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(54) **Hand-held riveting tool for placing and deforming blind rivets and/or blind rivet nuts**

(57) The invention relates to a hand-held riveting tool (1) for placing and deforming blind rivet elements, which hand-held riveting tool comprises a frame (26) as well as a case (10) that surrounds securing means for securing a blind rivet element in the hand-held riveting tool, which securing means are connected to a shaft (6), said case being movable with respect to the frame, by means of two handles (24a,24b) that can be moved towards and away from each other, by moving the handles from a first

position, in which the angle between the two handles is maximum, to a second position, and vice versa, in which first position the blind rivet element can be secured in the hand-held riveting tool by the securing means, whilst a deforming force can be generated by means of the case by moving the handles from the first position to the second position, by means of which force the blind rivet element secured in the hand-held riveting tool can be deformed.

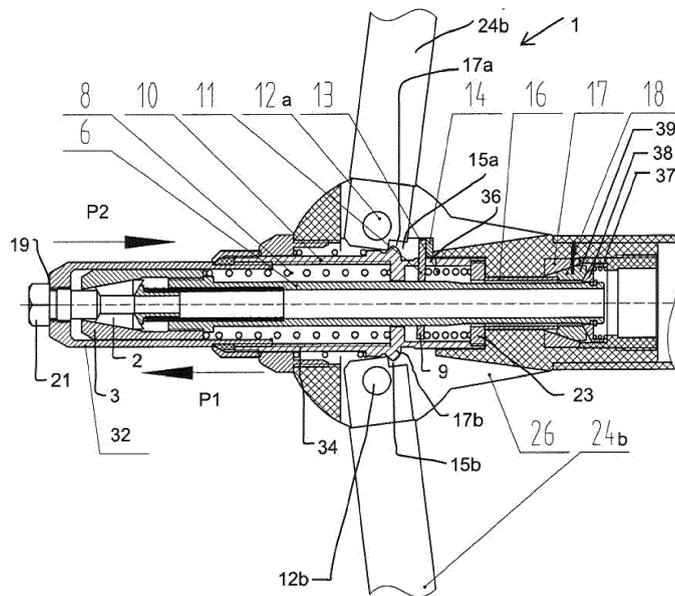


Fig. 1

Description

[0001] The invention relates to a hand-held riveting tool for placing and deforming blind rivet elements, which hand-held riveting tool comprises a frame as well as a case that surrounds securing means for securing a blind rivet element in the hand-held riveting tool, which securing means are connected to a shaft, said case being movable with respect to the frame, by means of two handles that can be moved towards and away from each other, by moving the handles from a first position, in which the angle between the two handles is maximum, to a second position, and vice versa, in which first position the blind rivet element can be secured in the hand-held riveting tool by the securing means, whilst a deforming force can be generated by means of the case by moving the handles from the first position to the second position, by means of which force the blind rivet element secured in the hand-held riveting tool can be deformed.

[0002] Such a hand-held riveting tool and the operation thereof are known per se, for example from EP-1.524.042.

[0003] The dimensions of the tool of the known hand-held riveting tool constitute a drawback. In order to be able to generate sufficient force for deforming blind rivet elements, such as blind rivets having a diameter of up to 10 mm and/or blind rivet nuts M4-M12, for example, the stroke that can be made with the handles for generating the required deforming force must be sufficiently large. The force to be exerted by the user with his hands is minimized by designing the lever to have maximum dimensions. Because of the required size of the lever, the dimensions of the hand-held riveting tool are relatively large.

[0004] The object of the present invention is therefore to provide a riveting tool of relatively simple construction and compact dimensions, by means of which at least the same force can be generated as by means of the conventional riveting tool.

[0005] This object is accomplished with the hand-held riveting tool according to the invention in that the frame is provided with a moving mechanism by means of which the shaft and the securing means connected to the shaft are immovable with respect to the frame upon movement of the handles toward the second position for applying the deforming force, via the moving case, on the blind rivet element secured in the hand-held riveting tool, wherein, upon movement of the handles toward the first position, the shaft is moved with respect to the frame in the same direction as the case by means of the moving mechanism, wherein, in the case of a repeated movement of the handles toward the second position, the shaft and the securing means connected to the shaft are again immovably clamped down by means of the moving mechanism for applying a renewed deforming force on the blind rivet element.

[0006] The moving mechanism makes it possible in a simple manner to have the deformation of the blind rivet

element from the undeformed condition to the fully or desired deformed condition take place in several steps. This makes it possible to use a smaller lever, or, if the dimensions of the lever remain unchanged, to generate greater deforming forces. The hand-held riveting tool can be designed to have much more compact dimensions with relatively few adaptations to the known hand-held riveting tool.

[0007] Because of its relatively compact dimensions, the hand-held riveting tool according to the present invention can also be used in environments that are difficult to reach by an operator, where relatively little space is available for making the deforming stroke with the handles. This is possible because the handles, and in particular the length of each handle, can be made smaller.

[0008] Because of the limited dimensions of the hand-held riveting tool according to the invention for deforming the aforesaid blind rivet and/or blind rivet nut, the hand-held riveting tool according to the invention is moreover lighter in weight, so that the total weight of a mechanic's toolbox containing the hand-held riveting tool according to the invention, among other tools, which leads to improved labour conditions.

[0009] The term "blind rivet element" as used herein is understood to mean an element to be deformed through the application of a force, such as a blind rivet, a blind rivet nut, a blind rivet bolt, a hollow-wall anchor, a locking pin that will open and fix itself in place by being tightened (expander), a tensioning nut or an insert.

[0010] According to one embodiment of the hand-held riveting tool according to the invention, the moving mechanism is provided with a clamping element for clamping down the shaft immovably with respect to the frame when the handles are moved toward the second position, and also with a connecting mechanism that can be connected to the shaft in such a manner that the connecting mechanism and the shaft can be moved together with the case when the handles are moved toward the first position.

[0011] The clamping element is movable against spring force and the shaft engaging surface of the clamping element is provided with an engaging profile that engages a part of the circumferential surface of the shaft in such a manner that movement of the shaft in a first direction is blocked, whereas movement in an opposite direction is allowed.

[0012] Using a clamping element thus configured, it is ensured in a simple manner that the shaft will only move in the desired direction. In a constructionally simple variant, which is advantageous from the viewpoint of costs, the engaging surface of the clamping element as well as at least said part of the circumferential profile are provided with mating serrated profiles.

[0013] The clamping element is a ratchet mechanism, which enables shaft to move freely in one direction and locks the shaft against movement in the other direction. Using the ratchet mechanism, the blind rivet elements can be deformed in several steps in a simple manner.

[0014] The connecting mechanism of the moving

mechanism is provided with a tiltable, biased pawl, through which the shaft extends, with the pawl projecting through an opening in the case, which pawl connects to the shaft upon movement of the handles to the first position, such that the shaft is connected to the case via the pawl, so that the shaft can be moved along with the shaft.

[0015] According to another embodiment of the hand-held riveting tool according to the invention, the case is provided with a receiving hole through which the blind rivet and/or the blind rivet nut, including any additional fitting pieces, can be connected to the securing means, wherein the case is provided with an unlocking plate opposite the side remote from the receiving hole, which unlocking plate presses against a pressure sleeve in the first position of the handles, thereby disconnecting the clamping element from the shaft.

[0016] In the first position, the handles include a maximum angle with each other, and the case is placed maximally rearwards, as a result of which the clamping element is disconnected by means of the unlocking plate of the case that presses against the pressure sleeve, so that the clamping element no longer clamps down the shaft. In said first position, the tool is in the loading condition, in which the blind rivet element to be deformed can be positioned, or in a condition in which the blind rivet element has just been deformed and the remaining part of the blind rivet element can be removed.

[0017] According to another embodiment of the hand-held riveting tool according to the invention, the part of the shaft that interacts with the clamping element is conical in shape, so that the shaft, because of its conical shape, will disconnect from the clamping element after being moved a predetermined distance with respect to the frame.

[0018] In this way disconnection takes place in a simple manner upon completion of a predetermined maximum riveting operation, which, in particular in the case of blind rivet nuts, can be an indication to the operator that the blind rivet nut has been deformed to its desired shape.

[0019] The invention will now be described in more detail with reference to the embodiment shown in the figures.

Figure 1 shows a hand-held riveting tool according to the invention for placing and deforming blind rivets, with the handles in a first position;

Figure 2 shows a hand-held riveting tool according to the invention for placing and deforming blind rivets, with the handles in a second position;

Figure 3 shows a hand-held riveting tool according to the invention for placing and deforming blind rivets, with the handles in an intermediate position between the first position shown in figure 1 and the second position shown in figure 2;

Figure 4 shows a detail view of a hand-held riveting tool according to the invention as shown in the pre-

ceding figures, more in particular the clamping element thereof;

Figure 5 shows a hand-held riveting tool according to the invention for placing and deforming blind rivet nuts.

[0020] Like parts are indicated by the same numerals in the various figures.

[0021] Figures 1-3 show an embodiment of a hand-held riveting tool 1 according to the invention for placing and deforming blind rivets 11. Said hand-held riveting tool 1 comprises a frame 26 as well as a case 10 that surrounds securing means such as, among other parts, spring-tensioned tensioning jaws 2 and a movable clamping sleeve 3 for securing a blind rivet in the hand-held riveting tool 1. The front side of the hand-held riveting tool 1 according to the invention holding the securing means 2, 3 is known and will therefore not be discussed in detail herein. It is noted in that regard that several other techniques for securing blind rivets are known, which techniques can also be applied in the hand-held riveting tool 1 according to the invention.

[0022] The securing means are connected to a shaft 6, which extends in the longitudinal direction of the tool 1.

[0023] The case 10 is provided with a receiving hole 19 at one end, in which a fitting piece in the form of a nosepiece 21 for receiving the blind rivet is located. The spring 8 exerts a spring force on the nosepiece 21. The case 10 is built up of a front receiving part 32 and a rear pusher part 34. The rear pusher part 34 is provided with an outer wall comprising shoulders 17a, 17b that extend transversely to the central axis.

[0024] The frame 26 is provided with two handles 24a, 24b connected thereto via pivot pins 12a, 12b, which handles can be moved towards and away from each other. Each handle 24a, 24b has an end provided with a recess 15a, 15b, which recesses 15a, 15b mate with the shoulders 17a, 17b of the pusher part 34 of the case 10.

[0025] Making use of the mating projections 17a, 17b and respective recesses 15a, 15b, the case 10 can be moved with respect to the frame 26 by means of the two handles 24a, 24b, which are movable toward and away from each other, by moving the handles from a first position (figure 1), in which the angle between the two handles is maximum, to a second position (see figure 2), and vice versa.

[0026] In the first position of the handles 24a, 24b that is shown in figure 1, the nosepiece 21 pushes against the tensioning jaws 2 under the influence of the spring 8, causing the tensioning jaws to move apart, so that the blind rivet can be secured in the nosepiece 21 of the hand-held riveting tool through the passage in the direction indicated by arrow P2. By moving the handles 24a, 24b from the first position toward the second position, a mandrel of the blind rivet is clamped down more firmly by the tensioning jaws 2.

[0027] By moving the handles 24a, 24B from the first position shown in figure 1 to the second position shown

in figure 2, in which the angle between the handles is minimum, the case 10 is moved forward in the direction indicated by arrow P1, whilst a deforming force is generated by means of the case 10, by which the blind rivet secured in the hand-held riveting tool can be deformed.

[0028] In the hand-held riveting tool 1 according to the invention, the frame 26 is provided with a moving mechanism comprising a clamping element 18, by means of which the shaft 6 and the securing means connected to said shaft 6 are immovably clamped down with respect to the frame 26 upon movement of the handles 24a, 24b toward the second position for applying the deforming force via the moving case 10 on the blind rivet secured in the hand-held riveting tool. By returning the handles 24a, 24b to the first position, the shaft 6 is made to move by means of the moving mechanism, more in particular by means of the connecting mechanism 11, with respect to the clamping element 18 in the same direction as direction in which the case 10 is pushed by means of the handles 24a, 24b, which direction is indicated by arrow P2.

[0029] Figure 4 shows a larger-scale detail view of the disconnected clamping element 18, which disconnection has taken place in that the shaft has moved a predetermined distance in the direction indicated by arrow P2, which will be explained yet hereinafter.

[0030] Another manner of disconnecting can be realised by means of the handles 24a, 24b, which, in order to make disconnection possible, must be in the first position (see figure 1). The clamping element 18 is built up of at least one spring 37 and two clamping parts 38, 39 configured in such a manner that they can be moved against the spring force of the spring 37 and also be disconnected from the shaft 6 if the handles 24a, 24b are fully open. As it is, the case 10, and more in particular the pusher part 34, is further provided with an unlocking plate 23 opposite the side remote from the receiving hole 19, which unlocking plate 23 pushes against a movable pressure sleeve 16 by moving the handles to the first position, which pressure sleeve, by moving in the direction indicated by arrow P2, moves/pushes the shaft 6 aside against spring force, so that the clamping element 18 is disconnected from the shaft 6.

[0031] The shaft engaging surface (see figure 4, numeral 40) of the clamping part 39 is provided with an engaging profile which, in the connected condition (the condition in which the handles 24a, 24b are not in the first position shown in figure 1), engages a part 42 of the circumferential surface of the shaft 6 in such a manner that movement of the shaft 6 in a direction indicated by arrow P1 is blocked during movement of the handles toward the second position. The engaging surface 40 of the clamping element 18 and also at least the part 42 of the circumferential profile are provided with mating serrated profiles. Such serrated profiles render movement in a first direction (arrow P1) impossible, whilst movement in an opposite direction (indicated by arrow P2) is allowed.

[0032] Upon return movement of the handles 24a, 24b to the first position, the connecting mechanism 11 will be activated.

[0033] The connecting mechanism 11 is provided with a tiltable pawl 9, which is tensioned and supported by a spring 13, through which pawl a shaft 6 extends, with the pawl 9 projecting into the case 10 through an opening 36. During movement of the handles to the second position, the pawl 9 will slide over the shaft 6, which is retained in place by the clamping element 18. Upon movement of the handles to the first position, however, the pawl 9 will connect to the shaft 6 in such a manner that the shaft 6 can be moved along with the case 10 in the direction indicated by arrow P2. Said movement is allowed by the serrated profiles of the clamping element and the part 42 of the circumferential profile.

[0034] The clamping element 18 and the connecting mechanism 11 provide a ratchet mechanism which makes it possible to apply a renewed deforming force on the blind rivet in the case of a repeated movement of the handles 24a, 24b toward the second position, in which the shaft 6 and the securing means connected to the shaft are again immovably clamped down by means of the clamping element 18. Figure 3 also shows, therefore, that the shaft 6 has moved rearwards in the direction indicated by arrow P2 with respect to the frame 26 after the handles 24a, 24b have been moved from the (intermediate) position of the handles 24a, 24b shown in figure 2 to the position thereof shown in figure 3.

[0035] This can be repeated until the blind rivet breaks. The mandrel of the blind rivet is still stuck in the tensioning jaws 2 at that point. Said mandrel can be liberated by moving the handles 24a, 24b completely to the first position (see figure 1), as a result of which the shaft 6 with the securing means connected thereto is pressed forward by the spring 8, so that the tensioning jaws 2 will move apart and the mandrel of the blind rivet will be positioned clear of the tensioning jaws 2 and can be discharged through the hollow shaft 6.

[0036] It is also possible to use the ratchet mechanism repeatedly until the shaft 6 has moved a predetermined distance in the direction indicated by arrow P2. The fact is that the shaft has a conical shaft portion 61, see figure 4. Because of the conical shape of said shaft portions 61, repeated movement of the handles 24a, 24b from the first position to the second, and vice versa, causes the shaft to be automatically disconnected from the clamping element 18 after having moved a predetermined distance. As a result of being disconnected, which condition is shown in figure 4, the shaft 6 can be freely moved and the operator of the tool will know that the desired deforming operation has taken place.

[0037] Figure 5 shows another embodiment of a hand-held riveting tool 101 according to the invention for placing and deforming blind rivet nuts 111. Said hand-held riveting tool 101 for placing and deforming blind rivet nuts 111 is provided with securing means, being a threaded rod assembly, in which the blind rivet nut 111 can be

positioned in the first position of the handles. The hand-held riveting tool 101 further comprises a rotary knob 131 by means of which a blind rivet nut 111 can be turned onto a threaded rod assembly and be turned off said threaded rod assembly after the deforming step. The operation of the moving mechanism of the hand-held riveting tool 101 is identical to that of the moving mechanism of the hand-held riveting tool 1 as described in relation to figures 1-4.

[0038] By setting the distance between the beginning of the conical thickening 61 of the shaft 6 and the clamping element 18, more in particular the clamping part 39, it is possible to set the maximum stroke to be applied to the blind rivet nut.

Claims

1. A hand-held riveting tool (1, 101) for placing and deforming blind rivet elements, which hand-held riveting tool comprises a frame (26, 126) as well as a case (10) that surrounds securing means for securing a blind rivet element in the hand-held riveting tool, which securing means are connected to a shaft (6), said case being movable with respect to the frame, by means of two handles (24a, 24b) that can be moved towards and away from each other, by moving the handles from a first position, in which the angle between the two handles is maximum, to a second position, and vice versa, in which first position the blind rivet element can be secured in the hand-held riveting tool by the securing means, whilst a deforming force can be generated by means of the case by moving the handles from the first position to the second position, by means of which force the blind rivet element secured in the hand-held riveting tool can be deformed, **characterised in that** the frame is provided with a moving mechanism by means of which the shaft and the securing means connected to the shaft are immovable with respect to the frame upon movement of the handles in the direction of the second position for exerting the deforming force, via the moving case, on the blind rivet element secured in the hand-held riveting tool, wherein, upon movement of the handles toward the first position, the shaft is moved with respect to the frame in the same direction as the case by means of the moving mechanism, wherein, in the case of a repeated movement of the handles toward the second position, the shaft and the securing means connected to the shaft are again immovably clamped down by means of the moving mechanism for exerting a renewed deforming force on the blind rivet element.
2. A hand-held riveting tool according to claim 1, **characterised in that** the moving mechanism is provided with a clamping element (18) for clamping down the shaft immovably with respect to the frame when the handles are moved toward the second position, and also with a connecting mechanism (11) that can be connected to the shaft in such a manner that the connecting mechanism and the shaft can be moved together with the case when the handles are moved toward the first position.
3. A hand-held riveting tool according to claim 2, **characterised in that** the clamping element is movable against spring force and the shaft engaging surface (40) of the clamping element is provided with an engaging profile that engages a part (42) of the circumferential surface of the shaft in such a manner the movement of the shaft in a first direction is blocked, whereas movement in an opposite direction is allowed.
4. A hand-held riveting tool according to claim 3, **characterised in that** the engaging surface of the clamping element as well as at least said part of the circumferential profile are provided with mating serrated profiles.
5. A hand-held riveting tool according to any one of the preceding claims 2-4, **characterised in that** the connecting mechanism (11) of the moving mechanism is provided with a tiltable, biased pawl (9), through which the shaft extends, with the pawl projecting through an opening (36) in the case, which pawl connects to the shaft upon movement of the handles to the first position, such that the shaft is connected to the case via the pawl, so that the shaft can be moved along with the shaft.
6. A hand-held riveting tool according to any one of the preceding claims 2-5, **characterised in that** the case is provided with a receiving hole (19) through which the blind rivet and/or the blind rivet nut, including any additional fitting pieces, can be connected to the securing means, wherein the case is provided with an unlocking plate (23) opposite the side remote from the receiving hole, which unlocking plate presses against a movable pressure sleeve (16) in the first position of the handles, thereby disconnecting the clamping element from the shaft against spring force.
7. A hand-held riveting tool according to any one of the preceding claims, **characterised in that** a part (61) of the shaft that interacts with the clamping element is conical in shape, so that the shaft, because of its conical shape, will disconnect from the clamping element after being moved a predetermined distance with respect to the frame.
8. A hand-held riveting tool according to any one of the preceding claims, **characterised in that** the blind rivet element is an element to be deformed through

the application of a force, such as a blind rivet, a blind rivet nut, a blind rivet bolt, a hollow-wall anchor, a locking pin that will open and fix itself in place by being tightened (expander), a tensioning nut or an insert.

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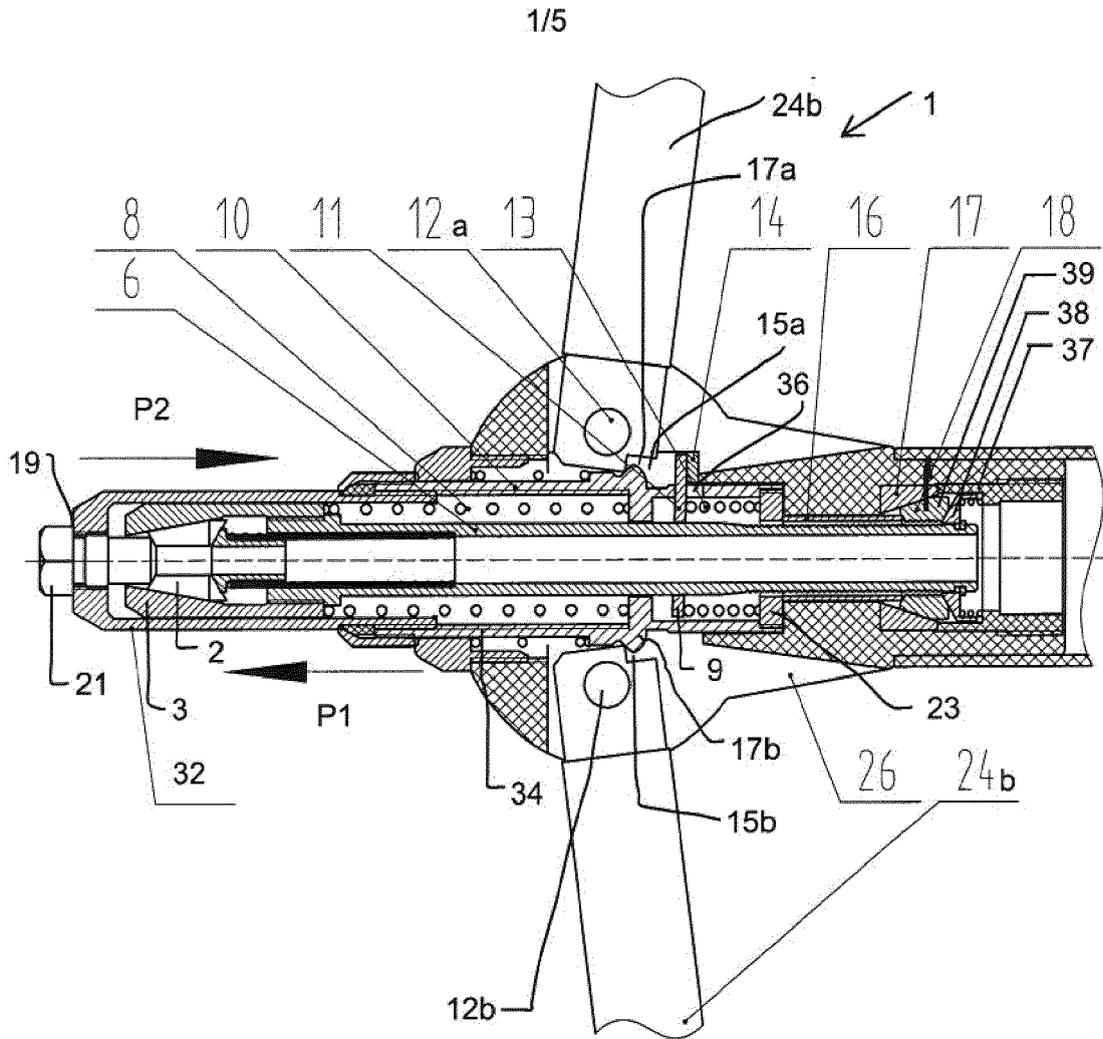


Fig. 1

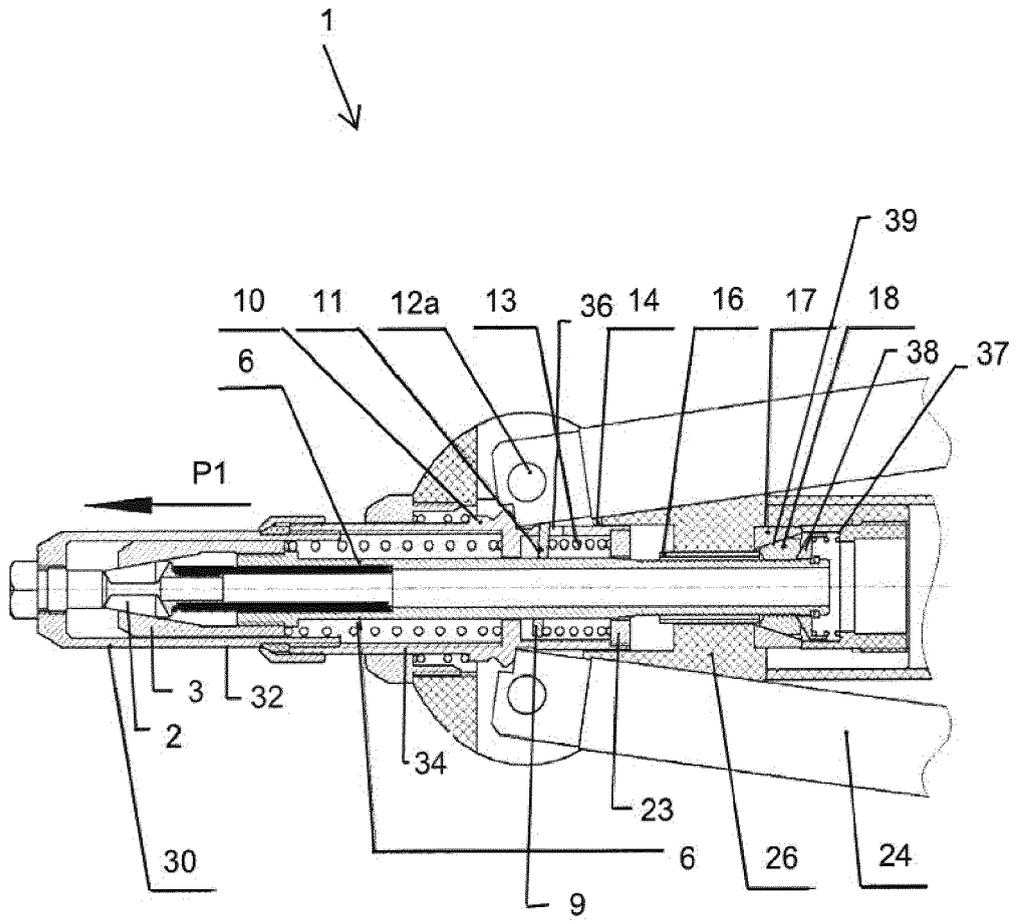


Fig. 2

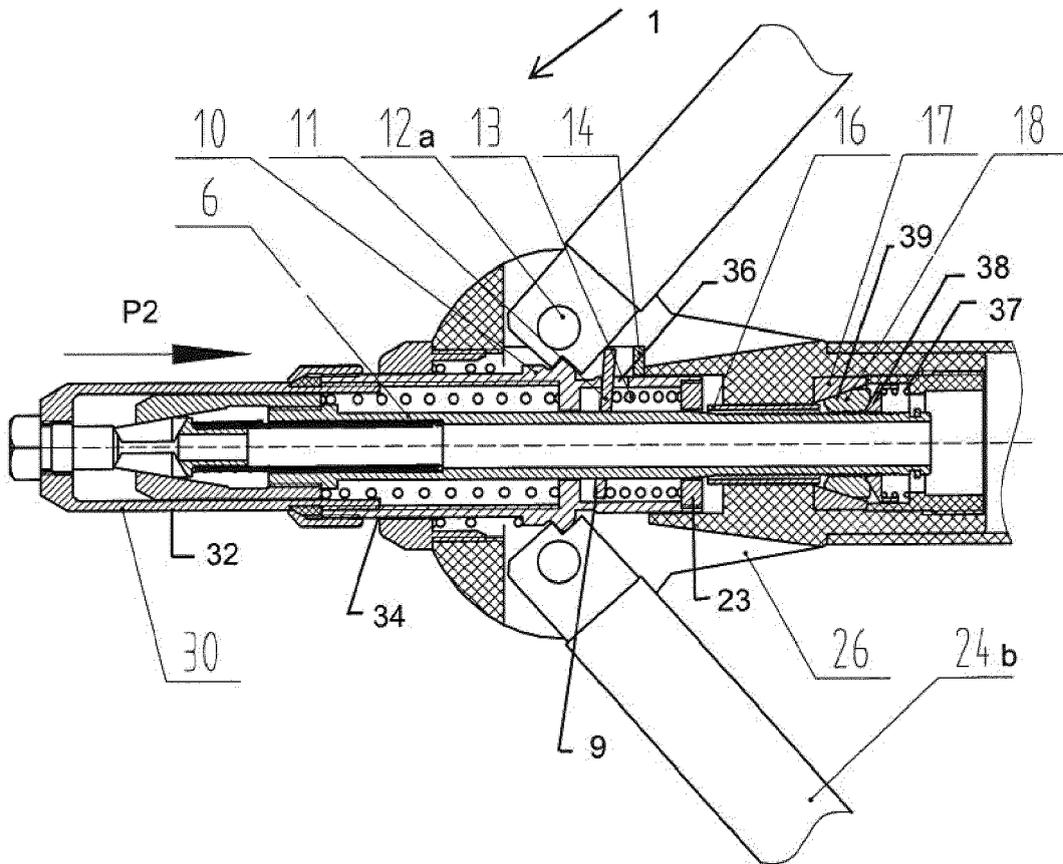


Fig. 3

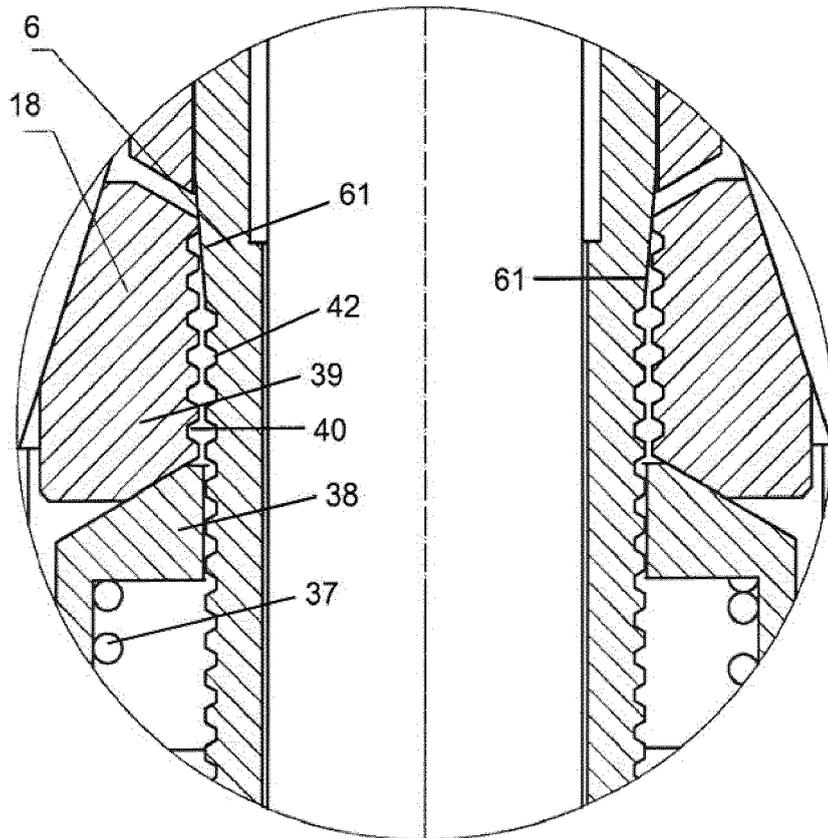


Fig. 4

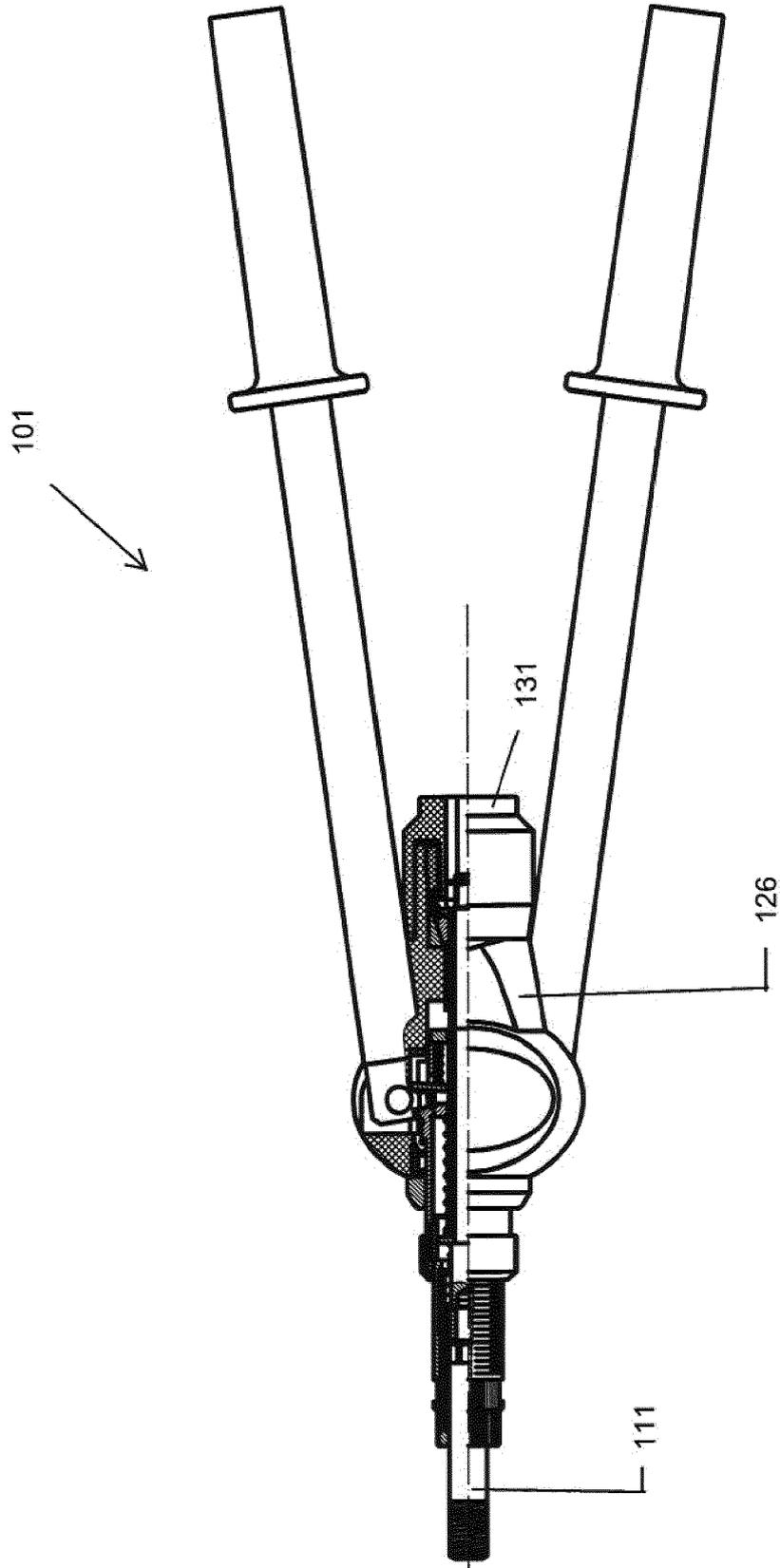


Fig. 5



EUROPEAN SEARCH REPORT

Application Number
EP 12 16 1208

DOCUMENTS CONSIDERED TO BE RELEVANT			
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 11 July 2012	Examiner De Backer, Tom
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 12 16 1208

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