A HOLDING DEVICE FOR HOLDING PULL RODS IN A PULLING TOOL. AS WELL AS USE THEREOF

Abstract:
In a pulling tool for the installation of underground pipes (1) between two trenches (2, 6), where an old pipe (4) is disposed between the two trenches, the new pipe is pulled by a pulling tool (5), which pulls a crusher tool (3) which is connected with the pulling mechanism by means of a plurality of interconnected pull pipes (10). The pull rods have grooves (11, 12, 13, 14) or ribs capable of cooperating with grooves (26) or ribs on the inner face of radially movable parts (15, 16, 17) of a holding device, which have an outer face that may rest against the inner face of a movable ring (19), which may preferably be moved in an angular area of 120°. The inner face of the movable ring has a varying diameter (20, 21), which means that the movable parts of the holding device may be moved radially, so that the grooves and the ribs may be held in engagement with a pull pipe or be released from the pull pipe. It is hereby possible to establish a pull in the pull rods (10), without it being necessary to apply a radial force directed inwardly toward the movable parts in order to hold the pull pipe.
A HOLDING DEVICE FOR HOLDING PULL RODS IN A PULLING TOOL AS WELL AS USE THEREOF

The invention relates to a holding device for holding pull rods in a pulling tool.

The invention moreover relates to use of the holding device.

WO 2004/074732 A1 discloses a tool for the installation of underground pipes, where the pipes are installed along an existing underground pipeline in that the new pipes are pulled by a pulling tool equipped with a crusher tool which crushes the existing pipeline, thereby making space for the new pipes which are enclosed by the crushed material from the old pipe.

This system works in that a plurality of pull rods are screwed together and are moved through the existing pipe between two trenches, where the one trench is disposed at the end of the underground pipeline which is to be replaced, while the other trench is disposed at a pulling device. The pulling device pulls the pull rods in steps, so that one step corresponds to the length of one pull rod.

It is not explained in detail in the document how the pull rods are connected with the pulling device, but a common way of doing this is that a holding device, which is formed by two gripper claws, is pressed against one end of the pull rod, which is smooth, by a force sufficient for the pull to be accomplished.

It has been found that when large pipes are to be installed, it may be a problem to provide sufficient forces for the gripper claws, so that these can hold the pull rods during the pulling process, which results in limitations of the permissible distance between the trenches.
Accordingly, an object of the invention is to provide an arrangement which ensures a greater holding capacity between a pull rod and gripper claws of a pulling device.

The object of the invention is achieved by a holding device of the type defined in the introductory portion of claim 1, which is characterized in that the holding device is formed by at least two radially movable parts, said movable parts having an inner face with grooves which are adapted to engage ribs arranged on the pull rod, or vice versa, and that the holding device has an outer face which engages the inner face of a rotatable ring, said inner face having a varying diameter.

It is ensured in this manner that the holding device cannot slide on the pull rod.

Further, no radial, inwardly directed clamping forces are to be applied, which occur during the pull from the holding device toward the pull rod, to hold the pull rod. In other words, the radial, outwardly directed forces are absorbed by the ring.

Expediently, as stated in claim 2, the varying diameter increases or decreases evenly, and, as stated in claim 3, the rotatable ring may be rotated in an angular work area which is maximum 180°. It should be observed that the rotatable ring may be moved to and fro continuously or in steps.

In a preferred embodiment, as stated in claim 4, the holding device has three movable parts, and the ring is moved in an angular area which is 120°.

When, as stated in claim 5, the movable parts are provided with grooves at the top and at the bottom which are adapted to receive ribs on two non-
movable rings, between which rings the movable ring is mounted, easy and rapid adjustment of the holding device is ensured.

A particularly firm engagement between the holding device and the pull rods is achieved when, as stated in claim 6, the grooves and the ribs extend essentially perpendicularly relative to the longitudinal axis of the holding device.

As mentioned, the invention also relates to a use. This use is defined in claim 7.

The invention will now be explained more fully with reference to the drawing, in which

fig. 1 shows the principles of a pulling tool for the installation of new, underground pipes,

fig. 2 shows a detailed section of the pulling tool of fig. 1,

fig. 3 shows the principles of the mode of operation of the holding device according to the invention, seen from above, while

fig. 4 shows parts of the holding device of fig. 3, seen in perspective.

In fig. 1, the numeral 1 indicates a pipe which is moved down into a trench 2.

The pipe is connected with a crusher tool 3 which is intended to crush an existing, underground pipe 4. As will be seen in the figure at the reference numeral 7, the existing pipe 4 is destroyed during the pulling operation of the new pipe 1, which is performed by a pulling tool 5. At the bottom of the
figure, the new pipe has been pulled through the ground and may then optionally be pulled further on to another trench (not shown).

Fig. 2 shows the principles of the pulling process.

The pulling tool 5 and the crusher tool 7 are connected with each other via a plurality of pull rods, four of which are shown in fig. 2, one being designated 10.

Grooves and ribs are provided in the vicinity of both ends of the pull rods, which typically have a distance of 0.5 m and are designated 11, 12, 13, and 14. Their function will be explained later.

Pulling of the pull rods with the crusher tool 7 and new pipes 1 is accomplished in the following manner:

A holding tool 9, which is mounted on a slide 9a, grips a pull pipe, while another non-movable holding tool 8 is released. When the slide 9a on the pulling tool 5 has moved a distance corresponding to the distance between two sets of grooves and ribs on two interconnected pull pipes, the non-movable holding tool 9 is caused to grip and hold the new next pull pipe, while the slide runs back, and the holding tool 8 is caused to grip the next pull pipe, following which the non-movable holding tool 8 is caused to release, and then the process is repeated.

It should be observed that the reason why a non-movable holding tool 8 is used, is to prevent the pull rods from jumping slightly backwards when the movable holding tool 9 releases the pull rods.

It will now be explained how the holding device in the pulling device is constructed and operates in connection with figures 3 and 4.
As will be seen, the holding tool consists of three movable parts designated 16, 17, 18, which are enclosed by a movable ring 19.

The movement of the three movable parts is radial, as shown by the arrow 18. The movable parts have grooves at the top and at the bottom, one of which being designated 22.

The grooves are intended to receive ribs 24 on two non-movable rings which are disposed above and below the movable parts 15, 16 and 17. Only one non-movable ring is shown in fig. 4.

As will also be seen in fig. 4, the movable parts have grooves and ribs 26 on their inner side which extend essentially perpendicularly relative to the longitudinal axis of the movable parts.

The rotatable ring 19 is mounted against the non-movable rings and may be rotated in the direction of the arrow 23.

As will be seen in fig. 3, the inner face is divided into three sections, where each section has a varying diameter.

The reference numeral 20 indicates a section where the diameter is larger than at the reference numeral 21.

As will be seen, the movable parts 16, 17 and 18 engage the inner side of the rotatable ring with their outer face.

With this structure, it is possible to move the movable parts to and fro toward the centre of the rotatable ring merely by rotating the rotatable ring, which may open and close in the shown case by a rotation through 120°.
It will now be explained how the holding device operates.

When the movable parts are present in the position shown in fig. 3, a pull pipe may be inserted between the movable parts.

Then, the rotatable ring is rotated counterclockwise, whereby the movable parts slide in the ribs 24 and are moved inwards toward the centre, which means that when the rotatable ring reaches the position 21, the ribs and the grooves 11, 12, 13, 14 on the pull rods will engage the ribs and the grooves 26 on the inner side of the movable parts and ensure a firm grip during a subsequent pulling process, without it being necessary to apply inwardly directed, radial forces to the movable parts, since the rotatable ring will prevent the movable parts from being moved backwards during the pulling process. In other words, the rotatable ring absorbs the radial, outwardly directed forces.

Although the invention has been described in connection with a holding device comprising three parts, nothing prevents the provision of two, four or more movable parts within the scope defined by the claims.
PATENT CLAIMS

1. A holding device for holding a pull pipe (10) in a pulling tool (5), characterized in that the holding device is formed by at least two radially movable parts (15, 16, 17), said movable parts having an inner face with grooves (26) which are adapted to engage ribs (11, 12, 13, 14) arranged on the pull pipe (10), or vice versa, and that the holding device has an outer face which engages the inner face of a rotatable ring (19), said inner face having a varying diameter (20, 21).

2. A holding device according to claim 1, characterized in that the varying diameter increases or decreases evenly.

3. A holding device according to claims 1–2, characterized in that the rotatable ring (19) may be rotated in an angular work area which is maximum 180°.

4. A holding device according to claims 1–3, characterized in that the holding device has three movable parts (15, 16, 17), and that the rotatable ring (19) is moved in an angular area which is 120°.

5. A holding device according to claims 1–4, characterized in that the movable parts are provided with grooves (22) at the top and at the bottom, which are adapted to receive ribs (24) on two non-movable rings (25), between which rings the rotatable ring (19) is mounted.

6. A holding device according to claims 1–5, characterized in that the grooves (26) and the ribs (11, 12, 13, 14) extend essentially perpendicularly relative to the longitudinal axis of the holding device.

7. Use of a holding device according to claims 1–6 for the installation of
underground pipes by pulling.
**INTERNATIONAL SEARCH REPORT**

**A. CLASSIFICATION OF SUBJECT MATTER**

| INV. | E21B7/30 | E21B19/06 | E21B19/12 | F16L55/165 |

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):

- E21B
- F16L

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 practical, search terms used):

- EPO-Internal

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

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<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
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<td>US 4 576 254 A (COX ET AL) 18 March 1986 (1986-03-18) column 1, lines 6-10 column 1, line 3853; figures 3, 5</td>
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- Further documents are listed in the continuation of Box C.
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- Date of the actual completion of the international search: 7 September 2006.
- Date of mailing of the international search report: 26/09/2006.

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