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Crimping tool for turned contacts

This invention relates to a crimping tool for turned contacts on electrical conductors.

DE 10 2009 026 470 A1 describes crimping pliers for turned contacts, where a missing force-distance adjustment device must be compensated for by the manual unlocking of a locking latch in the handle part of the pliers, after the crimping swage, during the crimping of a turned contact upon a conductor, has been blocked. Moreover, the tool must be set exactly for the cross-section that is to be crimped prior to the crimping.

The operation of the crimping pliers is rather laborious because of the absence of the force-distance adjustment device. Moreover, the diameter range of the turned contacts that can be pressed with the crimping pliers is limited.

However, it is desirable to have a crimping tool for turned contacts that is provided with an automatically operating force-distance adjustment so that there will be no need for the manual unlocking or adjustment of the crimping pliers and, moreover, it will permit the crimping of turned contacts upon conductors with the largest possible diameter range so that the largest possible spectrum of conductor cross-sections can be provided with turned contacts with the help of a single crimping tool.

Crimping tools of the type in question are known from the prior art, thus from DE 195 07 347 C1. However, the force-distance adjustment device requires improvement. The solution to this

problem is the object of the invention. DE 195 07 347 C1 discloses the preamble of Claim 1.

The invention achieves the object by way of the subject matter of Claim 1. In this case, the first spring is implemented in a structurally simple manner by a part of the basic sheet metal piece in each case, which is delimited by a cut. It is advantageous in this case that the first spring essentially has a geometry in the form of a curved leaf spring, in particular essentially has a geometry in the shape of a circular arc-shaped leaf spring.

The invention according to Claim 1, further specified in the dependent claims, is thus based on the concept of providing an increased force and an increased distance for the force-distance adjustment device for the crimping tool by the advantageous spring action due to the cooperation of the springs. It is thus ensured that contacts and/or conductors turned using the crimping tool can be crimped with the largest possible diameter range.

It is furthermore preferable in this case if the cut essentially runs in each case parallel to the outer contour of the basic sheet metal piece. To reduce the mechanical tension at the terminal point of the cut, the terminal point of the cut is preferably embodied rounded. The cut advantageously runs around the joint bolt in its contour line and exits from the basic sheet metal piece at the upper side of the handle. The spring thus preferably essentially receives a geometry in the form of a curved leaf spring or a circular arc-shaped leaf spring. To implement a noticeable spring travel, the cut is preferably made accordingly long and wide. The spring thus implemented is

therefore located outside the handle. A connection in parallel of both springs thus results due to the arrangement of the cut in both basic sheet metal pieces.

The crimping tool furthermore has a pressure ring for accommodating the crimping stamps in a particularly structurally compact and advantageous manner, wherein the pressure ring in turn has a passage in the form of a "lemon-shaped clearance bearing".

Further advantageous embodiments of the crimping tool according to the invention for turned contacts will be found in the dependent claims.

Exemplary embodiments of a crimping tool according to the invention for turned contacts are illustrated in the drawings and will be described in further detail below.

In the figures:

Figure 1: shows a sectional view of a crimping tool according to the invention for turned contacts;

Figure 2: shows a front view of a crimping tool according to the invention for turned contacts;

Figure 3: shows an excerpt enlargement of the front view from Fig. 2 of a crimping tool according to the invention for turned contacts, which, in particular, shows the cooperating crimping stamps;

Figure 4: shows a sectional view of a crimping tool according to the invention for turned contacts in which the parts that are relevant for the driving mechanics of the crimping tool are emphasized;

Figure 5: shows an enlarged excerpt of the sectional view from Fig. 4 of a crimping tool according to the invention for turned contacts that, in particular, shows the parts of the crimping tool that are relevant for the drive mechanics in the area of the crimping swage;

Figure 6: shows a front view of a crimping tool according to the invention for turned contacts where a cascade spring according to the invention is in the basic position;

Figure 7: shows a front view of a crimping tool according to the invention for turned contacts where a cascade spring according to the invention is in the maximum excursion;

Figure 8: shows a three-dimensional view of an enlarged excerpt from the profile view in Fig. 4 of a crimping tool according to the invention for turned contacts, which, in particular, shows the arrangement of the locator in detail;

Figure 9: shows a three-dimensional view of a conductor lead with stripped end and a turned contact that is crimped upon by a crimping tool according to the invention for turned contacts.

By the term "turned contact," we essentially mean in terms of the invention at hand those contacts that are based on flexible conductors, whose flexibility rests on the combination of a plurality of thin conductor wires, which are combined into one conductor by means of a casing of the conductor. When such conductors, for example, are integrated into plugs, then one usually employs corresponding contacts which, on the one hand, consist of a sleeve that in the uncrimped state will receive the stripped conductor and, on the other hand, will form a solid contact, which, for example, can be integrated into a plug with multiple contacts. Such contacts, for example, are made as a machine turned part so that the concept of "turned contact" obviously provides information concerning a possible production technology used for such a contact so that such contacts are generally known to the person skilled in the art by this term.

Fig. 1 shows a crimping tool 101 according to the invention for the crimping of turned contacts upon electrical conductors 3 (not shown). The manually operated crimping tool 101 in the form of pliers comprises a crimping swage 104 with automatic adjustment to the crimping sleeves and conductor cross-section that is to be processed, which is constituted of several crimping stamps 105. A pressed turned contact 102 can be made in a form of a three-point or n-point crimp.

The crimping tool 101 has two basic sheet metal pieces 106 between which are assembled essential parts of the crimping tool 101. Between two basic sheet metal pieces 106, which are coaxial with respect to the circular opening 107 (not illustrated) in the basic sheet metal pieces 106, which serve for the passage of a conductor 103 that is to be crimped together with a turned

contact 102, there is a pressure ring 139. The pressure ring 139 receives the crimping swage 104, which is made up of three or more crimping stamps 105. The crimping stamps 105 are in each case arranged and guided in a stamp holder 141 that is arranged radially with respect to opening 107 of crimping swage 104. The stamp holder 141 is firmly connected to the basic sheet metal piece 106 via bolts 140. By means of a rotation angle limitation formed on the pressure ring 139 by virtue of bolt 112 and a recess 113 that can be moved with relation to the fixed bolt 112, the maximum rotation angle of the pressure ring 139 and thus the minimal and maximal opening of the crimping swage 104 is defined. The two basic sheet metal pieces 106 are screwed together by bolt 112.

To close the crimping swage 104, the crimping tool 101 has a toggle lever kinematic mechanism 114. The toggle lever kinematic mechanism 114 is tensioned between the joint bolts 115, 116 and an eccentric bolt 117. The joint points which form the two joint bolts 115, 116 are connected by a thrust strut 118, whereby the joint bolt 115 is additionally connected to the basic sheet metal pieces 106 and the joint bolt 116 is additionally connected to a movable lever 119. The lever 119 can be provided with a handle (126) not shown here. When at rest, the thrust strut 118 rests on a rounded projection 120 (not shown), which is an integrative part of the pressure ring 139.

The basic position of the crimping swage 104 can be changed by turning the eccentric bolt 117. In that way, one can adapt the degree of opening of the opened crimping swage 104 to the diameter of the turned contact 102 prior to the crimping so that an essential part of the working stroke of crimping joint 104 must be carried out merely as an unproductive return stroke

until crimping swage 104 comes into contact with the turned contact 102. An adjusting disk 121 and a flathead screw 122 fix the eccentric bolt 117 in the set position. Here, the eccentric bolt 117 is used only for the basic setting and possibly to compensate for any finishing tolerances. The user of the crimping tool customarily does not adjust the eccentric bolt 117.

To make sure that the crimping swage 104 will always be reliably operated all the way to the final stop, the thrust strut 118 has gear teeth 123 in which a block 124 engages and thus prevents the premature opening of the crimping swage 104. A pressure spring 125 provides for the independent opening of the crimping swage 104 after the crimping of the turned contact 102.

Fig. 2 or Fig. 3 show a turned contact 102 that was introduced into the opened crimping swage 104. By manually bringing together the handles 126, 127 of the crimping tool 101, the turned contact 102 is crimped upon the conductor 103 (not shown). Essential in terms of the invention is the fact that the handles 126, 127 or the parts 119, 106, which are encased by the handles 126, 127, will not display any local cross-section decrease or weakening, for example, in the form of a constriction that would result in an increased elasticity or an increased spring action.

Fig. 4 or 5 show the drive mechanics of a crimping tool 101 according to the invention for turned contacts 102. By actuating the lever 119, the toggle joint kinematic mechanism 114 is further moved into the stretch position, as a result of which, the pressure ring 139 performs a rotary motion in the clockwise direction. By virtue of the contact in the area S between

pressure ring 139 and crimping stamps 105, the pressure ring 139 will slide along the crimping stamps 105 and will move the crimping stamp 105 radially toward the contact in the opening 107. The opening of pressure ring 139 has an opening, whose geometry is reminiscent of the borehole of a hydrodynamic sliding bearing, in order to receive the stamp holder 141 and the crimping stamp 105, where a circular borehole is widened with two or more arc-like areas in which a lubricating wedge can form. Such sliding bearings are known in the trade as "lemon clearance bearings." The contact area S in the pressure ring 139 can be made in the form of a curve with a constant slope or as a curve with a specially adapted slope to optimize any manual and pressing forces. The crimping stamps 105 are positioned in the stamp holder 141 for the radial movement. The pressure spring 142 moves the crimping stamps 105 after the crimping procedure along curve S again back into the starting position.

To be able to process the various cross-sections of the turned contacts 102 or conductor cross-sections in a crimping swage 104, a force-distance adjustment device is integrated in each case into the basic sheet metal piece 106 in the form of a cascade spring 129, which facilitates a diversion of the rear toggle lever pivot point in the direction of the arrow (see Fig. 6 or 7).

Over the area H on the basic sheet metal 106 in each case, a cylindrical pin 130 is used to drive a second or other spring 131 of the cascade spring 129. The spring 131 is on the same level as the thrust strut 118 that is located between the two basic sheet metal pieces 106 and -like thrust strut 118 - has a thickness that is almost identical to the interval between the basic sheet metal pieces 106. The second or other spring 131 is

fastened as a single part to a lever-type extension of the basic sheet metal pieces 106. This is implemented simply and thus advantageously - solely by way of example - in Figure 1 by two bolts. The fastening of the second or other spring 131 can also be implemented in another manner. By means of the advantageous spring action resulting from the cooperation of two springs, a first spring 131 and a second or other spring 132, an increased force and an increased distance are provided for the force-distance adjustment device that is to be provided for the crimping tool.

Here, the cascade spring 129 absorbs the required residual stroke of the crimping swage 104 as elastic deformation work when the crimping swage 104, during the crimping of a turned contact 102, has already been put upon the block, although a distance still has to be covered so that the block 124 will release the opening of the crimping swage 104. The crimping tool 101 is thus automatically set for the cross-section of the turned contacts 102 to be crimped and the conductor cross-section. This makes it possible with only one crimping swage 104 to cover continuously the crimping of conductor cross-sections of 0.08 mm^2 to 6.0 mm^2. The crimping tool 101 can be closed and opened independently until jumping over the block 124.

The integration of a first spring 132 of the cascade springs 129 as a parallel-connected leaf spring into the basic sheet metal pieces 106 facilitates a compact structure of the crimping tool 101 with simultaneous precise adaptation to the needed force-distance adjustment. Compared to other designs, they thus need less structural space with the same output.

The first spring 132 is delimited or implemented in each case in the basic sheet metal piece 106 by a cut 137 into the basic sheet metal piece 106, which cut essentially runs parallel to the outer contour of the basic sheet metal piece 106. To reduce the mechanical tension at the terminal point 138 of the cut 137, the terminal point 138 of cut 137 is made in a rounded fashion. Along its contour line, the cut 137 runs around the joint bolt 115 so that the joint bolt 115 in each case will be in the area of the basic sheet metal piece 106 in the spring 132 and otherwise in the thrust strut 118 and will exit on the top of the handle 127 in each case out of basic sheet metal piece 106. The spring 132 thus essentially in each case has a geometry in the form of an arc-shaped or circular arc-shaped leaf spring, which is formed by the outer contour of the basic sheet metal pieces 106 and the respective cut 137. To make a noticeable spring travel distance, the cut 137 is made accordingly long and wide. The spring 132 thus is outside handle 127.

To prevent the lifting of area H from the cylinder pin 130 and the basic sheet metal pieces 106 under load, the basic sheet metal pieces 106, in each case in area M, have a cross-section with a high degree of stiffness. That prevents a deformation of the basic sheet metal pieces 106 under load and provides for a constantly reproducible force-distance adjustment.

Figure 8 shows a crimping tool 101 according to the invention with a locator 143 for turned contacts 102. The locator 143 is set for the contact type that is to be processed and via the gear teeth 144 locks in the set position. The contact 102 (not shown) is inserted into the opened crimping swage 104 and is retained in the crimping position by the locator 143. In that way, one can procedurally safely simply handle and crimp at the

designated spot on contact 102. By actuating the handle 126 and/or 119 of the tool 101, the contact 102 is crimped upon the conductor 103 (not shown).

Fig. 9 shows a conductor 103 on whose stripped end there was pressed a turned contact 102. In the example illustrated, the turned contact 102 was pressed with a four-point crimp.

List of reference signs

101 crimping tool
102 turned contact
103 conductor
104 crimping swage
105 crimping stamp
106 basic sheet metal piece
107 opening
108
109
110
111
112 bolt
113 recess
114 toggle lever kinematic mechanism
115 joint bolt
116 joint bolt
117 eccentric bolt
118 thrust strut
119 lever
120 rounded projection
121 adjusting disk
122 flathead screw
123 gear teeth
124 block
125 spring
126 handle
127 handle
128
129 cascade spring
130 cylindrical pin

131 spring

132 spring

133 gear teeth

134

135

136

137 cut

138 terminal point

139 pressure ring

140 bolt

141 stamp holder

142 pressure spring

143 locator

144 gear teeth

PATENTKRAV

1. Krympeværktøj (101) for drejede kontakter (102) på elektriske ledere (103), der omfatter en krympematrice (104), som er dannet af mindst tre krympestempler (105), der desuden omfatter mindst en basismetalplade (106) og mindst en vægtarm (119), ved hjælp af hvilken, via en knæledskinematik (114), åbningen (107) i krympematricen (104) kan gøres mindre, såvel som en kraft-vej-udligningsanordning, der er udformet til at modtage det nødvendige restslag af krympematricen (104) som elastisk deformationsarbejde i en tilstand, i hvilken krympematricen (104) ved krympningen af en drejet kontakt (102) allerede er løbet på blokken, selv om der endnu er vej, som skal tilbagelægges, således at en spærring (124) frigiver krympematricens (104) åbning, hvorved kraft-vej-udligningsanordningen er udformet som en kaskadefjeder (129), hvis ene – første – fjeder (132) er en del af basismetalpladen (106), og hvis anden fjeder (131) omfatter en vægtarm, **kendetegnet ved, at** den respektive første fjeder (132) ved hjælp af en indskæring (137) i basismetalpladen (106) er afgrænset mod den øvrige basismetalplade (106) og i geometrisk henseende i det væsentlige har form som en bueformet bladfjeder.

2. Krympeværktøj (101) ifølge krav 1, **kendetegnet ved, at** vægtarmen for den anden fjeder (131) i kaskadefjederen (129) er anbragt mellem basismetalpladerne (106) og fortrinsvis på disse med en af sine ender.

3. Krympeværktøj (101) ifølge et af de førnævnte krav, **kendetegnet ved, at** indskæringen (137) i hvert tilfælde i det væsentlige strækker sig parallelt med den ydre kontur af basismetalpladen (106).

4. Krympeværktøj (101) ifølge et af de førnævnte krav, **kendetegnet ved, at** den første fjeder (132) er en bladfjeder, som i det væsentlige har en cirkelbueafsnit-formet geometri.

5. Krympeværktøj (101) ifølge et af de førnævnte krav, **kendetegnet ved, at** krympeværktøjet (101) omfatter en trykring (139) til modtagelse af krympestemplet (105).

6. Krympeværktøj (101) ifølge et af de førnævnte krav, **kendetegnet ved, at** krympematricens (104) krympestempler (105) radialt er ført ind i en stempelholder (141) i forhold til åbningen (107) med henblik på indsætning af en drejet kontakt (102) i krympesænken (104).

7. Krympeværktøj (101) ifølge et af de førnævnte krav 5 eller 6, **kendetegnet ved, at** krympestemplerne radialt er ført gennem et kontaktområde (S) i trykringen (139).

8. Krympeværktøj (101) ifølge krav 7, **kendetegnet ved, at** kontaktområdet (S) er udført som en kurve med konstant stigning.

9. Krympeværktøj (101) et af de førnævnte krav 7 eller 8, **kendetegnet ved, at** kontaktområdet (S) er udført som en kurve med en stigning.

10. Krympeværktøj (101) ifølge et af de førnævnte krav, **kendetegnet ved, at** krympeværktøjet (101) tillader trinløs krympning afledertværsnit fra 0,08 mm^2 til 6,0 mm^2.

11. Krympeværktøj (101) ifølge et af de førnævnte krav, **kendetegnet ved, at** krympeværktøjet (101) omfatter en lokator (143), ved hjælp af hvilken kontakten (102) indføres i den åbnede krympematrice (104) og holdes i krympeposition.

12. Krympeværktøj (101) ifølge krav 11, **kendetegnet ved, at** lokatoren (143) efter indstilling til kontakttypen, som skal behandles, via en fortanding (144) indraster i den indstillede position.

13. Krympeværktøj (101) ifølge et af de førnævnte krav, **kendetegnet ved, at** krympeværktøjet (101) omfatter en excentrikbolt (117), ved hjælp af hvilken krympematricens (104) basisposition kan indstilles.

14. Krympeværktøj (101) ifølge krav 13, **kendetegnet ved, at** krympeværktøjet (101) omfatter en justeringsskive (121) samt en fladhovedskrue (122), med hvilken excentrikbolten (117) kan fikseres i den indstillede position.

15. Krympeværktøj (101) ifølge et af de førnævnte krav, **kendetegnet ved, at** krympeværktøjet (101) omfatter en trykkestang (118), i hvilken der er indarbejdet en fortanding (123), som en spærring (124) griber ind i og derved forhindrer en for tidlig åbning af krympematricen (104).

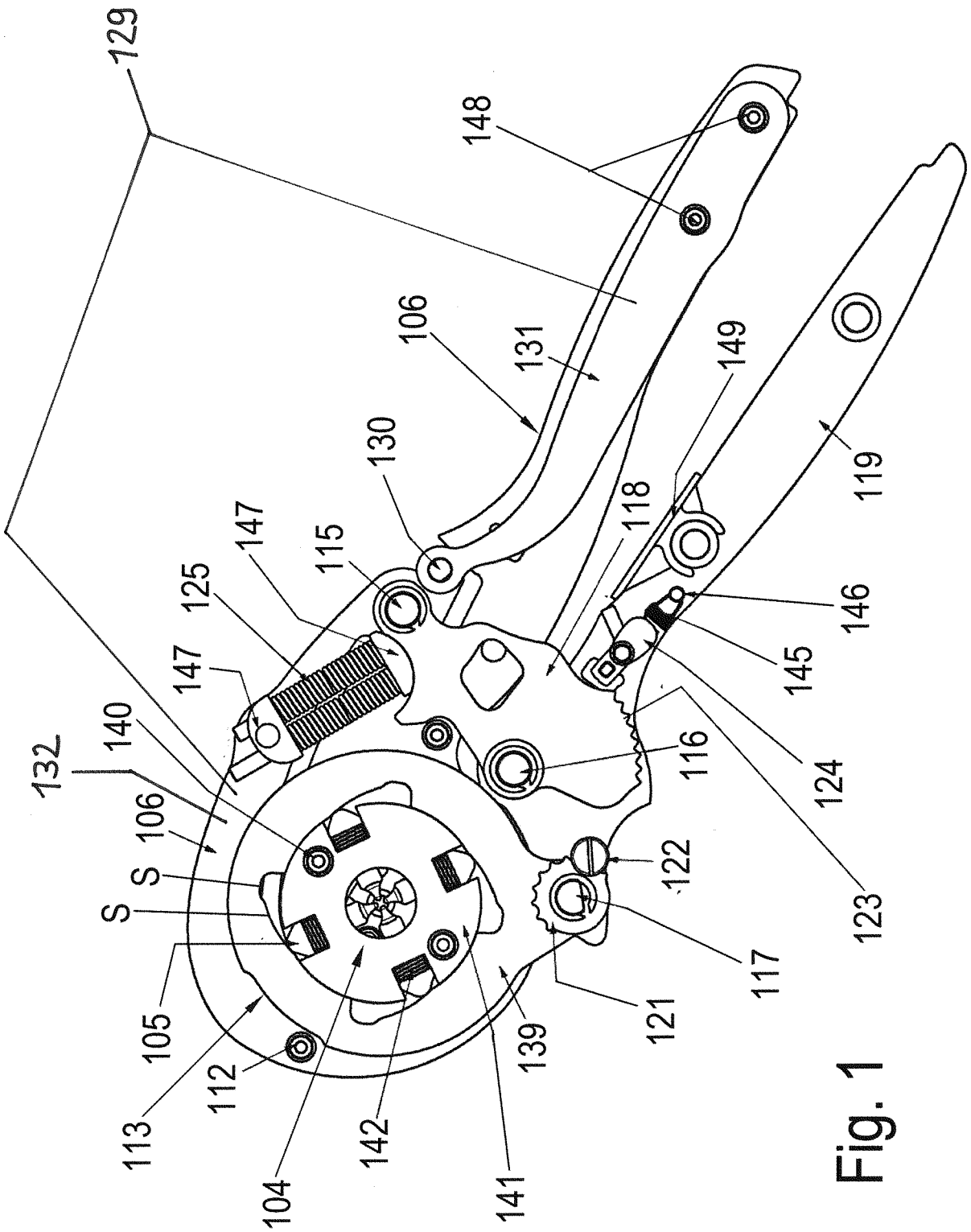

129
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Fig. 1

Fig. 3

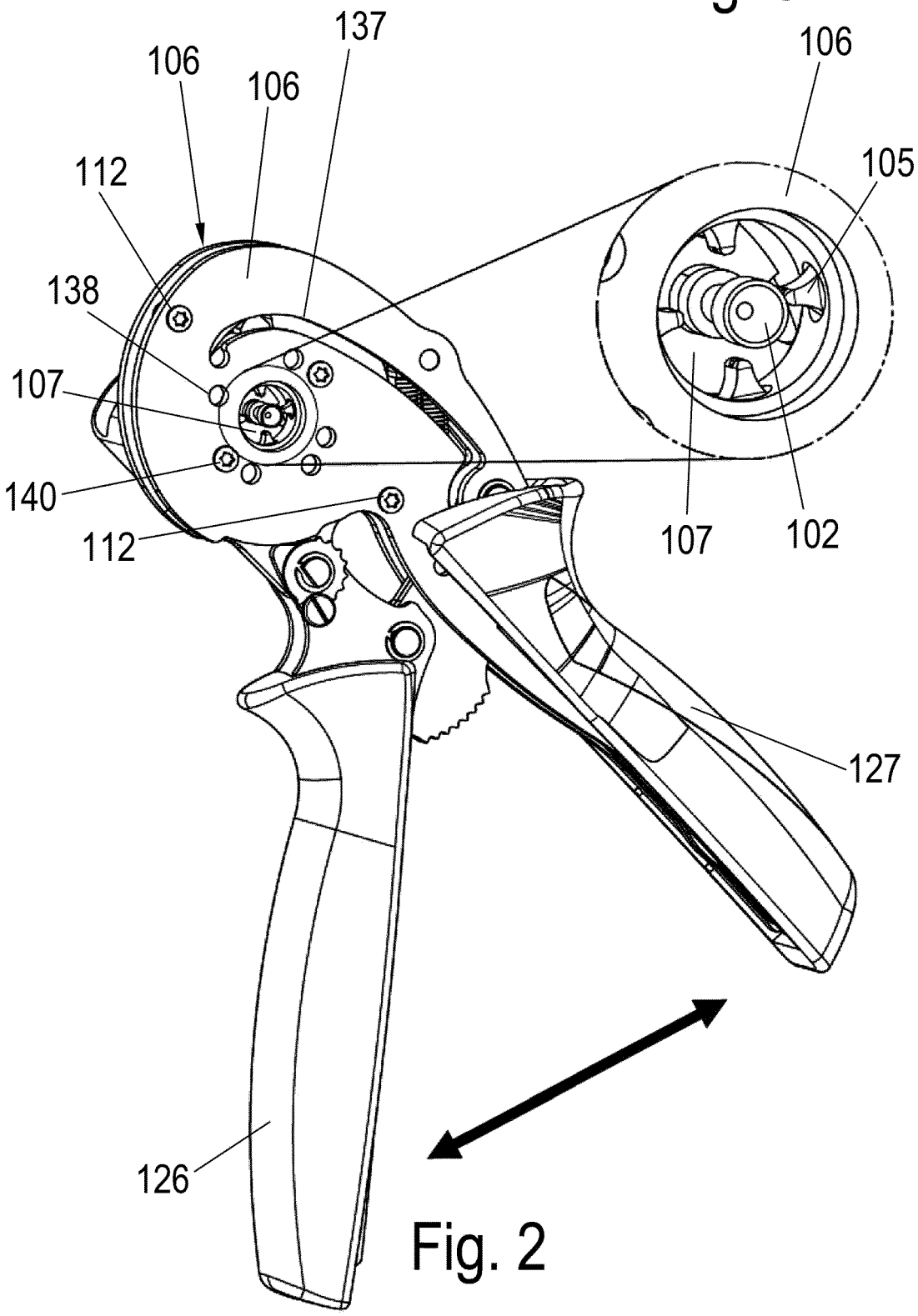


Fig. 2

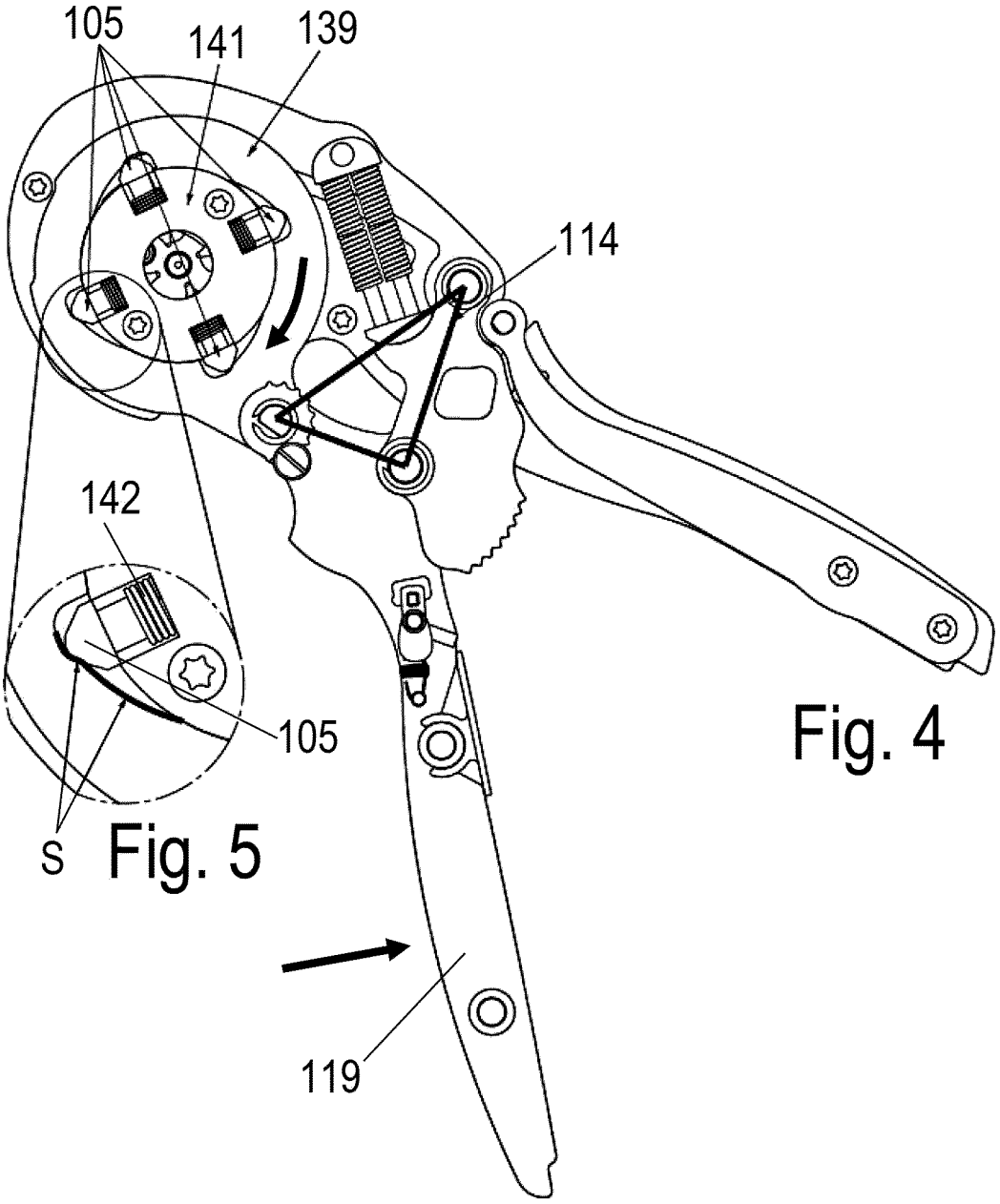


Fig. 4

Fig. 5

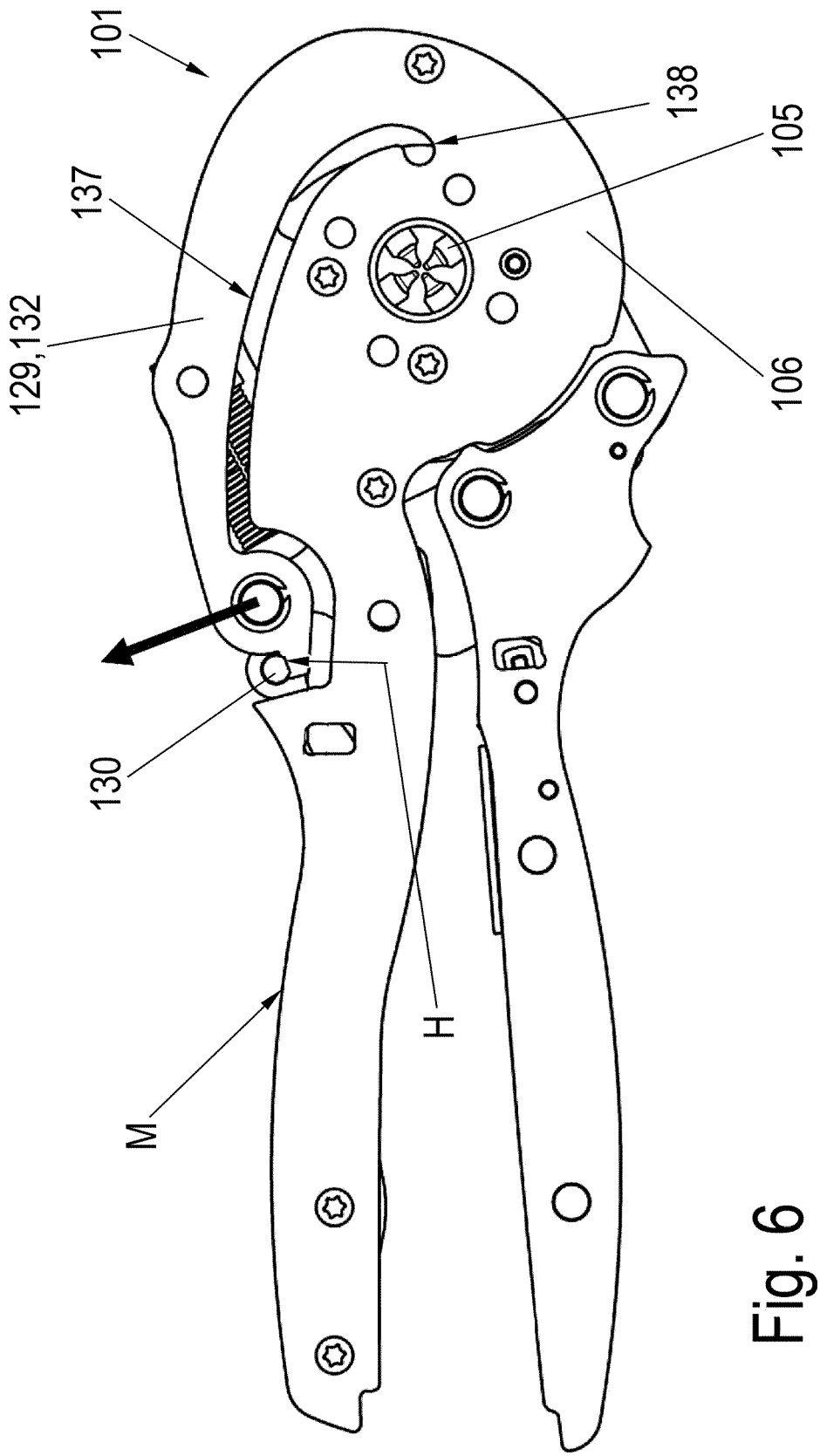


Fig. 6

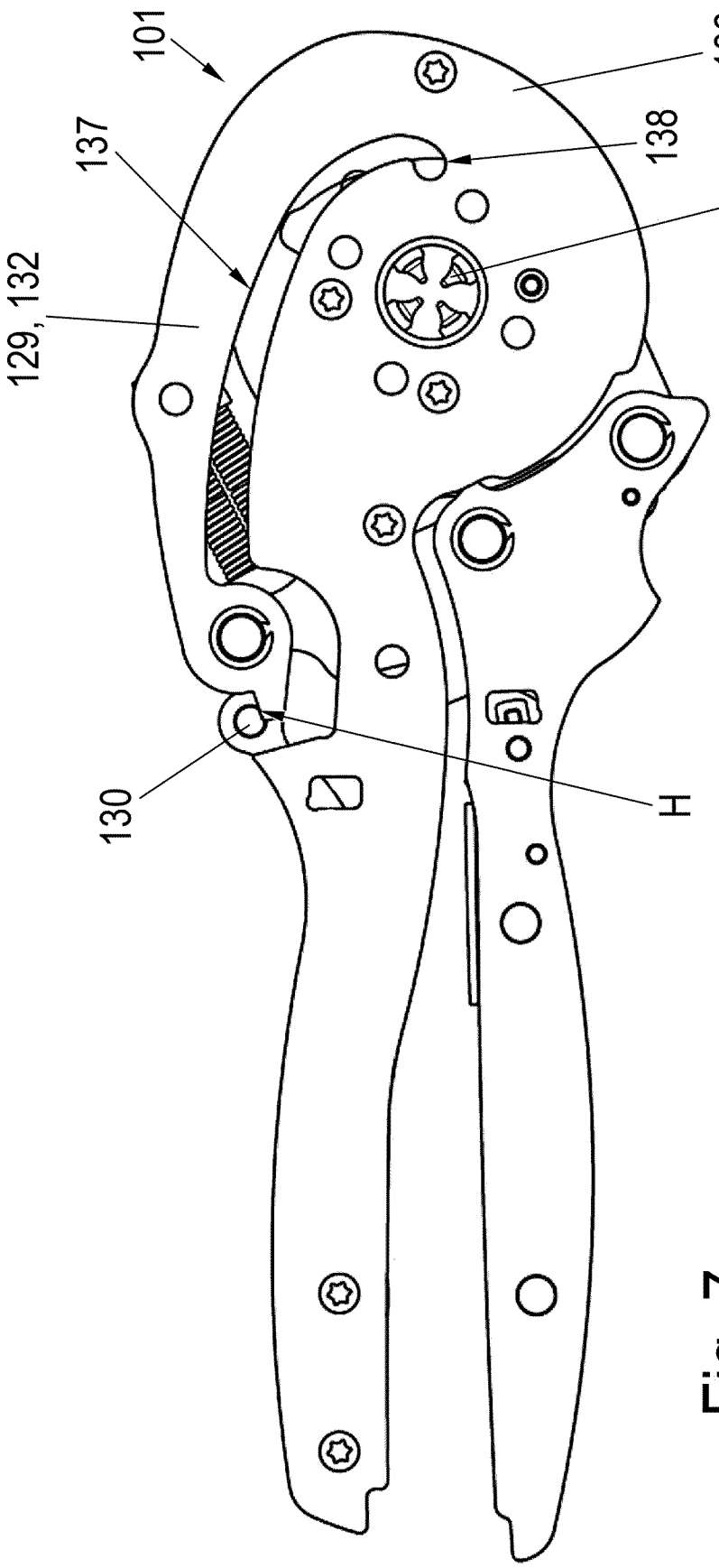


Fig. 7

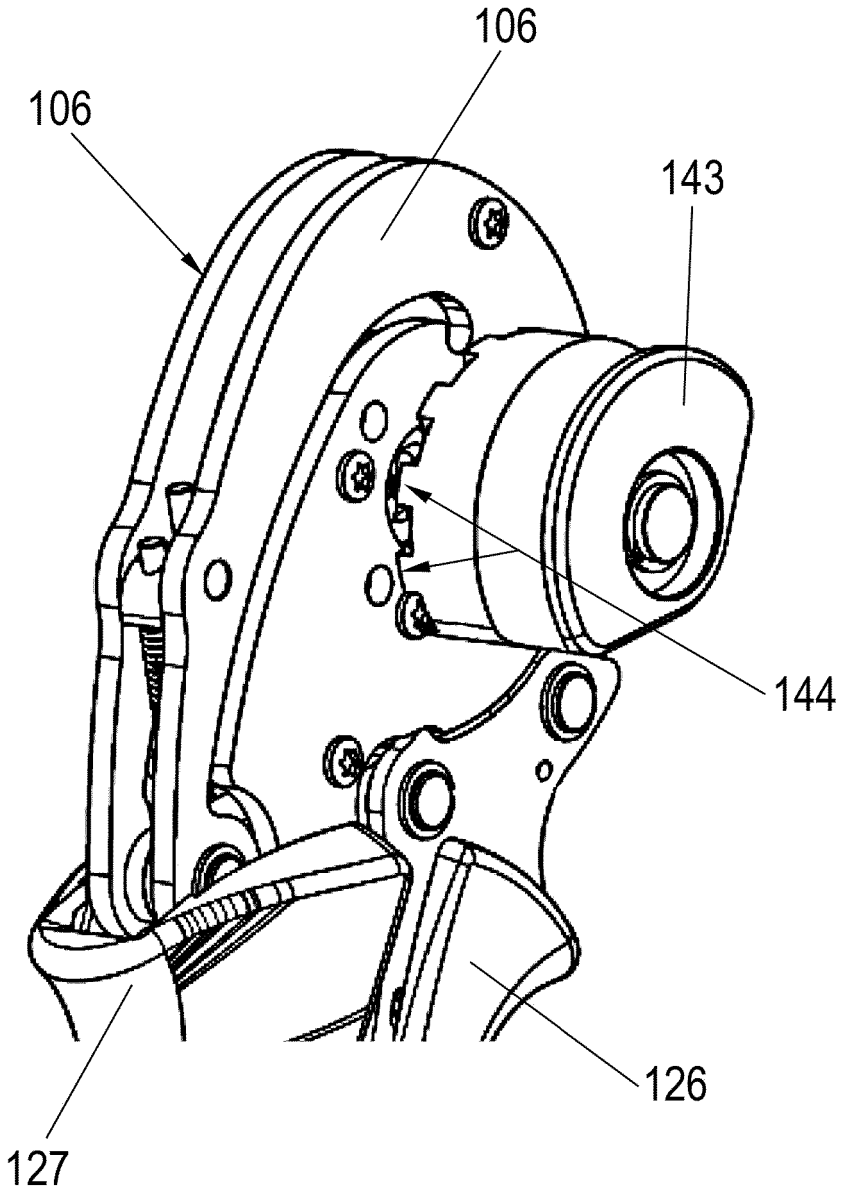


Fig. 8

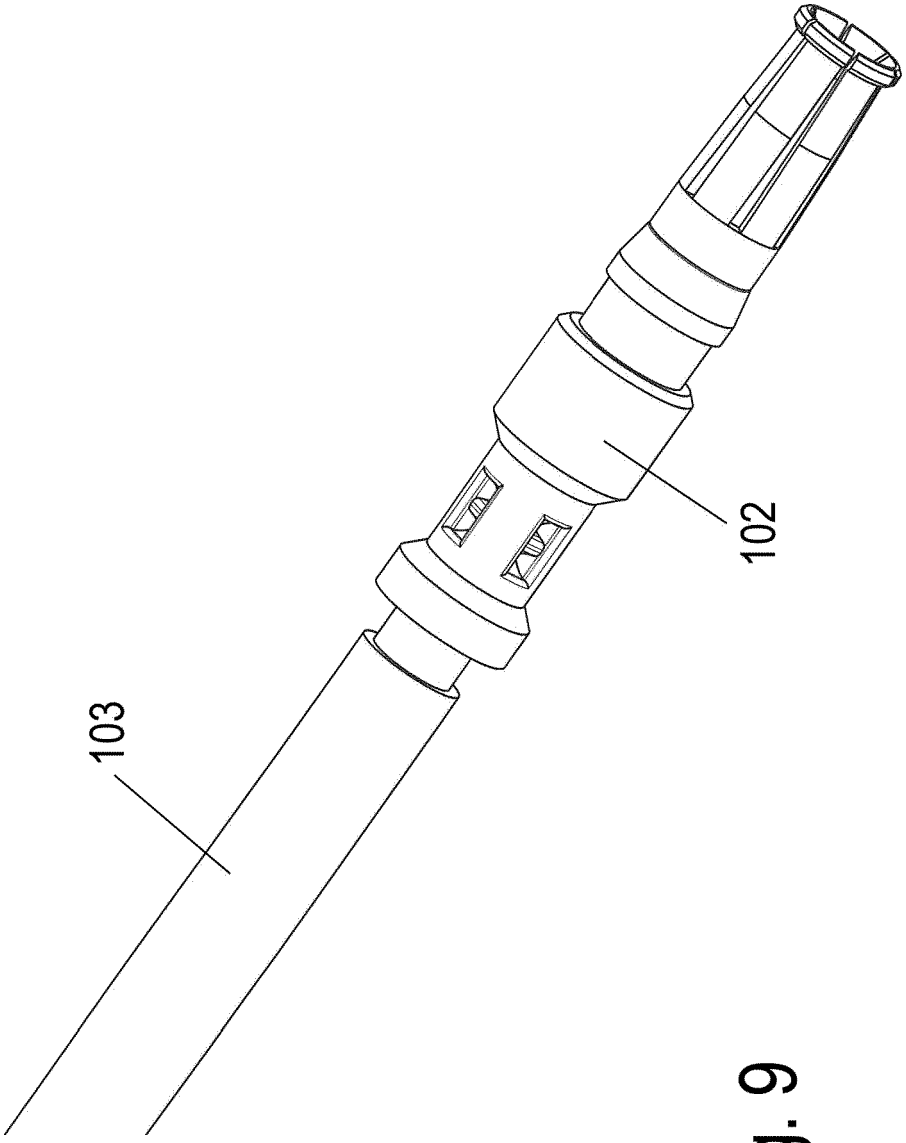


Fig. 9