main frame 102 has a question mark-like shape. The straight root of the question mark functions as a slide rail 102B for the coupling structure 104. The coupling structure 104 is movable along the slide rail 102B in a straight line. In the present application, the direction of the straight line is mentioned as sliding direction of the coupling structure 104. The curved section 102B provides space in the clamping structure to receive for example a side of a high boot.

[0024] The main frame 102 comprises a section forming a slide rail 102A. The coupling structure 104 is attached to the slide rail 102A and could be moved along the slide rail 102A to change the distance between the first clamping surface structure 106 and the second clamping surface structure 108. By means of the second straight line action clamp 114 the coupling structure 104 could be secured to the main frame 102 such that it could not be moved along the slide rail 102A or released such that the coupling structure could slide along the slide rail 102A. Furthermore, the main frame 102 comprises a curved section 102B. The first clamping surface structure 106 is mechanically coupled to a free end of the curved section 102B. The clamping surface of the first clamping surface structure 106 is in a plane substantially perpendicular to the sliding direction.

[0025] The first straight line action clamp 112 is attached to the coupling structure 104. The second clamping surface structure 108 is mechanically couple to a plunger of the first straight line action clamp by means of elongated body 110. The first straight line action clamp 112 is configured to move the second clamping surface structure 108 in a direction parallel to the sliding direction of the coupling structure 104. When positioning the first straight line action clamp 112 from a clamp position of to a release position and vice versa, the clamping tool is configured such that when the second clamping surface

structure is first positioned without pressure against the first clamping surface structure in the release position and the coupling structure 104 is secured to the slide rail 102A, a defined clamping force is exerted between the surface structures after the first straight line action clamp 110 is moved from the release position to the clamp position. In the present embodiment, stress is build up in the part of the main frame, mainly the curved section 102B, when the straight line action clamp is moved from the release position to the clamp position. Due to this action, the first clamping surface 106 is pushed away from the slide rail 102B. This causes bending of the curved section 102B, resulting in stress in the material of the main frame 102. This stress results in the clamping force between the clamping surfaces of the first and the second clamping surface structures 106, 108.

[0026] The slide rail 102A of the main frame 102 continues at one end as curved part 102B. The other end of the slide rail 102A is mechanically coupled to an orientation adjusting member 116. The orientation adjusting member is configured to rotate the main frame 102 around a rotation axis parallel to the moving direction of the coupling structure 104 along the slide rail 102A.

[0027] A housing of the orientation adjusting member 116 is attached to a support structure comprising two profiles 118 that can slide over each other. One profile is attached to a base part configured to secure the clamping tool to for example a work bench. The other profile is attached to the housing of the orientation adjusting member 116. The two profiles are configured to slide over each other to set the height of the main frame 102. A fastener 122 is used to fasten the two profiles together to adjust the main frame to a desired height. In the present embodiment, the fastener is a butterfly nut; however other type of fasteners might be used.

[0028] Fig. 2 shows schematically a top view of the embodiment in Fig. 1 and Fig. 3 shows schematically a side view of the embodiment in Fig. 1. From Fig. 2 can be seen that the direction of the slide rail 102A is in line with the length axis of the elongated body 110 and the direction of movement of the elongated body 110 and the second clamping surface structure 108 caused by the first straight line action clamp 112. Furthermore, it can be seen that the clamping surfaces of the first and second clamping surface structures are perpendicular to said direction of movement. From Fig. 3 can be seen that the sliding direction of the coupling structure along the slide rail 102A is parallel to the central axis of the elongated body 110. Furthermore, it can be seen that the clamping surfaces of the first and second clamping surface structures are perpendicular to the sliding direction and the central axis of the elongated body 110.

[0029] Figs. 4 and 5 show schematically a perspective view of the clamping tool with the first straight line action clamp in clamp position and in release position, respectively. Further, Fig. 4 shows the second straight line action clamp 114 in a position wherein the coupling structure 104 is fastened to the slide rail 102A of the main

frame 102. This is done by pressing a pressure spindle 402 against a side surface of the slide rail 102A of the main frame 102. In the clamp position of the second straight line action clamp 114 the pressure spindle is pressed against the slide rail 102A which subsequently presses the coupling structure 104 against the slide rail 102A. Both the pressure exerted by the surface of the coupling structure 104 and the pressure spindle 402 on the slide rail 102A results in sufficient friction force to keep the coupling structure 104 in place on the slide rail when an object is clamped between the two clamping surface structures 106, 108.

[0030] Fig. 5 shows the first and second straight line action clamps 112, 114 in release position. In this position the distance between the second surface structure 108 and the coupling structure 104 is smaller than when the first straight line action clamp 112 is in the clamp position. Furthermore, when the second straight line action clamp 114 is in the release position, the pressure spindle 402 is not in contact with the slide rail 102A. This allows moving the coupling structure 104 along the slide rail 102A.

[0031] Fig. 6 shows schematically a detailed perspective view of the orientation adjusting member 116. The orientation adjusting member 116 comprises a housing 512, a helical spring 504, an end part 508, a first guiding element 510 and a second guiding element 506. The two guiding elements 506, 510 are at distance from each other and attached to the housing 512 of the orientation adjusting member 116. The two guiding elements are configured such that the end part of the slide rail 102A could be rotated in the guiding elements and be moved forward and backward though the guiding elements in a direction in line with the direction of movement of the coupling structure along the straight slide rail 102A and configured such that movement of the first clamping surface at the opposite side of main frame 102 in a direction perpendicular to the direction of movement of the slide rail 102A in the guiding elements is minimal. An end part 508 is attached to the end of the slide rail 102A. Helical spring 504 is placed compressed between guiding element 506 and the end part 508. The opening of the housing 512 through which the slide rail 102A enters the housing comprises an edge with a number of notches 504. Furthermore, a pin 502 is placed in a drilling hole through the slide rail 102A. Due to forces of the compressed spring 504, the pin 502 is pushed into the notches. The side walls of the notches prevent the slide rail 102A to rotate in the orientation adjusting member 116 when the pin 502 is located in the notches 504. By pulling the main frame 102 in a direction in line with the straight slide rail 102A away from the housing 512, the pin 502 is moved out of the notches and the main frame could be rotated around a rotation axis in the housing 512. When the pulling stops, the pin will be pushed again in the notches. This prevents further rotation of the main frame. The pin 502 and the notches 504 form a self-locking structure for securing the orientation of the clamping tool. Fig. 7 shows schematically a perspective view of the embodiment in

Fig. 1 wherein the main frame is rotated 45 degrees.

[0032] Fig. 8 and Fig. 9 show a partial sectional view of the first straight line action clamp 112 in clamp position and in release position respectively. The first straight line action clamp comprises a base member 140, a plunger 142, a lever 144 and a hinge structure. The base member 140 is fastened to the coupling structure 104. The plunger 142 of the straight line action clamp is movable axially in a passage of a base member 140 of the straight line action clamp in a direction parallel to the moving direction of the coupling structure 104 along the slide rail 102A under control of lever 144. The lever 144 is mechanically coupled to a proximal end of the plunger by means of the hinge structure. The hinge structure converts a rotation of the lever 114 along a rotation axis into a straight line movement of the plunger 142. A further characteristic of the hinge structure is that when the lever 144 is in the clamp position, the hinge structure forces the lever 144 to stay in the clamp position. As soon as the lever 144 is rotated over a defined angle away from the clamp position the clamp pressure forces the lever 114 to rotate in direction of the release position of the lever 114. Fig. 9 shows the lever 114 in the release position. An advantage of the hinge structure is that no additional elements are necessary to lock and unlock the straight line action clamp 112.

[0033] The elongated body 110 coupling the second clamping surface structure to the straight line action clamp 112 is at one end mechanically coupled to a distal end of the plunger 142. The end comprises a borehole in which the distal end of the plunger 142 is placed. The elongated body 110 is fastened to the plunger 142 by means of the screw. The end of the elongated body 110 forms an elevation arranged on the plunger 142. The elevation defines the maximum displacement D of the plunger in the base member 140 when moving the lever 144 from a clamp position of to a release position and vice versa. The clamping tool is configured such that when the second clamping surface structure is positioned without pressure against the first clamping surface structure in the release position and the coupling structure 104 is secured to the slide rail 102A, a defined clamping force is exerted between the surface structures after the handle is moved from the release position to the clamp position. In the present embodiment the clamping force is generated by enlarging the distance between the first clamping surface and the coupling structure 104 by the movement of the second clamping surface structure which is pushed away from the coupling structure 104 when the straight line action clamp is moved from the release position to the clamp position. The enlargement of the distance causes bending the main frame part between the first clamping surface structure and the coupling structure 104; resulting in stress in the main frame which stress generates the clamping force of the clamp.

[0034] The maximal movement D of the plunger 142 in the base member is the width of the gap between the elongated body 110 and the base member 142 as shown

in Fig. 8. When the lever 144 is moved from the clamp position in Fig. 8 to the release position in Fig. 9, the elongated body can move in the direction of the coupling structure until the elevation on the plunger 142 by the elongated body abuts the base member 142. This situation is shown in Fig. 9.

[0035] The displacement of the plunger in the base member could be limited further by positioning at least one C-shaped ring or the like with a predefined thickness in the gap between the elevation and the base member. Reduction of the displacement results in reduction of the clamping force as the stress in the main frame will be less.

[0036] The presented pressure clamp clamps an object always with a known maximal clamping force, due to the known displacement of the plunger when moving the lever from the release state to the clamp state after surface of both the first and second clamping surface structures abuts said object and the coupling structure is secured to the main frame. The thickness of the object to be clamped does not have influence on the clamping force.

[0037] In the presented pressure clamp the clamping force is generated by stress in the main frame due to the bending of the main frame by enlarging the distance between the first clamping surface structure and the coupling structure. The clamping force could also be generated by a springy coupling element coupling the first clamping surface to the main frame and/or a springy coupling element coupling the second clamping surface to the plunger. In principle any construction of clamping could be used wherein the clamping tool and product to be clamped form a mechanical loop. As characteristic of the clamping tool according to the present technology is that when the product is first positioned between the first and second clamping surfaces with minimal force acting on the product and the first straight line action clamp in release position, a defined clamping force will be acting on the product after the first straight line action clamp is moved from release position to clamp position. The defined travel distance of the plunger of the first straight line action clamp changes the mechanical stress in the clamping tool and as a result a springy part in the part of the loop formed by the clamping tool deforms in a known manner which deformation results in the defined clamping force. In the embodiment shown in the figures, the springy part of the loop is the part of the main frame between the first clamping surface and the coupling structure. Therefore, the embodiment of a clamping tool according to the present technology is not limited to a main frame obtained from a 10 x 10 mm bar of blank unalloyed construction steel.

[0038] In the embodiment disclosed above the maximum width of the gap between the elongated body and the base member is 6 mm. This gap provides a maximum clamping force of 24 kg. When positioning a C-ring with a width of 2 mm in the gap the maximal movement of the plunger is reduced to 4 mm resulting in a clamping force of 16 kg. When two C-rings with a width of 2 mm are

positioned in the gap, the maximal movement of the plunger is reduced to 2 mm which results in a clamping force of 9 kg. Instead of a C-ring, any other component having a predefined thickness that could be positioned in the gap and removably secured to the plunger can be used. The clamping surface of the first clamping surface structure has an area of 4 cm² and the clamping surface of the second clamping surface structure is a circle with a diameter of 3 cm.

Claims

1. A clamping tool (100) comprising:

- a) a main frame (102) comprising a slide rail (102A);
- b) a first clamping surface structure (106) mechanically coupled to the main frame (102);
- c) a coupling structure (104) configured to be moved along the slide rail and to be secured to the slide rail;
- d) a straight line action clamp (112) attached to the coupling structure (104), a plunger (142) of the straight line action clamp is movable axially in a passage of a base member (140) of the straight line action clamp in a direction parallel to the moving direction of the coupling structure (104) along the slide rail (102A) under control of a lever (144) which is mechanically coupled to a proximal end of the plunger; and,
- e) a second clamping surface structure (108) mechanically coupled to a distal end of the plunger of the straight line action clamp;

an elevation arranged on the plunger (142) defines the maximum displacement of the plunger in the base member (140) when moving the lever (144) from a clamp position of to a release position and vice versa, the clamping tool being configured such that when the second clamping surface structure is positioned without pressure against the first clamping surface structure in the release position and the coupling structure is secured to the slide rail, a defined clamping force is exerted between the surface structures after the handle is moved from the release position to the clamp position,

characterized in that,

the clamping tool further comprises an orientation adjusting member (116), a free end of the slide rail is coupled to the orientation adjusting member (116), the orientation adjusting member being configured to rotate the main frame (102) around a rotation axis parallel to the moving direction of the coupling structure (104) along the slide rail and comprises a self-locking structure for securing the orientation.

2. The clamping tool according to claim 1, wherein the

elevation is an elongated body (110), one end is attached to the distal end of the plunger (142) and the other end is coupled to the second surface structure (108).

3. The clamping tool according to any of the claims 1 - 2, wherein at least one detachable C-shaped ring with a predefined thickness is positioned around the plunger (142) in the space between the elevation and the base member of the straight line action clamp.
4. The clamping tool according to any of the claims 1 - 3, wherein another straight line action clamp (114) is attached to the coupling structure and is configured to secure the position of the coupling structure on the slide rail.
5. The clamping tool according to any of the claims 1 - 4, wherein the orientation adjusting member (116) is released by pulling the main frame away from the orientation adjusting member in a direction parallel to the rotation axis.
6. The clamping tool according to any of the claims 1 - 5, wherein the main frame is a curved square bar.
7. The clamping tool according to claim 6, wherein the curved square bar is made from a 10 x 10 mm bar of blank unalloyed construction steel of type S235JRC+C.
8. The clamping tool according to any of the claims 1 - 7 wherein the main frame has a question-mark-like shape.

Patentansprüche

1. Klemmwerkzeug (100), umfassend:
 - a) einen Hauptrahmen (102), der eine Gleitschiene (102A) umfasst;
 - b) eine erste Klemmflächenstruktur (106), die mit dem Hauptrahmen (102) mechanisch gekoppelt ist;
 - c) eine Kupplungsstruktur (104), die dazu ausgelegt ist, entlang der Gleitschiene bewegt und an der Gleitschiene fixiert zu werden;
 - d) eine Linearklemme (112), die an der Kupplungsstruktur (104) befestigt ist, wobei ein Kolben (142) der Linearklemme in einem Durchgang eines Basiselements (140) der Linearklemme in eine Richtung parallel zur Bewegungsrichtung der Kupplungsstruktur (104) entlang der Gleitschiene (102A), die von einem Hebel (144) gesteuert wird, der mit einem proximalen Ende des Kolbens mechanisch gekoppelt

ist, axial beweglich ist; und
e) eine zweite Klemmflächenstruktur (108), die mit einem distalen Ende des Kolbens der Linearklemme mechanisch gekoppelt ist;

wobei eine auf dem Kolben (142) angeordnete Erhebung die Maximalverschiebung des Kolbens in das Basiselement (140) definiert, wenn der Hebel (144) von einer Klemmstellung zu einer Freigabestellung oder umgekehrt bewegt wird, wobei das Klemmwerkzeug derart ausgelegt ist, dass, wenn die zweite Klemmflächenstruktur in der Freigabestellung ohne Druck gegen die erste Klemmflächenstruktur angeordnet wird und die Kopplungsstruktur an der Gleitschiene fixiert ist, eine definierte Klemmkraft zwischen den Flächenstrukturen aufgebracht wird, nachdem der Griff von der Freigabestellung in die Klemmstellung bewegt wurde, **dadurch gekennzeichnet, dass** das Klemmwerkzeug ferner ein Ausrichtungsanpassungselement (116) umfasst, wobei ein freies Ende der Gleitschiene mit dem Ausrichtungsanpassungselement (116) gekoppelt ist, wobei das Ausrichtungsanpassungselement dazu ausgelegt ist, den Hauptrahmen (102) um eine Drehachse zu drehen, die parallel zur Bewegungsrichtung der Kopplungsstruktur (104) entlang der Gleitschiene verläuft, und eine selbstarretierende Struktur zur Fixierung der Ausrichtung umfasst.

2. Klemmwerkzeug nach Anspruch 1, wobei die Erhebung ein länglicher Körper (110) ist, wobei ein Ende am distalen Ende des Kolbens (142) befestigt ist und das andere Ende mit der zweiten Flächenstruktur (108) gekoppelt ist.
3. Klemmwerkzeug nach einem der Ansprüche 1-2, wobei mindestens ein abnehmbarer C-förmiger Ring mit einer festgelegten Stärke in dem Zwischenraum zwischen der Erhebung und dem Basiselement der Linearklemme um den Kolben (142) angeordnet ist.
4. Klemmwerkzeug nach einem der Ansprüche 1-3, wobei eine weitere Linearklemme (114) an der Kopplungsstruktur befestigt ist und dazu ausgelegt ist, die Stellung der Kopplungsstruktur auf der Gleitschiene zu fixieren.
5. Klemmwerkzeug nach einem der Ansprüche 1-4, wobei das Ausrichtungsanpassungselement (116) gelöst wird, indem der Hauptrahmen in eine Richtung parallel zur Drehachse vom Ausrichtungsanpassungselement weggezogen wird.
6. Klemmwerkzeug nach einem der Ansprüche 1-5, wobei der Hauptrahmen ein gekrümmter Vierkantstab ist.

7. Klemmwerkzeug nach Anspruch 6, wobei der gekrümmte Vierkantstab aus einem 10-x-10-mm-Stab aus unlegiertem Baustahl vom Typ S235JRC+C besteht.
8. Klemmwerkzeug nach einem der Ansprüche 1-7, wobei der Hauptrahmen fragezeichenförmig ist.

Revendications

1. Outil de serrage (100) comprenant :

- a) un cadre principal (102) comprenant un rail de coulissement (102A) ;
- b) une première structure de surface de serrage (106) accouplée mécaniquement au cadre principal (102) ;
- c) une structure d'accouplement (104) configurée pour être déplacée le long du rail de coulissement pour être fixée solidement au rail de coulissement ;
- d) une pince droite à action linéaire (112) fixée à la structure d'accouplement (104), un plongeur (142) de la pince droite à action linéaire est mobile axialement dans un passage d'un élément de base (140) de la pince droite à action linéaire dans une direction parallèle à la direction de déplacement de la structure d'accouplement (104) le long du rail de coulissement (102A) sous la commande d'un levier (144) qui est accouplé mécaniquement à une extrémité proximale du plongeur ; et,
- e) une seconde structure de surface de serrage (108) accouplée mécaniquement à une extrémité distale du plongeur de la pince droite à action linéaire ;

une saillie disposée sur le plongeur (142) définit le déplacement maximal du plongeur dans l'élément de base (140) lors du déplacement du levier (144) d'une position de serrage à une position de libération et vice versa, l'outil de serrage étant configuré de telle sorte que lorsque la seconde structure de surface de serrage est positionnée sans pression contre la première structure de surface de serrage dans la position de libération et que la structure d'accouplement est fixée solidement au rail de coulissement, une force de serrage définie soit exercée entre les structures de surface après que la poignée est déplacée de la position de libération à la position de serrage,

caractérisé en ce que,

l'outil de serrage comprend en outre un élément de réglage d'orientation (116), une extrémité libre du rail de coulissement est accouplée à l'élément de réglage d'orientation (116), l'élément de réglage d'orientation étant configuré pour faire tourner le ca-

dre principal (102) autour d'un axe de rotation parallèle à la direction de déplacement de la structure d'accouplement (104) le long du rail de coulissement et comprend une structure autobloquante pour fixer l'orientation.

- 2. Outil de serrage selon la revendication 1, dans lequel la saillie est un corps allongé (110), une extrémité est fixée à l'extrémité distale du plongeur (142) et l'autre extrémité est accouplée à la seconde structure de surface (108).
- 3. Outil de serrage selon l'une quelconque des revendications 1 - 2, dans lequel au moins une bague détachable en forme de C ayant une épaisseur prédéfinie est positionnée autour du plongeur (142) dans l'espace entre la saillie et l'élément de base de la pince droite à action linéaire.
- 4. Outil de serrage selon l'une quelconque des revendications 1 - 3, dans lequel une autre pince droite à action linéaire (114) est fixée à la structure d'accouplement et est configurée pour fixer solidement la position de la structure d'accouplement sur le rail de coulissement.
- 5. Outil de serrage selon l'une quelconque des revendications 1 - 4, dans lequel l'élément de réglage d'orientation (116) est libéré en tirant le cadre principal à l'écart de l'élément de réglage d'orientation dans une direction parallèle à l'axe de rotation.
- 6. Outil de serrage selon l'une quelconque des revendications 1 - 5, dans lequel le cadre principal est une barre carrée incurvée.
- 7. Outil de serrage selon la revendication 6, dans lequel la barre carrée incurvée est fabriquée à partir d'une barre de 10 x 10 mm d'acier de construction non allié brut de type S235JRC+C.
- 8. Outil de serrage selon l'une quelconque des revendications 1 - 7, dans lequel le cadre principal a une forme de point d'interrogation.

Fig. 1

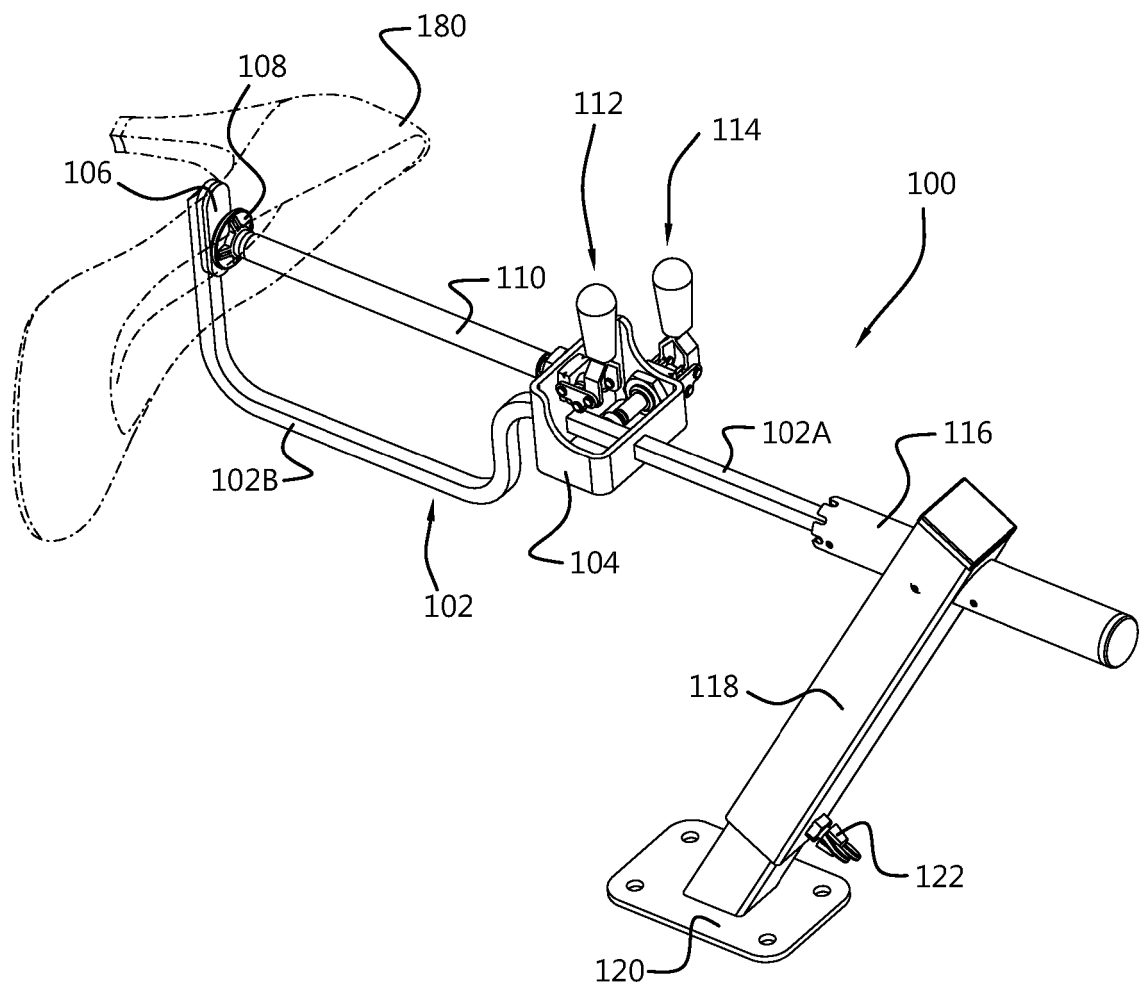


Fig. 2

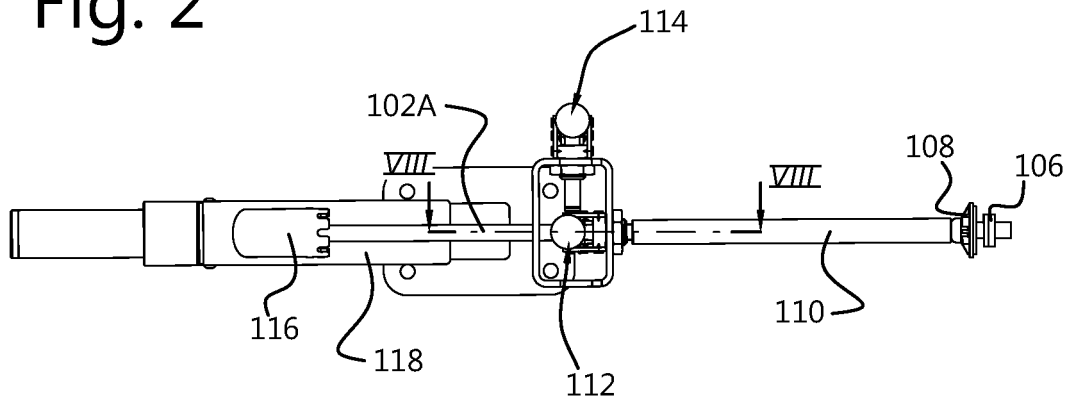


Fig. 3

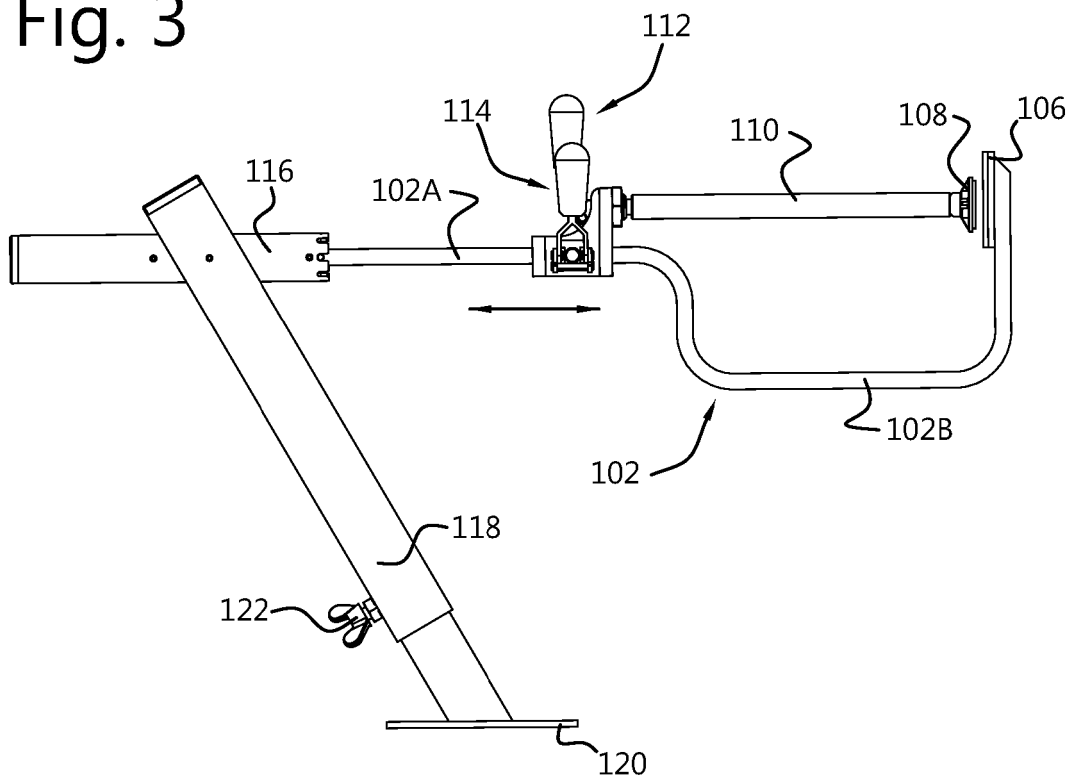


Fig. 4

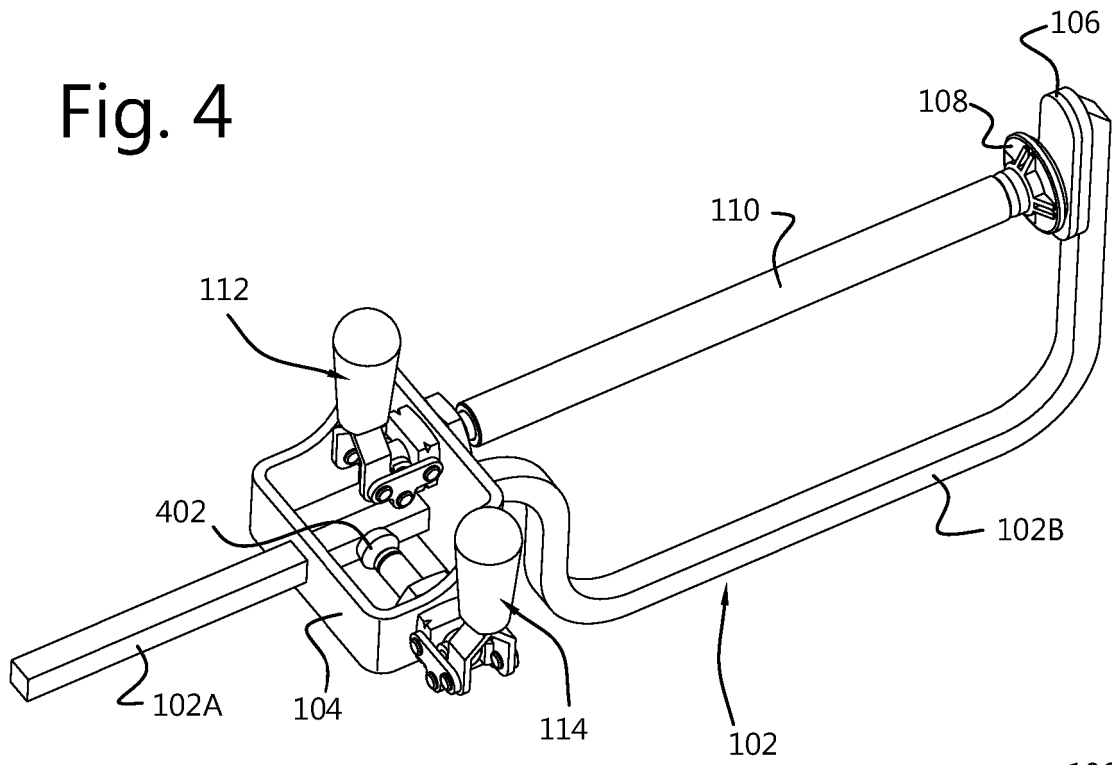


Fig. 5

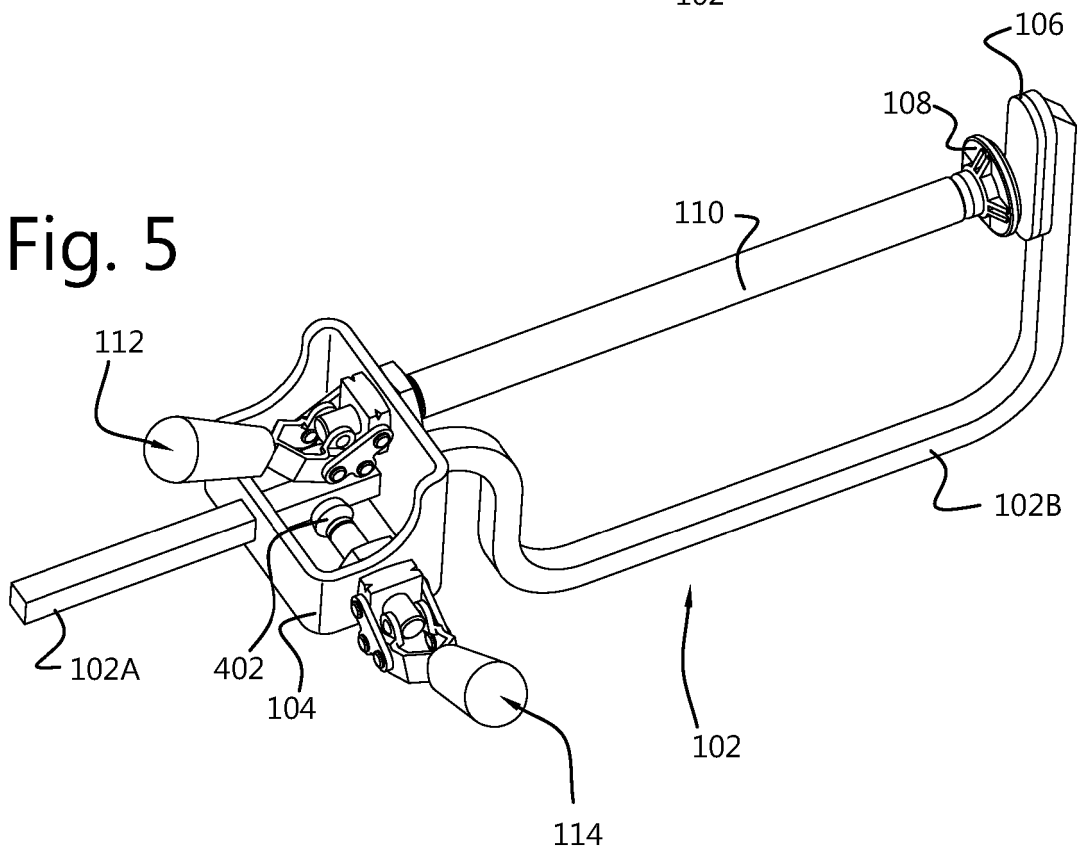


Fig. 6

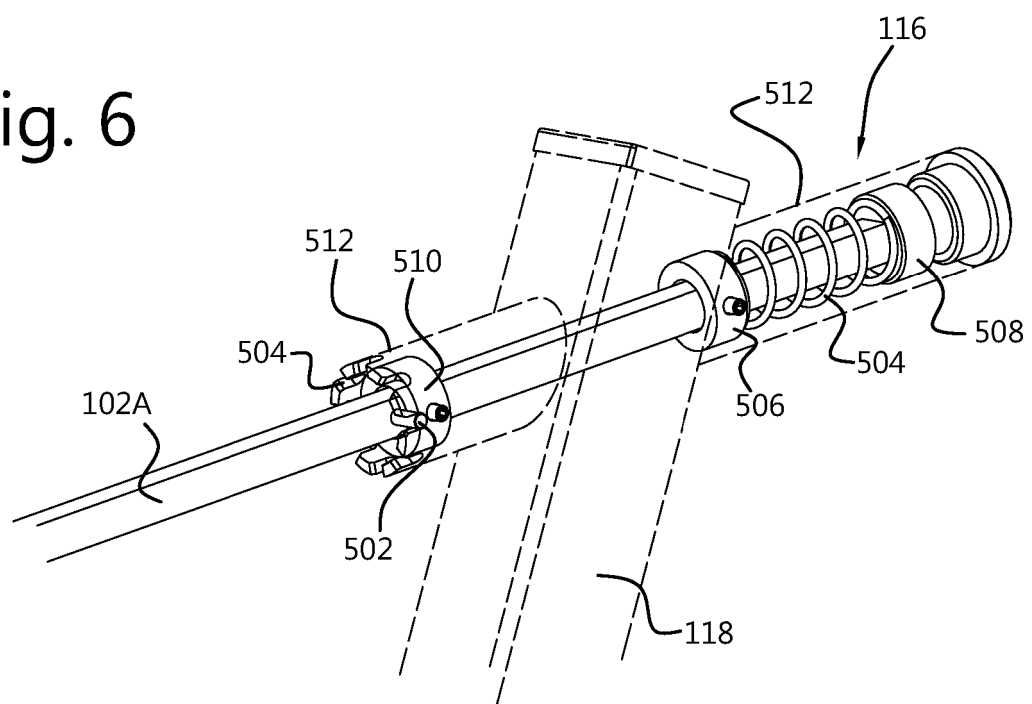


Fig. 7

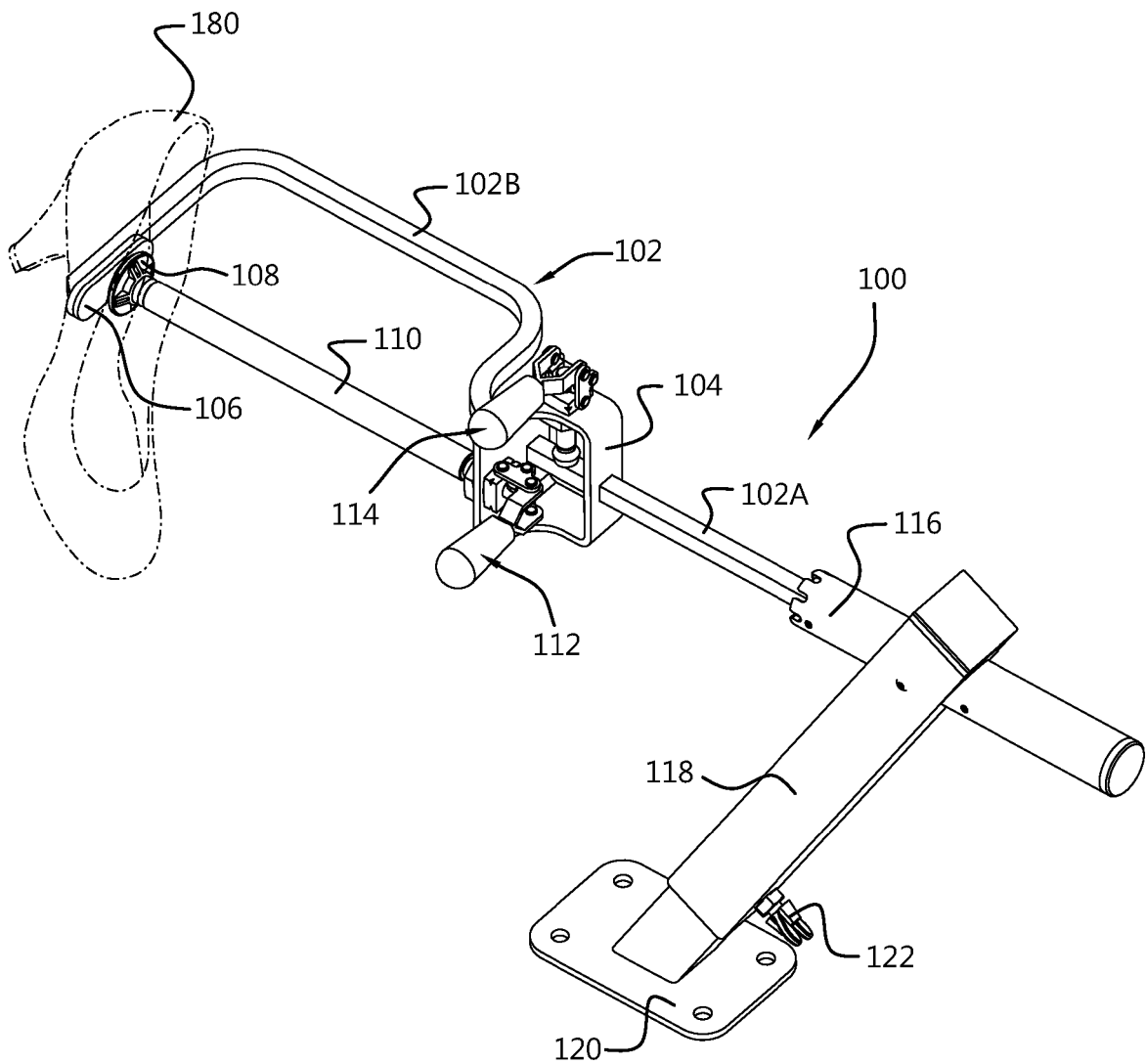


Fig. 8

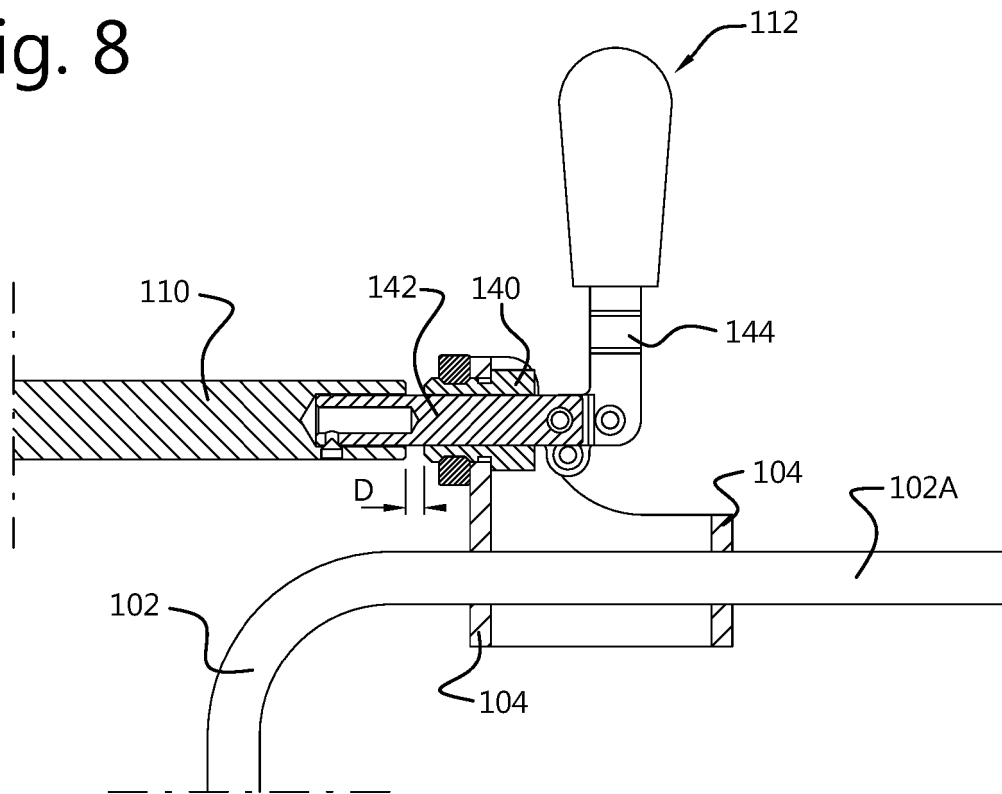
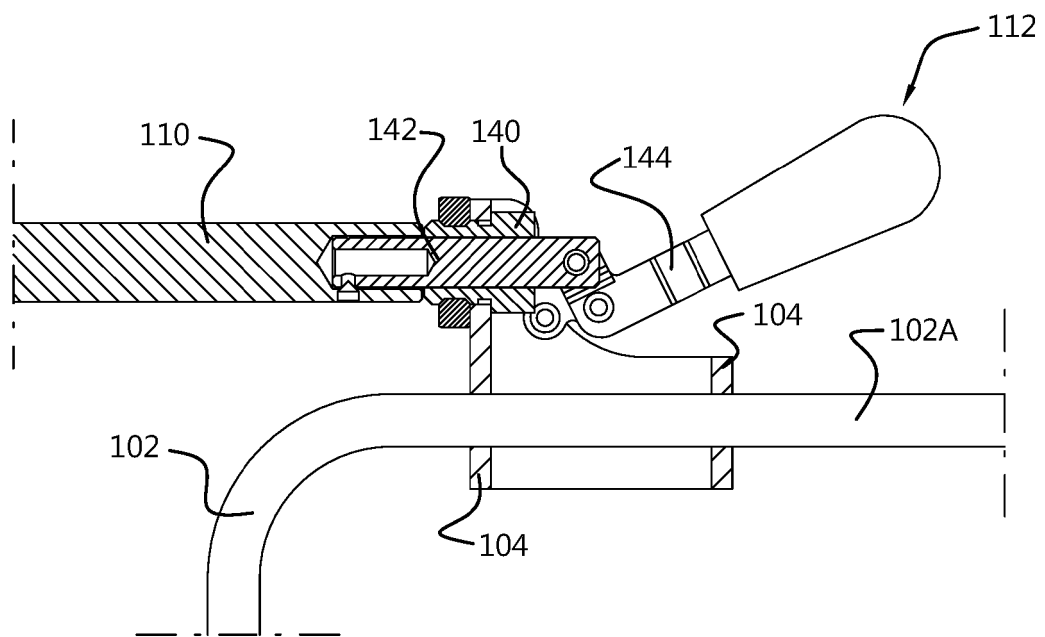


Fig. 9



REFERENCES CITED IN THE DESCRIPTION

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