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(54) Title: INSTALLATION TOOL AND METHOD FOR INSTALLING ELECTRICAL CONNECTOR

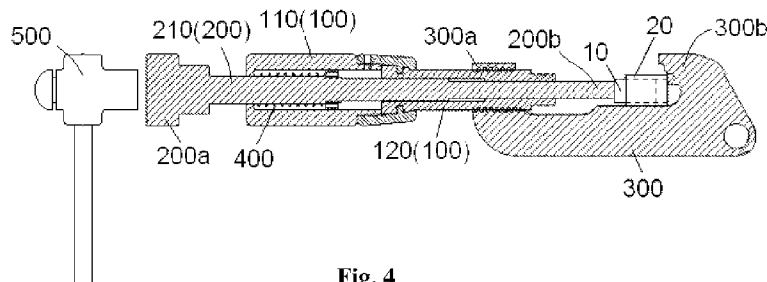


Fig. 4

(57) Abstract: Disclosed is an installation tool including a body (100), a holding head (300) and a power lever (200). The power lever (200) has a base end (200A) extending from the rear end of the body (100) and a top end (200B) extending from the front end of the body (100). The installation tool further comprises a hammering tool (500) adapted to hammer the base end (200A) of the power lever (200) to exert an impact force to the power lever (200). The top end (200B) of the power lever (200) pushes the first work piece (10) forward under the impact force to force the first work piece (10) to be inserted into the fitting hole of the second work piece (20). It is possible to manually hammer the power lever (200) by the hammering tool (500). The installation tool is simpler in structure, easier to operate and safer to use.

Installation Tool and Method for Installing Electrical Connector

CROSS-REFERENCE TO RELATED APPLICATION

5 This application claims the benefit of Chinese Patent Application No. 201510621180.X filed on September 25, 2015 in the State Intellectual Property Office of China, the whole disclosure of which is incorporated herein by reference.

BACKGROUND OF THE DISCLOSURE

10 **Field of the Disclosure**

 The disclosure relates to an installation tool, more particular, to an installation tool adapted to force a first work piece to be inserted into a fitting hole in a second work piece by impacting. The disclosure also relates to a method for installing an electrical connector by the installation tool.

15

Description of the Related Art

 It is often necessary to electrically connect two wires with each other during a power transmission. In the prior art, generally, one electrical connector is employed to electrically connect the two wires. The electrical connector comprises a wedge block made of metal and
20 a C-type clamp made of metal. The two wires is firstly placed into a wedge fitting hole of the C-type clamp, and then the wedge block is forced to be inserted into the wedge fitting hole of the C-type clamp by impacting through an installation tool. After the wedge block is inserted into the wedge fitting hole of the C-type clamp, the two wires are clamped between the wedge block and the C-type clamp and electrically connected with each other via the
25 wedge block and the C-type clamp.

 Since a larger impact force is required to insert the wedge block into the wedge fitting hole of the C-type clamp, it is developed a method to provide a power to the installation tool by a detonator in the prior art. The detonator is generally received in a detonator filling cavity in the installation tool and then is detonated. A power lever of the installation tool will
30 push the wedge block under an impact force generated during explosion of the detonator to force the wedge block to be inserted into the wedge fitting hole of the C-type clamp.

 However, during providing the power to the installation tool, it is necessary to provide a safety device to prevent the detonator from being detonated accidentally, which may result in a complicated structure of the installation tool; further, it is necessary to comply a number
35 of safety rules to ensure the safety, which may also result in a complicated installation process; in addition, there is also a safety risk of transporting and storing the detonator.

SUMMARY OF THE DISCLOSURE

The disclosure is intended to solve at least one of the above issues and defects existing in the prior art.

5 An object of the disclosure is intended to provide an installation tool adapt to force a first work piece to be inserted into a fitting hole of a second work piece by impacting. The installation tool is simple in structure, easy to operate and safe to use.

10 According to one aspect of the disclosure, there is provided an installation tool adapted to force a first work piece to be inserted into a fitting hole of a second work piece by impacting, comprising: a body having a front end and a rear end in a longitudinal direction; a holding head connected to the front end of the body and adapted to hold the second work piece; and a power lever movably mounted on the body in the longitudinal direction. The power lever has a base end extending from the rear end of the body and a top end extending from the front end of the body. The installation tool further comprises a hammering tool adapted to hammer the base end of the power lever to exert an impact force to the power lever. The top end of the power lever pushes the first work piece forward under the impact force to force the first work piece to be inserted into the fitting hole of the second work piece.

20 According to an exemplary embodiment of the disclosure, the body is provided with a compression spring adapted to exert a push force to the power lever therein. The top end of the power lever is adapted to push the first work piece into the second work piece under the push force, such that the first work piece is pre-held into the fitting hole of the second work piece before striking the first work piece.

25 According to another exemplary embodiment of the disclosure, the body is formed with a spring receiving cavity within which the compression spring is received. The power lever passes through the spring receiving cavity and the compression spring in the longitudinal direction. The power lever is mounted with a blocking ring thereon, and the compression spring is compressed between a rear end wall of the spring receiving cavity and the blocking ring.

30 According to yet another exemplary embodiment of the disclosure, the body comprises: a first portion located at the rear end of the body; a second portion located at the front end of the body; and a third portion adapted to connect the first portion and the second portion together.

35 According to still another exemplary embodiment of the disclosure, the third portion comprises a coupling nut having internal threads and the coupling nut is threaded onto the first portion and the second portion.

According to further another exemplary embodiment of the disclosure, the spring receiving cavity is formed in the first portion and the holding head is threaded onto the second portion.

According to yet another exemplary embodiment of the disclosure, the holding head has a connection end threaded onto the second portion of the body and a holding end adapted to hold the second work piece.

5 According to still another exemplary embodiment of the disclosure, a rod-like portion of the power lever passes through the body in the longitudinal direction.

According to further another exemplary embodiment of the disclosure, the first work piece includes a wedge block of an electrical connector for electrically connecting two wires, and the second work piece includes a C-type clamp of the electrical connector having a wedge fitting hole. After inserting the wedge block into the wedge fitting hole of the C-type clamp, the two wires are clamped between the wedge block and the C-type clamp and electrically connected with each other via the wedge block and the C-type clamp.

10 According to yet another exemplary embodiment of the disclosure, the C-type clamp has a first end and a second end having a diameter smaller than that of the first end, and a diameter of the wedge fitting hole is gradually reduced from the first end to the second end.

15 The holding head is adapt to hook the second end of the C-type clamp having the smaller diameter to hold the C-type clamp.

According to still another exemplary embodiment of the disclosure, the hammering tool includes a hammer or a hammer head.

According to another aspect of the disclosure, there is provided a method for installing an electrical connector for electrically connecting two wires, the electrical connector comprises a C-type clamp and a wedge block adapt to be inserted into a fitting hole of the C-type clamp, the method comprising steps of: providing the installation tool as described above; pulling the power lever rearward so that the compression ring is compressed to become short; pre-installing the wedge block and the two wire to be connected into the fitting hole of the C-type clamp; placing the wedge block, the C-type clamp and the two wires pre-installed together onto the holding head and hooking the holding head onto an end of the C-type clamp having a smaller diameter; releasing the power lever so that the power lever moves forward under a push of the compression spring to push the wedge block onto the C-type clamp, thereby pre-holding the wedge block and the two wires into the fitting hole of the C-type clamp; and hammering the base end of the power lever by the hammering tool so that the power lever moves forward under the impact force exerted by the hammering tool to force the wedge block to be inserted into the fitting hole of the C-type clamp, thereby clamping the two wires between the wedge block and the C-type clamp to electrically connect the two wires with each other.

35 In the installation tool as described in the above various embodiments of the disclosure, it is possible to directly hammer the power lever by the hammering tool such as a hammer or a hammer head. Therefore, the power lever may move forward under the hammering of the hammer to force the first work piece to be inserted into the fitting hole of the second work

piece. Therefore, as compared to the installation tool in which the impact force is provided by a detonator, the installation tool of the disclosure is simpler in structure, easier to operate and safer to use.

5 **BRIEF DESCRIPTION OF THE DRAWINGS**

The above and other features of the disclosure will become more apparent by describing in detail exemplary embodiments thereof with reference to the accompanying drawings, in which:

Figure 1 shows a schematic view of an installation tool according to an exemplary
10 embodiment of the disclosure;

Figure 2 is a cross-section view of the installation tool of figure 1 according to an exemplary embodiment of the disclosure;

Figure 3 is a cross-section view of the installation tool shown in Figure 2, on which first and second work pieces to be installed are pre-held;

15 Figure 4 is a schematic view of the installation tool as shown in Figure 3 when a power lever of the installation tool is hammered by a hammering tool; and

Figure 5 is schematic view of the installation tool shown in Figure 2, wherein the first work piece is inserted into a second work piece by hammering the power lever through the hammering tool.

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DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS OF THE INVENTION

The technical solutions of the disclosure will be described hereinafter in detail by exemplary embodiments with reference to the attached drawings. In the description, the
25 same or similar reference numerals refer to the same or similar components. The description to the embodiments of the disclosure hereinafter with reference to the attached drawings is intended to explain the general inventive idea of the present invention and should not be construed as being limited to the disclosure.

In the following detailed description, for purposes of explanation, numerous specific
30 details are set forth in order to provide a thorough understanding of the disclosed embodiments. It will be apparent, however, that one or more embodiments may be practiced without these specific details. In other instances, well-known structures and devices are schematically shown in order to simplify the drawing.

According to a general concept of the disclosure, there is provided an installation tool
35 adapted to force a first work piece to be inserted into a fitting hole of a second work piece by impacting. The installation tool comprises: a body having a front end and a rear end in a longitudinal direction; a holding head connected to the front end of the body and adapted to hold the second work piece; and a power lever movably mounted on the body in the

longitudinal direction. The power lever has a base end extending from the rear end of the body and a top end extending from the front end of the body. The installation tool further comprises a hammering tool adapted to hammer the base end of the power lever to exert an impact force to the power lever. The top end of the power lever pushes the first work piece forward under the impact force to force the first work piece to be inserted into the fitting hole of the second work piece.

In an exemplary embodiment of the disclosure, disclosed is an installation tool adapted to force a first work piece 10 to be inserted into a fitting hole of a second work piece 20 by impacting, as shown in Figures 3 to 5.

As shown in Figures 1 and 2, in the illustrated embodiments, the installation tool mainly comprises a body 100, a holding head 300 and a power lever 200. As illustrated in Figures 1 to 5, the body 100 has a front end (the right end of the Figure) and a rear end (the left end of the Figure) opposite to each other in a longitudinal direction. The holding head 300 is connected to the front end of the body 100 and adapted to hold the second work piece 20. The power lever 200 is movably mounted onto the body 100 in the longitudinal direction.

In the illustrated embodiments of the disclosure, as shown in Figures 1 and 2, the power lever 200 has a base end 200a extending from the rear end of the body 100 and a rod-like portion 210 extending from the base end 200a in the longitudinal direction. The rod-like portion 210 of the power lever 200 passes through the body 100 in the longitudinal direction, and a top end 200b of the rod-like portion 210 extends from the front end of the body 100.

As shown in Figure 4, in an exemplary embodiment of the disclosure, the installation tool further comprises a hammering tool 500 adapted to hammer the base end 200a of the power lever 200 to exert an impact force onto the power lever 200. In this way, the top end 200b of the power lever 200 can move towards the first work piece 10 under the impact force exerted by the hammering tool 500 and strike the first work piece 10 to force the first work piece 10 to be inserted into the fitting hole of the second work piece 20.

In an exemplary embodiment of the disclosure, for easy hammering, a size of the base end 200a of the power lever 200 is larger than that of the rod-like portion of the power lever 200, and the base end 200a of the power lever 200 has a flat surface.

As shown in Figures 1 to 5, in the illustrated embodiments of the disclosure, the body 100 is provided with a compression spring 400 adapted to exert a push force to the power lever 200 therein. The top end 200b of the power lever 200 is adapted to push the first work piece 10 into the second work piece under the push force exerted by the compression spring 400, so that the first work piece 10 is pre-held within the fitting hole of the second work piece 20 before striking the first work piece 10.

In an exemplary embodiment of the disclosure, as shown in Figures 1 to 5, the body

100 is formed with a spring receiving cavity 110a within which the compression spring 400 is received. The power lever 200 passes through the spring receiving cavity 110a and the compression spring 400 in the longitudinal direction. As shown in Figure 2, the power lever 200 is mounted with a blocking ring 211 thereon, and the compression spring 400 is
5 compressed between a rear end wall 111 of the spring receiving cavity 110a and the blocking ring 211.

In an exemplary embodiment of the disclosure, as shown in Figures 1 to 5, the body 100 comprises a first portion 110 located at the rear end of the body 100, a second portion 120 located at the front end of the body 100 and a third portion 130 located between the first
10 portion 110 and the second portion 120. The first portion 110 and the second portion 120 are connected by the third portion 130.

In an exemplary embodiment of the disclosure, the first portion 110 and the second portion 120 may be detachably connected by the third portion 130.

In the illustrated embodiments of the disclosure, as shown in Figures 1 to 5, the third
15 portion 130 comprises a coupling nut having internal threads, and the coupling nut is threaded onto the first portion 110 and the second portion 120.

In the illustrated embodiments of the disclosure, as shown in Figures 1 to 5, the spring receiving cavity 110a is formed in the first portion 110, and the holding head 300 is threaded onto the second portion 120.

20 In the illustrated embodiments of the disclosure, as shown in Figures 1 to 5, the holding head 300 has a connection end 300a threaded onto the second portion 120 of the body 100 and a holding end 300b adapted to hold the second work piece 20.

In the illustrated embodiments of the disclosure, as shown in Figures 1 to 5, the second
25 portion 120 of the body 100 is formed with external threads thereon, the connection end 300a of the holding portion 300 is formed with a thread hole therein, and the second portion 120 of the body 100 is threaded into the thread hole of the connection end 300a of the holding portion 300.

In the illustrated embodiments of the disclosure, as shown in Figures 1 to 5, the holding
30 end 300b of the holding head 300 is formed with a holding portion adapted to hook the second work piece 20 thereon.

Although not being illustrated, in an exemplary embodiment of the disclosure, the first work piece 10 may include a wedge block (not shown) for electrically connecting electrical connectors of two wires (not shown), and the second work piece 20 may include a C-type clamp (not shown) of the electrical connector having a wedge fitting hole. After inserting the
35 wedge block into the wedge fitting hole of the C-type clamp by the installation tool of the disclosure, the two wires are clamped between the wedge block and the C-type clamp and electrically connected with each other by the wedge block and the C-type clamp. Generally, the C-type clamp has a first end and a second end having a diameter smaller than that of the

first end, and a diameter of the wedge fitting hole is gradually reduced from the first end to the second end. The holding head 300 of the installation tool is adapt to hook the second end of the C-type clamp having the smaller diameter to hold the C-type clamp, thereby prevent the C-type clamp from moving when the power lever 200 is struck.

5 A method for inserting a first work piece (a wedge block) of an electrical connector into a fitting hole of a second work piece (a C-type clamp) of the electrical connector by the installation tool of the disclosure will be described in detail with reference to Figures 3 to 5.

Firstly, as shown in Figure 3, the power lever 200 is pushed rearward. The compression spring 400 is gradually compressed to become short during the power lever 200 moving rearward, and the top end 200b of the power lever 200 gradually moves away from the holding end 300b of the holding head 300. When the power lever 200 moves rearward in position, the holding end 300b of the holding end 300 will hook an end of the second work piece 20, for example an end of the C-type clamp having the smaller diameter. At this time, the first work piece 10 and the two wires (not shown) have been pre-installed into a fitting hole of the second work piece 20. Then, the power lever 200 is released to push the first work piece 10 onto the second work piece 20 under a push force exerted by the compression spring so that the first work piece 10 and the two wires are pre-held into the fitting hole of the second work piece 20.

Then, as shown in Figure 4, a base end 200a of the power lever 200 is hammered by a hammering tool 500 such as a hammer or a hammer head to exert an impact force to the power lever. A top end 200b of the power lever 200 moves forward and strike the first work piece 10 under the impact force, such that the first work piece 10 is forced to be inserted into the fitting hole of the second work piece 20, as shown in Figure 5.

In this way, after inserting the first work piece (the wedge block) 10 into the fitting hole of the second work piece 20 (the C-type clamp) by using the installation tool as described above, the two wires are clamped between the first work piece (the wedge block) 10 and the second work piece 20 (the C-type clamp) and electrically connected with each other via the first work piece (the wedge block) 10 and the second work piece 20 (the C-type clamp).

In order to realize a good electrical connection, in an exemplary embodiment of the disclosure, the first work piece (the wedge block) 10 and the second work piece 20 (the C-type clamp) may be made of metal.

In the installation tool as described in the above various embodiments of the disclosure, it is possible to manually hammer the power lever 200 by the hammering tool 500 such as a hammer or a hammer head. Therefore, the power lever 200 may strike the first work piece 10 under the hammering of the hammer to force the first work piece 10 to be inserted into the fitting hole of the second work piece 20. Therefore, as compared to the installation tool in which the impact force is provided by a detonator, the installation tool of the disclosure is simpler in structure, easier to operate and safer to use.

Although the disclosure has been described with reference to the attached drawings, the embodiments disclosed in the attached drawings is intended to illustrate the preferred embodiment of the disclosure and should not be construed as being limited to the disclosure.

Although embodiments of the present invention have been described and illustrated
5 with reference to the accompanying drawings, it would be appreciated by those skilled in the art embodiments as described and shown above are exemplary and various changes or modifications may be made thereto by those skilled in the art without departing from the scope defined by claims. Further, structures described in various embodiments may be combined in any forms without conflicting with each other in structure or concept. The
10 scope of the present invention is defined by claims and their equivalents.

It should be noted that phrase “comprise” or “include” does not exclude other elements or steps, and the phrase “a” or “an” does not exclude multiple.

What is claimed is,

1. An installation tool adapted to force a first work piece (10) to be inserted into a fitting hole of a second work piece (20) by impacting, comprising:

a body (100) having a front end and a rear end in a longitudinal direction;

a holding head (300) connected to the front end of the body (100) and adapted to hold the second work piece (20); and

a power lever (200) movably mounted on the body (100) in the longitudinal direction,

wherein the power lever (200) has a base end (200a) extending from the rear end of the body (100) and a top end (200b) extending from the front end of the body (100);

wherein the installation tool further comprises a hammering tool (500) adapted to hammer the base end (200a) of the power lever (200) to exert an impact force to the power lever (200); and

wherein the top end (200b) of the power lever (200) pushes the first work piece (10) forward under the impact force to force the first work piece (10) to be inserted into the fitting hole of the second work piece (20).

2. The installation tool according to claim 1, wherein

the body (100) is provided with a compression spring (400) adapted to exert a push force to the power lever (200) therein; and

the top end (200b) of the power lever (200) is adapted to push the first work piece (10) into the second work piece (20) under the push force, such that the first work piece (10) is pre-held into the fitting hole of the second work piece (20) before striking the first work piece (10).

3. The installation tool according to claim 2, wherein

the body (100) is formed with a spring receiving cavity (110a) within which the compression spring (400) is received;

the power lever (200) passes through the spring receiving cavity (110a) and the compression spring (400) in the longitudinal direction; and

the power lever (200) is mounted with a blocking ring (211) thereon, and the compression spring (400) is compressed between a rear end wall (111) of the spring receiving cavity (110a) and the blocking ring (211).

4. The installation tool according to claim 3, wherein the body (100) comprises:

a first portion (110) located at the rear end of the body (100);

a second portion (120) located at the front end of the body (100); and

a third portion (130) adapted to connect the first portion (110) and the second portion (120) together.

5. The installation tool according to claim 4, wherein the third portion (130) comprises a coupling nut having internal threads, and the coupling nut is threaded onto the first portion (110) and the second portion (120).

6. The installation tool according to claim 4, wherein the spring receiving cavity (110a) is formed in the first portion (110) and the holding head (300) is threaded onto the second portion (120).

7. The installation tool according to claim 6, wherein the holding head (300) has a connection end (300a) threaded onto the second portion (120) of the body (100) and a holding end (300b) adapted to hold the second work piece (20).

8. The installation tool according to claim 1, wherein a rod-like portion (210) of the power lever (200) passes through the body (100) in the longitudinal direction.

9. The installation tool according to claim 1, wherein
the first work piece (10) includes a wedge block of an electrical connector for electrically connecting two wires, and the second work piece (20) includes a C-type clamp of the electrical connector having a wedge fitting hole; and
after inserting the wedge block into the wedge fitting hole of the C-type clamp, the two wires are clamped between the wedge block and the C-type clamp and electrically connected with each other via the wedge block and the C-type clamp.

10. The installation tool according to claim 9, wherein
the C-type clamp has a first end and a second end having a diameter smaller than that of the first end, and a diameter of the wedge fitting hole is gradually reduced from the first end to the second end; and
the holding head (300) is adapt to hook the second end of the C-type clamp having the smaller diameter to hold the C-type clamp.

11. The installation tool according to claim 1, wherein the hammering tool (500) includes a hammer.

12. A method for installing an electrical connector for electrically connecting two wires, the electrical connector comprises a C-type clamp and a wedge block adapt to be inserted into a fitting hole of the C-type clamp, the method comprising steps of:

providing the installation tool according to claim 2;

pulling the power lever (200) rearward so that the compression ring (400) is compressed;

pre-installing the wedge block and the two wire to be connected into the fitting hole of the C-type clamp;

placing the wedge block, the C-type clamp and the two wires pre-installed together onto the holding head (300) and hooking the holding head (300) onto an end of the C-type clamp having a smaller diameter;

releasing the power lever (200) so that the power lever (200) moves forward under a push of the compression spring (400) to push the wedge block onto the C-type clamp, thereby pre-holding the wedge block and the two wires into the fitting hole of the C-type clamp; and

hammering the base end of the power lever (200) by the hammering tool (500) so that the power lever (200) moves forward under the impact force exerted by the hammering tool to force the wedge block to be inserted into the fitting hole of the C-type clamp, thereby clamping the two wires between the wedge block and the C-type clamp to electrically connect the two wires with each other.

Drawings

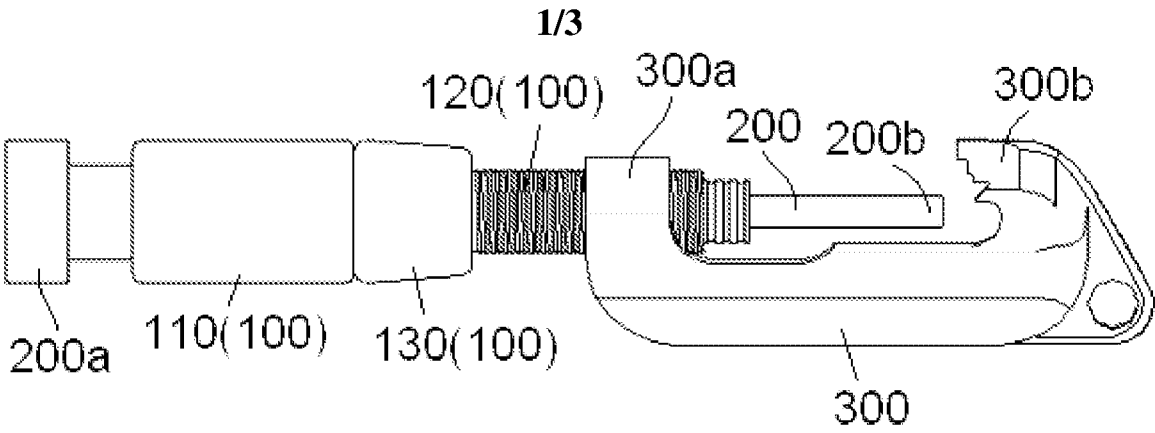


Fig. 1

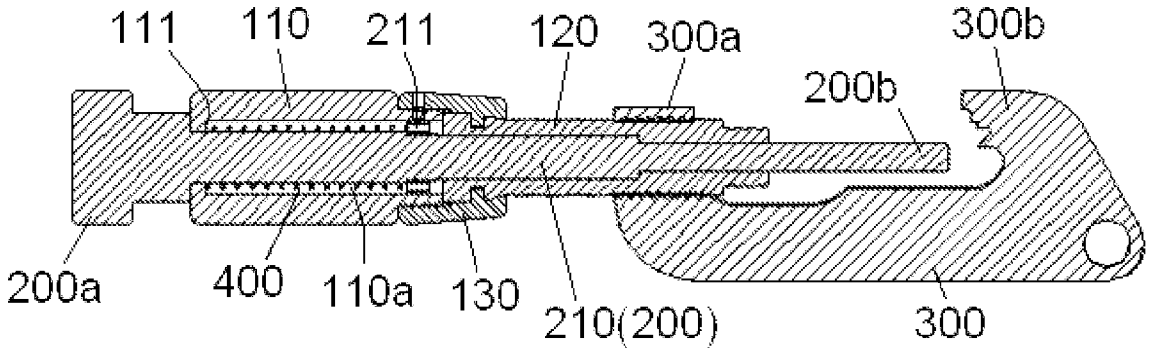


Fig. 2

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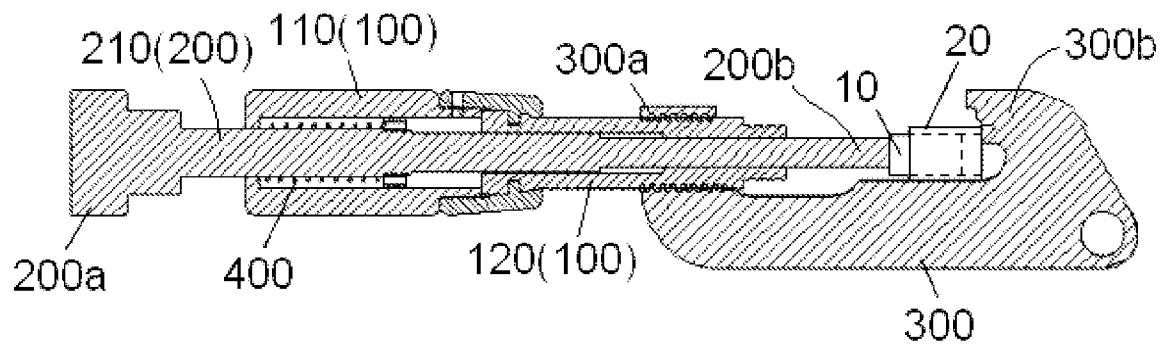


Fig. 3

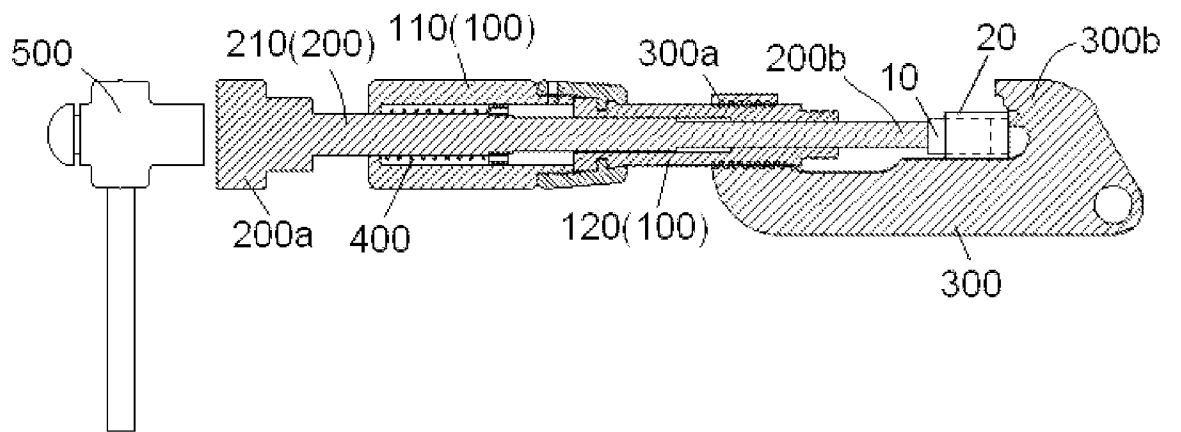


Fig. 4

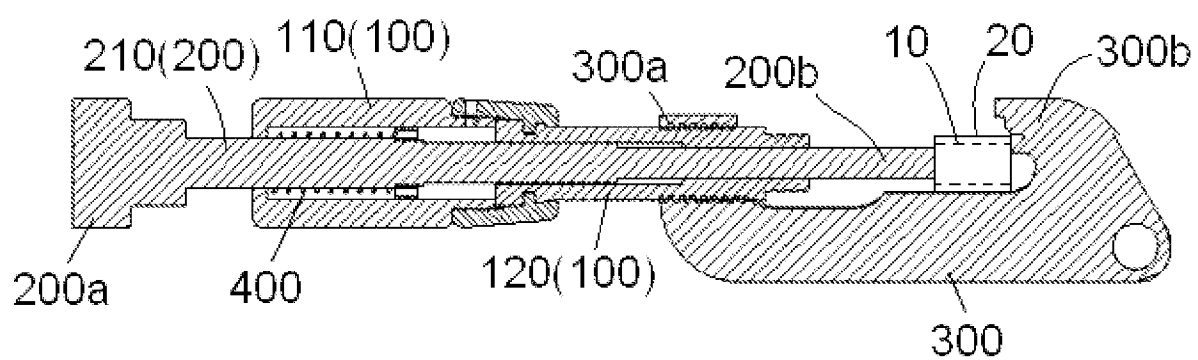


Fig. 5

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2016/055713

A. CLASSIFICATION OF SUBJECT MATTER

INV. H01R4/50 B25B27/00 H01R4/02 B25B27/04 B25B27/14
H01R43/027
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
H01R B25B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EP0-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2006/090912 A1 (PETERSON JENNIFER M [US] ET AL) 4 May 2006 (2006-05-04)	1,8-11
Y	figures 1-3	2,12

X	US 2011/154652 A1 (LEFAVOUR JOHN D [US] ET AL) 30 June 2011 (2011-06-30)	1
A	figures 1-3	2,8-12

X	US 3 257 499 A (BROSKE WILLIAM F) 21 June 1966 (1966-06-21)	1
A	figures 1-7	2,8-12

Y	WO 98/40178 A1 (KLAUKE GMBH GUSTAV [DE]; FRENKEN EGBERT [DE]) 17 September 1998 (1998-09-17) page 7, line 234 - page 8, line 264; figures 1-3	2

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☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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INTERNATIONAL SEARCH REPORT

International application No

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