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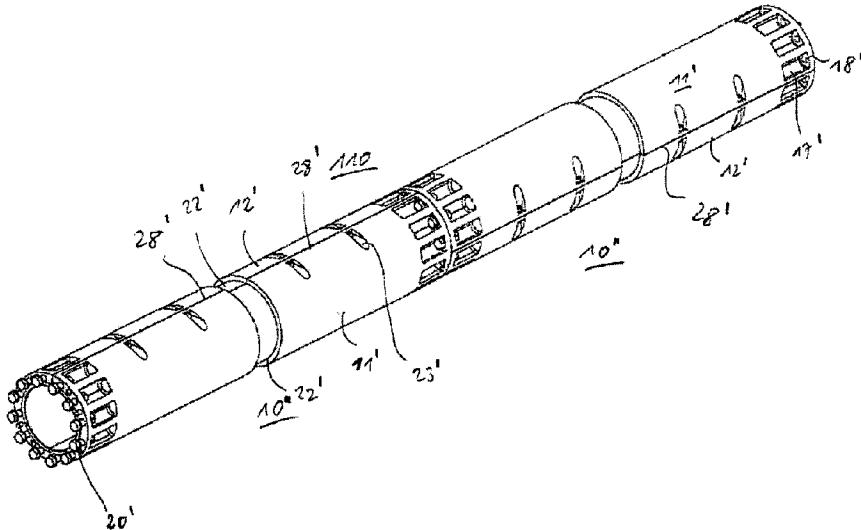
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that an outer wall of the drill pipe (10) is made in one piece. The invention further relates to a device (103') for moving at least one drill pipe (10) into a borehole or out of the same, and to a system and a corresponding method.

(57) Zusammenfassung: Die Erfindung betrifft ein Bohrrohr (10) zum Einsatz beim Erstellen einer Bohrung in einem Boden (100, 101) von einem Startpunkt (101) zu einem Zielpunkt (102) entlang einer vorgegebenen Bohrlinie, insbesondere zum oberflächennahen Verlegen von Erdkabeln oder Erdleitungen im Boden (100), wobei die Bohrung mittels einer Bohrvorrichtung (103, 106) mit einem Bohrwerkzeug zum Lösen des Bodens beim Vorschieben der Bohrrohre (10) aufgefahren wird, wobei das Bohrrohr (10) an seinen Enden jeweils wenigstens einen Anschlussabschnitt (11, 12) zum zugfesten lösbar Verbinden mit einem weiteren Element eines Bohrstrangs (110) aufweist, dass das Bohrrohr (10) wenigstens ein Element (21) zum Herstellen einer zugfesten Verbindung mit einem korrespondierenden Element (31) einer Vorschubeinrichtung zum Vorschieben und/oder Zurückziehen des Bohrrohrs (10) in das Bohrloch aufweist, und dass eine Außenwandung des Bohrrohres (10) einstückig ausgeführt ist. Weiterhin betrifft die Erfindung eine Vorrichtung (103') zum Bewegen wenigstens eines Bohrrohrs (10) in ein Bohrloch hinein oder aus diesem hinaus so wie ein System und ein Verfahren dazu.

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Drill pipe, and system and method for laying a pipeline

Description

The invention relates to a drill pipe for use during the creation of a borehole in a ground from a starting point to a target point along a predetermined drill line, in particular for the near-surface laying of underground cables or underground lines in the ground, wherein the

- 5 borehole is gradually created by means of a drilling device that has a drilling tool for loosening the ground when the drill pipes are advanced. Furthermore, the invention relates to a device for moving at least one drill pipe into a borehole or out from it, especially during the near-surface creation of a borehole in a ground from a starting point to
- 10 a target point and/or when placing a pipeline or underground line or an underground cable in the ground from a starting point to a target point or vice versa, with at least one base, with at least one abutment, with at least one actuator for moving the at least one drill pipe, being operatively connected to the base, with a transmission element, being
- 15 operatively connected to the actuator, for transmitting the movement produced by the at least one actuator to the at least one drill pipe, as well as a system and a method for the creation of a borehole in the ground from a starting point to a target point along a predetermined drill line, in particular for the near-surface laying of underground cables or underground lines in the ground, wherein the borehole is gradually created by means of a drilling device that has a drilling tool for loosening the ground when the drill pipes are advanced.

When erecting a power supply grid, for example when creating a 380 kV line, besides the creation of overhead power lines it is also necessary to lay these lines in the ground.

- 5 The open ditch method is used during a near-surface laying of underground cables, underground lines and also conduits (such as pipelines). This sometimes causes substantial operations along the route and involves an expense which should not be underestimated for ditch excavation and refilling. For example, in the construction of a
- 10 380 kV cable route there are needed two ditch profiles, each with 5.5 m width and 2.15 m depth. The separation of the individual soil layers has proven to be especially complicated, requiring several separate clamps. This is necessary in order to restore the soil quality to the original state during the later refilling of the ditch. Furthermore, a
- 15 construction service area of around 40 m must be kept open during the construction work, while after completion of the construction work a cable protection zone of around 23 m must be kept accessible. These operations during the construction phase and the impact after completion of the work in the context of open laying of cable justify
- 20 the need to develop a suitable underground laying method.

Furthermore, in order to limit the intrusions into nature during the construction phase and keep down the construction costs, it is necessary to achieve large reach lengths. Reach lengths of up to

25 1500 m or more are desirable here. The problem with near-surface laying is the slight coverage of the line and sometimes also the slight distance between the individual boreholes (both of which may be only

2 to 6 m). The diameter of the lines being laid here is in a range of less than 500 mm, often also less than 300 mm.

Ditch-less drilling methods are already available from pipeline 5 construction. (microtunneling, HDD), but heretofore it has not been possible to easily satisfy the necessary parameters with these methods.

Thus, drilling methods already exist which can lay the desired diameter range, but for technical reasons these methods are limited to 10 much shorter laying lengths, especially due to the supplying of drill fluid. For example, the microtunnel drilling technique is up to 300 mm. For a reach length of up to or more than 1.5 km, it has still been necessary to resort to a microtunnel drilling technique with a diameter of around 1000 mm. However, with increasing diameter the 15 space required for the construction zone layout and the costs increase significantly. Therefore, so far this technique has not been economically feasible. Moreover, the pipelines of the microtunnel drilling technique are only plugged together, so that only compressive but no tensile forces can be transmitted.

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With the Horizontal Directional Drilling (HDD) method, a laying would be conceivable in regard to the requirements for the diameter and the reach length. This method is already being used in particular for crossing under rivers and roads. In this method, a pilot borehole is 25 first made, using a rotating drill head and drill string, from the starting point in the direction of a target point. The position accuracy is ensured by a measurement system, which is arranged behind the drill

head. The removed material is delivered to the surface with a bentonite suspension. The bentonite suspension is pumped through the drill string directly to the nozzles arranged at the drill head. The suspension mixes with the loosened soil and flows back through the 5 annular space between drill string and ground to the starting point. However, large flushing pressures are needed for a clean removal of the loosened ground. But in order to prevent an unwanted emergence of the flushing on the surface, in the HDD method as well laying depths and thus coverages of more than 30 m are required. The drill 10 pipes of the pilot drill string are coupled together by a non-positive locking connection by the drill pipes being screwed together directly by a screw thread connection. This also provides the connection to the drive unit of the so-called HDD rig. The screwing together of the drill string elements accordingly requires set-up time.

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Thanks to developments in the field of drilling and pumping techniques in regard to the supplying of the drilling device with driving and flushing fluid, it has become possible to overcome the 1000 mm diameter barrier for the use of microtunneling methods, for 20 example. However, the successive installing of drill pipes is a problem in regard to the regular extending of the supply lines for the drilling device and the transporting away of the drill cuttings. This involves significant loss of performance due to set-up times for laying lengths of up to or more than 1500 m.

25

Furthermore, in regard to the laying of near-surface lines it is necessary, after or during the producing of the borehole, to introduce a

pipeline into the ground, especially one made advantageously of plastic (other materials such as polymer concrete, glass fiber plastic or the like are also possible) in order to then lay the conduit inside it. The problem here is that it is not easily possible to create the borehole 5 directly with the introducing of plastic pipes in the ground, since the plastic pipe especially in the case of long laying lengths is not suited to transmitting the necessary forces without damage. It is therefore necessary to use drill pipes which are suited to providing the necessary forces required for the drilling. Here, once more, the 10 above-described problem of successive inserting occurs.

After reaching the target point, the drilling device is removed. Furthermore, the drill pipes laid are removed once more and the plastic pipe is placed in the ground at the same time or after a delay. It 15 is necessary to transmit tensile forces onto and across the drill pipes and accordingly once a drill pipe has been removed from the borehole it must be separated from the drill string in order to use it again.

The problem of the invention is therefore to overcome the 20 aforementioned drawbacks, especially to reduce the set-up times and to make possible the transmitting of tensile forces in the drill string.

This problem is solved with respect to a first solution by a drill pipe in a first embodiment in that the drill pipe has at each of its ends at least 25 one connection section for detachably connecting it to a further element of a drill string in a tensile-resistant manner, in that the drill pipe has at least one element for producing a tensile-resistant

connection to a corresponding element of an advancing device for advancing the drill pipe into and/or retracting it from the borehole, and in that an outer wall of the drill pipe is made in one piece.

- 5 Surprisingly, it has been found that a tensile-resistant drill string can be produced with such a drill pipe in a simple manner, one which is designed to be advanced and/or retracted.

Another solution of the problem with regard to the drill pipe in a
10 second embodiment proposes that the drill pipe has at each of its ends at least one connection section for detachably connecting it to a further element of a drill string in a tensile-resistant manner, that the drill pipe has at least one element for producing a tensile-resistant connection to a corresponding element of an advancing device for
15 advancing the drill pipe into and/or retracting it from the borehole, and that the drill pipe consists of at least two shell elements which are axially connectable to the drill pipe.

By dividing the drill pipe into shell elements it is possible to lay the
20 supply lines of the drilling device, coupled together as a hose pack, in a lower portion of the shell elements and to close them with the other shell elements as a kind of lid. The supply lines may therefore be provided, for example, wound up on a drum over the full drilling length. Fragmenting of the supply lines during microtunneling is
25 reduced or eliminated, which significantly decreases the set-up times.

Another teaching of the invention proposes that at least one connection region of a shell element is provided with at least one seal. In this way, pressure tightness of the drill pipe can be provided in a simple fashion.

5

Another teaching of the invention proposes that the connection by the respective connection sections of the drill pipe to another element of the drill string occurs in the form of a positive-locking and/or non-positive-locking connection. Another teaching of the invention 10 proposes that the drill pipe has at its first end a first connection section and at its opposite second end a second connection section corresponding to the first connection section.

It is advantageous that the first connection section and the second 15 corresponding connection section in the mounted state form a flange connection, having connection elements and/or boreholes for the placement of a bolt connection. In this way, a tensile-resistant connection between the drill pipes can be provided in a simple and economical manner.

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Alternatively, it is advantageous that the first connection section and the second corresponding connection section form a tensile-resistant plug-in sleeve connection, wherein one connection section has a pointed end and the other connection section is a corresponding 25 sleeve, each of them having at least one corresponding indentation in the opposite surface, which form a groove in the assembled state in which at least one shearing element can be inserted to produce the

tensile-resistant supporting connection. Here as well it is possible in a simple manner to produce a tensile-resistant connection between the drill pipes. Surprisingly, it has been found that such a connection can also be used for drill pipes.

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Another teaching of the invention proposes that the element for producing a tensile-resistant connection with the corresponding element of the advancing device is an indentation in the outer wall of the drill pipe. In this way, it is possible in an easy manner to enable a 10 movement of the drill pipe via a movement device, such as a press frame for example, in a tensile-resistant manner and with substantially less set-up time.

Another teaching of the invention proposes that the indentation can be 15 provided with a covering. This is advantageous for avoiding stones and the like from getting jammed in the indentation in the ground.

Another teaching of the invention proposes that the element for producing a tensile-resistant connection with the corresponding 20 element of the advancing device is an element of a tensile-resistant plug-in sleeve connection. In this way, it is possible in an easy manner to enable a movement of the drill pipe via a movement device, such as a press frame for example, in a tensile-resistant manner and with substantially less set-up time.

25

Another teaching of the invention proposes that the drill pipe has at least one conduit section arranged in the outer wall and/or in the inner

space of the drill pipe at the outer wall and extending in parallel along the outer wall, wherein the at least one conduit section has at each of its ends a connection element for producing a connection between conduit sections of interconnected drill pipes or elements of the drill string. The conduits serve for example for the transport of bentonite, as a driving line for the driving of a pump, as a feed line for transporting away the drill cuttings, for bringing in electrical lines, as a high-pressure conduit or as a delivery line for the mixture of washing liquid and drill cuttings/loosened soil. The conduits have, for example, a plug-in sleeve system, possibly with gaskets, so that the conduits can be plugged into one another. In this way, the set-up times for providing the supply lines can be substantially reduced.

Advantageously, the drill pipes according to the invention have a length of more than 8 m. This likewise significantly reduces the set-up times.

Another teaching of the invention proposes that the drill pipe has at least one indentation in its wall for producing a connection with an advancing device for advancing the drill pipe into and/or retracting it from the borehole. A positive locking can be implemented in this way for easier transmitting of advancing forces to the outer surface.

Another teaching of the invention proposes that at least one manipulating element has an element for producing a connection with a shell element, for example in the form of a gripping element, which preferably engages in an indentation in the surface of the shell

element, a magnetic element, or a suction or vacuum element. In this way, a supporting connection can easily be provided for the lifting of the shell element.

- 5 A further solution of the invention proposes in regard to the movement device that a guide element is provided which is movable relative to the base and operatively connected to the transmission element, that the transmission element has at least one positive-locking element for the transmission of the motion, being designed
- 10 such that a tensile-resistant releasable connection exists between transmission element and drill pipe.

In this way it is easily possible to transmit tensile forces to the drill string on a drill string consisting of drill pipes, especially as

15 previously described, among others.

Another teaching of the invention proposes that the at least one actuator is a hydraulic cylinder and/or a rack and pinion drive. Advantageously, they are simple actuators which are maintenance-free

20 and able to provide the required forces.

Another teaching of the invention proposes that the positive-locking element has at least one engaging element which provides the tensile-resistant releasable connection by engaging with an engaging section

25 of the drill pipe, preferably on its outer wall. Advantageously, the at least one engaging element is designed so that it encloses the drill pipe, wherein preferably the positive-locking element has at least two

engaging elements, which are especially preferably arranged horizontally and/or vertically movable in the positive-locking element. In this way, a releasable connection for the force transmission which has low set-up time can be provided in an easy manner. In particular,

5 the set-up time can be reduced significantly by a horizontal/vertical moving of the engaging elements.

Another teaching of the invention proposes that the at least one engaging element is a connection section corresponding to a

10 connection section of the drill pipe. Advantageously, the connection sections form a tensile-resistant plug-in sleeve connection, wherein the engaging element has either a pointed end or a sleeve corresponding to the pointed end, each of them having at least one corresponding indentation in the opposite surfaces, which form a

15 groove in the assembled state in which at least one shearing element can be inserted to produce the tensile-resistant supporting connection. In this way, a releasable connection for the force transmission which has low set-up time can be provided in an easy manner. In particular the set-up time can be reduced significantly by inserting and removing

20 the at least one shearing element.

Another teaching of the invention proposes that a starting seal is provided, preferably in connection with the base.

25 Another solution of the invention proposes a device for the mounting of a drill pipe as described above for use during the creation of a borehole in the ground from a starting point to a target point along a

predetermined drill line, in particular for the near-surface laying of underground cables or underground lines in the ground, wherein the borehole is gradually created by means of a drilling device that has a drilling tool for loosening the ground when the drill pipes are

5 advanced, with a feed area for the shell elements, with a mounting area for connecting the shell elements, with manipulating elements for receiving, moving and positioning the shell elements in the mounting area, with at least one advancing element and/or at least one rotating element for the positioning of the shell elements in the mounting area.

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Another teaching of the invention proposes that the shell elements are positionable about a supply line of the drilling device.

15

Another teaching of the invention proposes that has at least one manipulating element with a gripping element for producing a connection with a shell element, which preferably engages in an indentation in the surface of the shell element.

20

Another teaching of the invention proposes that the manipulating elements are horizontally and vertically movable, so that the shell elements are movable from the feed area to the mounting area.

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Another solution of the invention proposes in regard to the system that the drill pipes are the drill pipes described above, and an advancing device as described above is provided for the moving of the drilling device by the advancing of the drill string.

Advantageously, when using the two-piece drill pipes, a device as described above is provided for the mounting of a drill pipe.

Another teaching of the invention proposes that the drill pipes are
5 arranged in the drill string such that the axial connection regions of the shell elements are arranged offset relative to each other.

Another solution of the invention proposes in regard to the method that the previously described drill pipes are used, which are moved in
10 the borehole, mounted on a drill string, by means of an advancing device as described above.

Advantageously, when using the two-piece drill pipes, a device for the mounting of a drill pipe is used as described above.

15 Another teaching of the invention proposes that the drill pipes are arranged in the drill string such that the axial connection regions of the shell elements are arranged offset relative to each other.

20 The above-described solutions of the invention are not limited to the near-surface laying of pipelines, underground cables or underground lines in the ground. Instead, the aforementioned problem can likewise be employed in classical microtunneling with large diameters, for example with concrete pipes. Here as well, the solutions according to
25 the invention can significantly reduce the set-up times and substantially eliminate lengthening the supply lines and installing

advancing pipes in the drilling area with respect to installations and supply lines.

Furthermore, the drill pipe may also be a product pipe at the same

5 time, which as such remains in the ground and does not have to be removed again from the ground for the pulling in of the product pipe.

The invention shall be explained more closely below with the aid of

an exemplary embodiment in connection with a drawing. There are

10 shown:

Figure 1A, 1B a side view of a first embodiment of a drill pipe according to the invention,

15 Figure 2A a first connection section of the drill pipe according to the invention,

Figure 2B a second connection section of the drill pipe according to the invention,

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Figure 2C the connection section of Figure 2A without covering,

Figure 2D a side view of Figure 2C,

25 Figure 3A the connection section of two interconnected drill pipes according to the invention,

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Figure 3B a side view of Figure 3A,

Figure 4A a spatial view of a first embodiment of a device according to the invention for moving a drill pipe in a first position,

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Figure 4B a spatial view of the device according to the invention for moving a drill pipe in a second position,

Figure 5A a spatial view similar to Figure 4A with the first

10 embodiment of the drill pipe according to the invention,

Figure 5B a spatial view similar to Figure 4B with the first

embodiment of the drill pipe according to the invention

15 Figure 5C a top view of Figure 5A,

Figure 5D a top view of Figure 5B,

Figure 6A a side view of a first transmission element according to

20 the invention of the first embodiment of the device according to the invention with engaging elements in a first position,

Figure 6B a similar view to Figure 6A with engaging elements

25 according to the invention in a second position,

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Figure 7 a schematic representation of a first system according to the invention in spatial view after finishing the drilling process,

5 Figure 8 a schematic representation in spatial view at the start of the pulling in of the conduit, and

10 Figure 9 a cross sectional view of a second embodiment according to the invention of two interconnected drill pipes according to the invention in a second embodiment.

Fig. 10 a schematic representation of a second embodiment of the system according to the invention in side view,

15 Fig. 11 a top view of Fig. 10,

Fig. 12 a spatial view of Fig. 10,

20 Fig. 13 to 19 a schematic representation of an embodiment of a mounting device according to the invention with the individual mounting steps,

25 Fig. 20 a spatial schematic representation of a third embodiment of a drill pipe according to the invention,

Fig. 21 a spatial schematic representation of two connected drill pipes for this,

Fig. 22 a side view of Fig. 21, and

Fig. 23 a spatial schematic representation of a shell element.

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Figures 1A, 1B show in side view a first embodiment of a drill pipe 10 according to the invention. The drill pipe 10 has at its first end a first connection section 11 and at its opposite second end a second connection section 12, wherein the first connection section 11 corresponds to the second connection section 12 inasmuch as these may be joined together or inserted into one another. The first connection section 11 and the second connection section 12 are provided such that they form a flange connection in a first embodiment of the invention, wherein the first connection section 11 has a support section 13, in which boreholes 14 are provided. Behind the support section 13 is provided an indentation 15 in the outer wall 16 of the drill pipe 10. (See Figure 2A to 2D). Corresponding to the boreholes 14, recesses 17 are provided in the indentation 15. Furthermore, boreholes 18 are provided in the support section 13, being designed such that centering pins 19, provided on the second connection section 12, can engage in them.

The second connection section 12 likewise has a support element 20, on which either bolts 21 are firmly arranged, or in which boreholes 31 are provided, containing a thread in which loose bolts 21 are screwed into the recesses 17 through the boreholes 14 into the threaded boreholes 31 in the support section 20.

The indentation 15 may be closed with a covering 22. The covering 22 is fastened in the indentation 15 for example by means of screws. The covering serves to prevent any objects from gathering in the 5 indentation 15 or in the recesses 17 while the drill pipe 10 is moving in the borehole.

Inside the drill pipe 10 are firmly arranged several conduits. These include a delivery line 23 for taking away loosened soil or drill 10 cuttings in connection with drill flushing/drilling/bentonite suspension, a pressing line 24, with which for example a bentonite suspension is introduced to penetrate as a lubricating agent between drill pipes and borehole wall, a driving line 25, with which for example driving fluid is transported to the drilling device in order to 15 drive a jet pump optionally present there (not shown), a feed line 26 with which for example a bentonite suspension is transported to the drill head, with which the drill cuttings or the loosened dirt is then transported out from the borehole and the working face in front of the drilling tool is supported, and a channel 27, in which are provided for 20 example high-pressure lines for the spray system of the cutting tools or power lines for the power supply for the drilling device.

The conduits are connected by a plug-in sleeve system, wherein the first connection section 11 here has pointed ends 28, being provided 25 with seals, while the second connection section 12 has sleeves 29, in which the pointed ends 28 of the conduits 23-26 and possibly 27 engage. This is evident for example from Figure 3B.

Figure 3A and Figure 3B show a first drill pipe 10, which is connected to a second drill pipe 10' by a flange connection 30. The first connection section 11 of the first drill pipe 10 is connected to the 5 second connection section 12 of the drill pipe 10'. The support section 13 and the support section 20 are in contact with each other. The bolts 21 are screwed in through the boreholes 14 into the threaded boreholes 31. For this, the bolts 21 are inserted into the recesses 17 and inserted into the boreholes 14 of the support section 13 of the first 10 connection section 11.

For the connecting of the first connection section 11 to the second connection section 12, the drill pipes 10, 10' are arranged relative to each other such that the centering pins 19 can be inserted into the 15 corresponding boreholes 18. In this case, the pointed ends 28 of the conduits 23-27 should also correspond with the sleeves 29 of the conduits 23-26 and 27. After this, the drill pipes 10, 10' are shoved against each other, so that the pointed ends 28 lock in the sleeve 29. Then the bolts 21 are introduced into the recesses 17 and shoved into 20 the boreholes 14. The bolts 21 are then screwed into the threaded boreholes 31 of the support section 20 of the second connection section 12.

The loosening of the drill pipe 11' from the drill pipe 10 is then done 25 by unscrewing the bolts 21 from the threaded boreholes 31 and removing the bolts 21 from the recesses 17. After this, the drill pipe 10' may be removed from the drill string, the pointed ends 28 of the

conduits 23-26 and 27 being separated from the sleeves 29 of the conduits 23-26 and 27.

Figure 4A and Figure 4B show a spatial view of a device 40 according to the invention for the moving of at least one drill pipe into a borehole or retracting it from this, especially during the near-surface creation of a borehole in a ground 100 from a starting point 101 to a target point 102 and/or when introducing a pipeline, underground line or underground cable 105 into the ground 101 from a starting point 101 to a target point 102 or vice versa. This shall be called a press frame 40 in the following. The press frame 40 comprises a base 41, having a framelike superstructure. On the base 41 are provided rails 42, on which guide elements 43 are provided, which can travel on the rails 42. On the guide elements 43 is arranged the transmission element 44.

Directly or operatively connected to the base 41 is an abutment 45 arranged on the abutment 45. In this way, two actuators 46, designed here as a double-stroke cylinder 47, are connected. One double-stroke cylinder 47 has two hydraulic cylinders 48, which are joined together by a plate 49. The cylinders 48 in the present instance are designed as telescopic cylinders. The plate 49 is likewise connected to a guide element 43, so that the plate 49 can thereby travel on the rails 42 and is guided. The double-stroke cylinders 47 are designed so that in the fully extended state they can move the transmission element 44 substantially as far as the front end of the base 41 on the opposite side of the abutment 45.

On the base 41 are provided end bearings 50, on which a drill pipe 10 or some other element of the drill string can be set down. The end bearings 50 are vertically oriented when a drill pipe 10 is to be placed 5 thereon. During the movement of the transmission element 44 in relation to the base 41, the supports 50 are folded down horizontally. (See Figure 4B).

Figure 5A to Figure 5D show a drill pipe 10, pointing with its second 10 connection section 12 in the direction of the borehole. A starting seal (not shown) could also be provided here at the end of the base 41 facing toward the borehole. The first connection section 11 or its indentation 15 enters into positive-locking connection with an engaging element 53 of the transmission element 44 in that the 15 engaging element 53 engages with the indentation in order to enable a movement of the drill pipe 10.

The transmission element 44 comprises a connection plate 51, with 20 which the double cylinders 47 engage. The transmission element 44 has an opening 52, into which the drill pipe 10 is introduced. Furthermore, a positive-locking element is provided, which in the present instance has two engaging elements 53. The engaging 25 elements 53 are respectively connected to a hydraulic cylinder 54, which are horizontally oriented. The engaging elements 53 are horizontally movable in relation to the transmission element 44. The movement here occurs preferably by the hydraulic cylinder 54. The engaging elements 53 can be moved from an open position (Figure

6A) to a closed engagement position (Figure 6B). In the engagement position shown here, the engaging elements 53 engage in the indentations 15 of the drill pipe 10 and thereby produce a positive-locking connection between the drill pipe 10 and the press frame 40.

- 5 Through the actuators 46, the transmission element 44 can be moved along the rails 42 toward the borehole or away from it. Thanks to the positive-locking connection of the engaging elements 53 with the indentation 15, both compressive and tensile forces may be applied, so that the drill pipe 10 can be moved out from the borehole or into it.
- 10 Alternatively, the engaging elements 53 may also consist of multiple elements, which are moved spatially, or in the case of two engaging elements 53 a vertical movement is also possible as an alternative.

On the back side of the transmission element 44 there are provided

- 15 connections 55 for the conduits 23 – 26 and 27, acting as quick connectors with the conduits 23 – 26 and 27. In regard to the channel 27 it may be necessary to manually introduce hoses or lines into a new drill pipe being connected before the connection is made and to connect them to the hoses or lines of the previous drill pipe 10' in the
- 20 channel 27. It is also possible to have as few connections as possible by making these lines or hoses longer than one drill pipe 10.

Figure 7 shows a schematic representation of the system according to

the invention in a spatial representation. A starting ditch 101 here is

- 25 provided in the ground 100, from which a borehole (not shown) is produced to a target ditch 102. In the starting ditch 101 there is provided a press frame 40. The distance between a starting ditch 101

and a target ditch 102 can be up to 1500 m or more. In Figure 7 one can see how a drilling device 103 has arrived in the target ditch 102. The drilling device 103 is then released from the drill string and removed from the target ditch 102. On the first drill pipe 10 of the 5 drill string is arranged an adapter 104, which is connected to a protective pipe 105 being laid or, if that is not needed, directly to the underground line or the underground cable. In the starting ditch in this embodiment the press frame 40 has been turned around so that the abutment 45 is located at the starting point of the borehole (not 10 shown) and is braced here. Alternatively, it is also possible for the press frame 40 to be designed so that the necessary forces are provided both in the extension direction of the hydraulic cylinder 48 and in the retraction direction of the hydraulic cylinder 48 so that the press frame does not have to be rotated.

15

When creating the borehole, individual drill pipes 10 or also several already interconnected drill pipes are connected to the drill string and shoved into the ground 100 by the press frame 40. The removal of the drill pipes 10 is done in that they are pulled out from the borehole by 20 the press frame 40. Once a drill pipe 10 has been pulled out completely, it is separated and removed from the drill string, for example as described above. Alternatively, several drill pipes connected to form a drill string section may be dismounted. During 25 the pulling out of the drill pipes, the protective pipe 105 or the underground line or the underground cable is introduced at the same time directly into the borehole in the ground 100.

Alternatively to the flange connection 30, a tensile-resistant plug-in sleeve connection 32 for the connecting of two drill pipes 10, 10' in a second embodiment is shown in Figure 9. The tensile-resistant plug-in sleeve connection 32 has a pointed end 33 and a sleeve 34. These are

5 shown connected in Figure 9. The pointed end 33 has a connection surface 35 and the sleeve 34 has a connection surface 36. In the connection surface 35 there is provided at least one indentation 37 and in the connection surface 36 there is likewise provided at least one corresponding indentation 38. If the pointed end 33 is shoved into the

10 sleeve 34, the connection surfaces 35, 36 come into contact and the indentations 37, 38 form a groove 39. A shearing element 60 is inserted into the groove 39 to make the tensile-resistant connection. Alternatively, several grooves 39 and shearing elements 60 could be provided. In addition, it is possible if required to provide at least one

15 seal 61 between the connection surfaces 35, 36. Firmly arranged conduits/channels 23 – 27 may likewise be provided accordingly inside the drill pipes 10, 10' with tensile-resistant plug-in sleeve connection 32.

20 Depending on which connection section 11, 12 is supposed to be connected to the transmission element 44, one alternative embodiment proposes in regard to the press frame 40 that either a pointed end 33 or a sleeve 34 is provided as the transmission element 44 or its engaging element 53 to make a tensile-resistant plug-in sleeve connection 32.

25

Fig. 10 to 12 show a schematic representation of another embodiment of the system according to the invention in a side view. A starting

ditch 101‘ has been provided in the ground 100‘, from which a borehole 102‘ is produced in the microtunneling method from a starting point to a target point (not shown). In the starting ditch is provided a scaffolding 104‘, optionally acting as an expansion of the 5 starting ditch 101‘ and in which the components of the system according to the invention are provided.

In the starting ditch 101‘ there is arranged an advancing unit 103‘, such as a pipe thruster or a press frame 40, with which a drill string 10 110 is pressed or shoved into the borehole 102‘. At the front end 105‘ of the drill string 110 there is provided a drilling device 106, with which the borehole 102‘ is created. The drilling device 106 is supplied via supply lines 108 with power and drill suspension for carrying away the loosened drill cuttings. The supply lines 108 are provided 15 outside the starting ditch 101‘, for example on a drum (not shown), and are unwound from the drum, bundled together (position 109) and introduced into the borehole as the borehole makes progress.

20 The drill string here consists of drill pipes 10“ in a third embodiment, which are represented in Fig. 20 to 23.

25 The drill pipe 10“ shown here as an example consists of 2 shell elements 11‘, 12‘, which are preferably identical in design here. It is of course possible to use more than two shell elements 11‘, 12‘, if this should prove to be advantageous.

At its front end 13[‘] and at its rear end 14[‘] the drill pipe 10[“] has a connection flange 15[‘]. For this, indentations 17[‘] are made in a wall 16[‘] of the shell element 11[‘], 12[‘]. Corresponding to the indentations 17[‘], boreholes 18[‘] are provided, into which connection bolts 20[‘] may 5 be inserted. These are screwed together with nuts 19[‘]. In this way, a non-positive locking connection is produced between the individual drill pipes 10[“]. In an indentation 21[‘] provided in the flange 15[‘] in the area of the boreholes 18[‘] a seal (not shown) may be introduced. Alternatively, the connection of the drill pipes 10[“] may be positive- 10 locking via engaging elements (not shown). An integral bonded connection is also possible, however then an easy releasing of the drill pipes from each other after the removal is not easily possible.

Furthermore, an indentation 22[‘] is provided in the wall 16[‘], acting as a 15 point of application of the forces for advancing or pulling back the drill string 110 via the advancing unit 103[‘].

Furthermore, indentations 23[‘] are provided in the wall 16[‘], being bounded on one side by a web 24. Boreholes 25[“] are provided in the 20 indentations 23[‘] and the web 24[‘]. This likewise involves a flange-like connection possibility for the shell elements 11[‘], 12[‘], which are arranged one on the other. Bolts 26[‘] can likewise be installed here, and are screwed together with nuts 27[‘]. In this way, an axial connecting of the shell elements 11[‘], 12[‘] occurs along a connection 25 line 28[‘]. Furthermore, an indentation 29[‘] is provided in the web 24[‘], in which likewise a seal (not shown) may be inserted.

In order to make possible a better positioning of the drill pipes 10“ relative to each other and that of the shell elements 11‘, 12‘ relative to each other, boreholes 30‘ and positioning pins 31‘ are arranged at or on the web 24‘ or the front or rear end 13‘, 14‘ of the drill pipe 10“,

- 5 which engage with each other when correctly positioned.

In order to accomplish a better stability of the drill string 110, the drill pipes 10“ are respectively arranged for example with a 90 degree offset from each other, as is shown in Fig. 21, 22.

10

The assembling of the drill pipes 10“ and the following connection of the drill pipes 10“ to each other to form the drill string 110 takes place in a mounting device 400. This comprises, as shown in Fig. 13 to 19, a stand 410 in which a feed area 430 and a mounting area 420 are provided. The supply lines 108 run through the mounting area 420.

15

The feed area 430 comprises an outer area 440 and an inner area 450. In the outer area 440, as is shown here as an example, a drill pipe 10“ which is composed of two shell elements 11‘, 12‘ assembled but not yet locked in place is arranged on a carriage 460, which can travel on guide elements 470 from the outer area 440 to the inner area. This position is represented in Fig. 13.

20

The mounting device 400 here comprises for example two manipulating elements 500, 510. The upper manipulating element 500 and the lower manipulating element 510 are each arranged on the frame 410 and able to travel vertically. The upper manipulating

element 500 has gripping elements 520, which grasp the upper shell element 12. The lower manipulating element 510 comprises a support 530, on which the lower shell element 11' is placed.

- 5 In Fig. 14, the upper manipulating element 500 has been lowered onto the upper shell element 12' and the grippers 520 are in engagement. At the same time, the lower manipulating element 510 has been raised so that the drill pipe 10" emerges from the carriage 460, so that the latter can travel back to the outer area 440. Next, the upper
- 10 manipulating element 500 together with the upper shell element 12' are raised and the lower manipulating element 510 is lowered (Fig. 15). After this, the two manipulating elements 500, 510 travel from the feed area 430 to the mounting area 420 and are moved so that the shell elements 11', 12' are again sitting on one another. (Fig. 16). The
- 15 shell elements 11', 12' of the drill pipe 10" are locked in place and then joined together. The drill pipe 10" is then rotated if necessary, moved toward the borehole 102' against the drill string 110 and connected to the latter. All components of the device 400 then release the drill pipe 10", and the drill string 110 is pressed by the advancing
- 20 unit 103' into the borehole 102'.

List of reference symbols

10,10',10'' Drill pipe	23 Delivery line
11 First connection section	23' Indentation
11' Shell element	24 Pressing line
12 Second connection section	24' Web
12' Shell element	25 Driving line
13 Support section	25' Borehole
13' Front end	26 Feed line
14 Borehole	26' Bolt
14' Rear end	27 Channel
15 Indentation	27' Nut
15' Connection flange	28 Pointed end
16 Outer wall	28' Connection line
16' Wall	29 Sleeve
17 Recess	29' Indentation
17' Indentation	30 Flange connection
18, 18' Borehole	30' Borehole
19 Centering pin	31 Threaded borehole
19' Nut	31' Positioning pins
20 Support section	32 Tensile-resistant plug-in
20' Connection bolt	sleeve connection
21 Bolt	33 Pointed end
21' Indentation	34 Sleeve
22 Covering	35 Connection surface
22' Indentation	36 Connection surface

37 Indentation	104‘ Scaffolding
38 Indentation	105 Protective
39 Groove	pipe/underground
40 Device/press frame	cable/underground line
41 Base	105‘ Front end
42 Rail	106 Drilling device
43 Guide element	108 Supply lines
44 Transmission element	109 Position
45 Abutment	110 Drill string
46 Actuator	400 Mounting device
47 Double-stroke cylinder	410 Stand/frame
48 Cylinder	420 Mounting area
49 Plate	430 Feed area
50 End bearing	440 Outer area
51 Connection plate	450 Inner area
52 Opening	460 Carriage
53 Engaging element	470 Guide element
54 Hydraulic cylinder	500 Upper manipulating
55 Connection	element
60 Shearing element	510 Lower manipulating
100, 100‘ Ground	element
101, 101‘ Starting ditch	520 Gripping element
102 Target ditch	530 Support
102‘ Boring/borehole	
103 Drilling device	
103‘ Advancing unit	
104 Adapter	

WE CLAIM:

1. A drill pipe for use during the creation of a borehole in a ground from a starting point to a target point along a predetermined drill line, wherein the borehole is gradually created by means of a drilling device that has a drilling tool for loosening the ground when the drill pipes are advanced, wherein the drill pipe has at each of its ends at least one connection section for detachably connecting it to a further element of a drill string in a tensile-resistant manner, wherein the drill pipe has at least one element for producing a tensile-resistant connection to a corresponding element of an advancing device for advancing the drill pipe into and/or retracting it from the borehole, and wherein an outer wall of the drill pipe is made in one piece and wherein the connection by the respective connection sections of the drill pipe to another element of the drill string occurs in the form of a positive-locking and/or a non-positive-locking connection wherein the drill pipe has at its first end a first connection section and at its opposite second end a second connection section corresponding to the first connection section **characterized in that** the first connection section and the second corresponding connection section form a tensile-resistant plug-in sleeve connection, wherein one connection section has a pointed end and the other connection section is a corresponding sleeve, each of them having at least one corresponding indentation in the opposite surface, which form a groove in the assembled state in which at least one shearing element can be inserted to produce the tensile-resistant supporting connection, and in that the drill pipe has at least one conduit section arranged in the outer wall and/or in the inner space of the drill pipe at the outer wall and extending in parallel along the outer wall, wherein the at least one conduit section has at each of its ends a

connection element for producing a connection between conduit sections of interconnected drill pipes or elements of the drill string.

2. A drill pipe for use during the creation of a borehole in a ground from a starting point to a target point along a predetermined drill line, wherein the borehole is gradually created by means of a drilling device that has a drilling tool for loosening the ground when the drill pipes are advanced, wherein the drill pipe has at each of its ends at least one connection section for detachably connecting it to a further element of a drill string in a tensile-resistant manner, wherein the drill pipe has at least one element for producing a tensile-resistant connection to a corresponding element of an advancing device for advancing the drill pipe into and/or retracting it from the borehole, wherein the drill pipe consists of at least two shell elements which are axially connectable to the drill pipe and wherein the connection by the respective connection sections of the drill pipe to another element of the drill string occurs in the form of a positive-locking and/or a non-positive-locking connection wherein the drill pipe has at its first end a first connection section and at its opposite second end a second connection section corresponding to the first connection section **characterized in that** the first connection section and the second corresponding connection section in the mounted state form a flange connection, having connection elements and/or boreholes for the placement of a bolt connection, and in that the drill pipe has at least one conduit section arranged in the outer wall and/or in the inner space of the drill pipe at the outer wall and extending in parallel along the outer wall, wherein the at least one conduit section has at each of its ends a connection element for producing a connection between conduit sections of interconnected drill pipes or elements of the drill string.

3. The drill pipe as claimed in claim 1 or 2, wherein said drill pipe is for the near-surface laying of underground cables or underground lines in the ground.
4. The drill pipe as claimed in any one of claims 1 to 3, **characterized in that** the element for producing a tensile-resistant connection with the corresponding element of the advancing device is an indentation in the outer wall of the drill pipe.
5. The drill pipe as claimed in claim 4, **characterized in that** the indentation can be provided with a covering.
6. The drill pipe as claimed in any one of claims 1 to 5, **characterized in that** the element for producing a tensile-resistant connection with the corresponding element of the advancing device is an element of a tensile-resistant plug-in sleeve connection.
7. The drill pipe as claimed in any one of claims 1 to 6, **characterized in that** the drill pipe has essentially the same diameter as the drilling device
8. A device for moving at least one drill pipe as claimed in any one of claims 1 to 7, into a borehole or out from it, especially during the near-surface creation of a borehole in a ground from a starting point to a target point and/or when placing a pipeline, underground line or underground cable in the ground from a starting point to a target point or vice versa, with at least one base, with at least one abutment, with at least one actuator for moving the at least one drill pipe, being operatively connected to the base, with a transmission element, being operatively connected to the actuator, for transmitting the movement

produced by the at least one actuator to the at least one drill pipe, wherein a guide element is provided which is movable relative to the base and operatively connected to the transmission element, in that the transmission element has at least one positive-locking element for the transmission of the motion, being designed such that a tensile-resistant releasable connection exists between transmission element and drill pipe, **characterized in that** the positive-locking element has at least one engaging element which provides the tensile-resistant releasable connection by engaging with an engaging section of the drill pipe, in that the at least one engaging element is designed so that it encloses the drill pipe or in that the at least one engaging element is a connection section corresponding to a connection section of the drill pipe wherein the connection sections form a tensile-resistant plug-in sleeve connection, wherein the engaging element has either a pointed end or a sleeve corresponding to the pointed end, each of them having at least one corresponding indentation in the opposite surfaces, which form a groove in the assembled state in which at least one shearing element can be inserted to produce the tensile-resistant supporting connection.

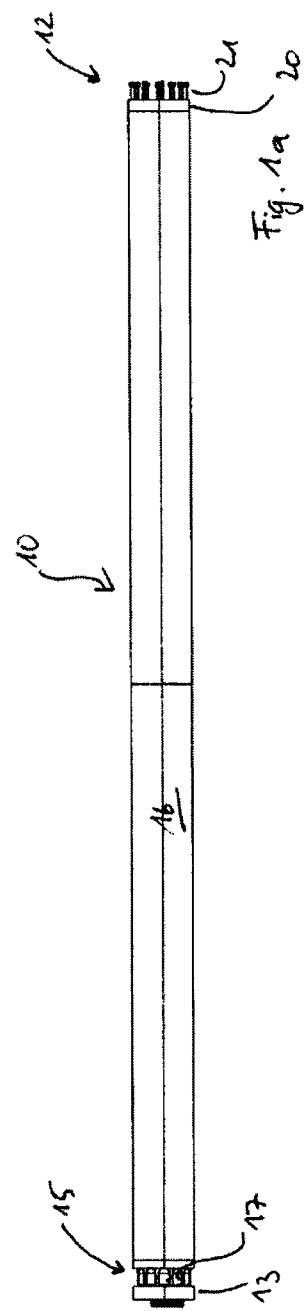
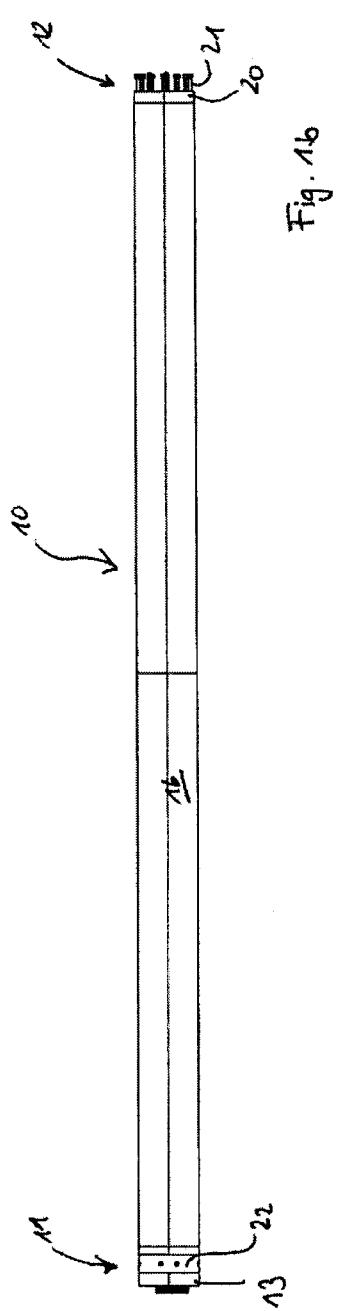
9. The device as claimed in claim 8, **characterized in that** the at least one actuator is a hydraulic cylinder and/or a rack and pinion drive.
10. The device as claimed in claim 9, **characterized in that** the positive-locking element has at least two engaging elements.
11. The device as claimed in claim 10, **characterized in that**, the engaging elements are arranged horizontally and/or vertically movable in the positive-locking element.

12. A system for use during the creation of a borehole in the ground from a starting point to a target point along a predetermined drill line for the near-surface laying of underground cables or underground lines in the ground, wherein the borehole is gradually created by means of a drilling device that has a drilling tool for loosening the ground when the drill pipes are advanced, **characterized in that** the drill pipes are drill pipes as claimed in any one of claims 1 to 7, and in that an advancing device is provided for moving the drilling device by the advancing of the drill string as claimed in any one of claims 8 to 11.
13. The system as claimed in claim 12, **characterized in that** near-surface laying is understood as laying at a depth of less than 10m.
14. The system as claimed in claim 13, **characterized in that** near-surface laying is understood as laying at a depth of 2 to 6 m.
15. A method for the creation of a borehole in the ground from a starting point to a target point along a predetermined drill line for the near-surface laying of underground cables or underground lines in the ground, wherein the borehole is gradually created by means of a drilling device that has a drilling tool for loosening the ground when the drill pipes are advanced, **characterized in that** drill pipes are used as claimed in any one of claims 1 to 7, which are moved in the borehole, mounted on a drill string by means of an advancing device as claimed in any one of claims 8 to 12.
16. The method as claimed in claim 15, **characterized in that** near-surface laying is understood as laying at a depth of less than 10m.

17. The method as claimed in claim 16, **characterized in that** near-surface laying is understood as laying at a depth of 2 to 6 m.

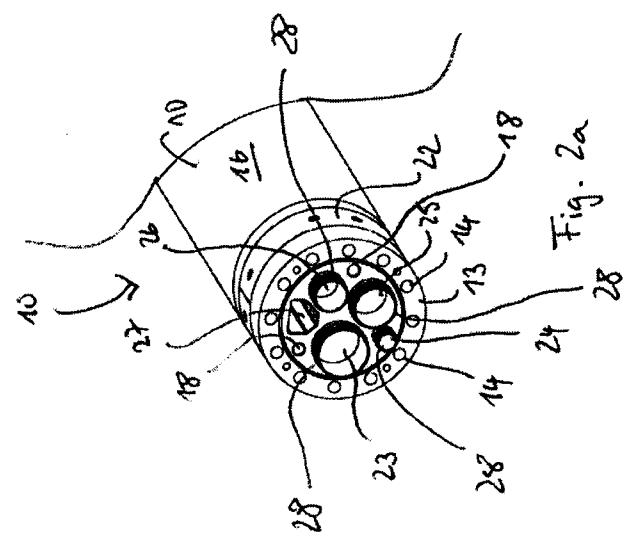
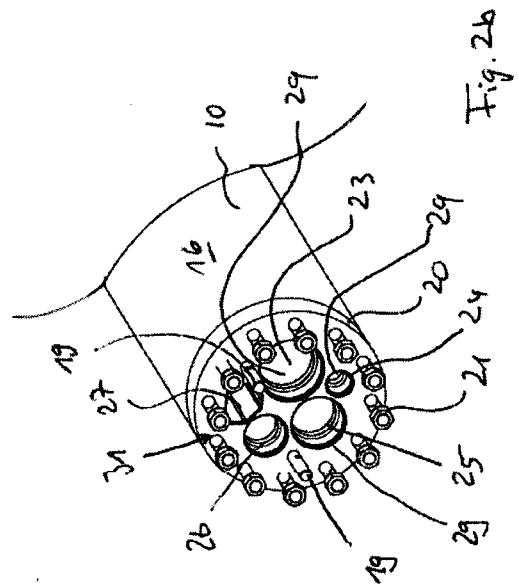
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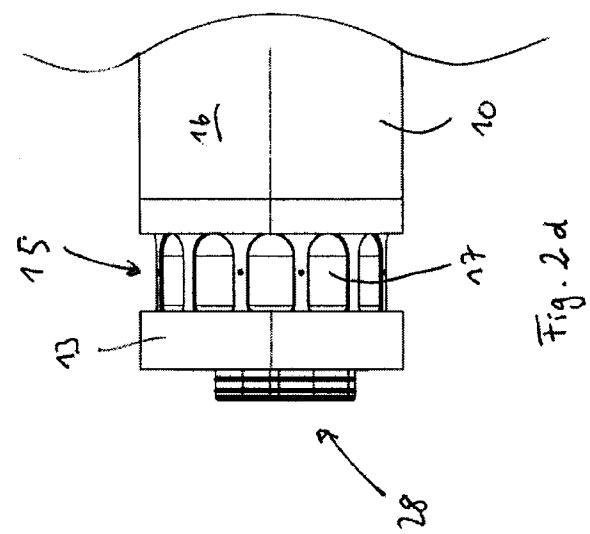
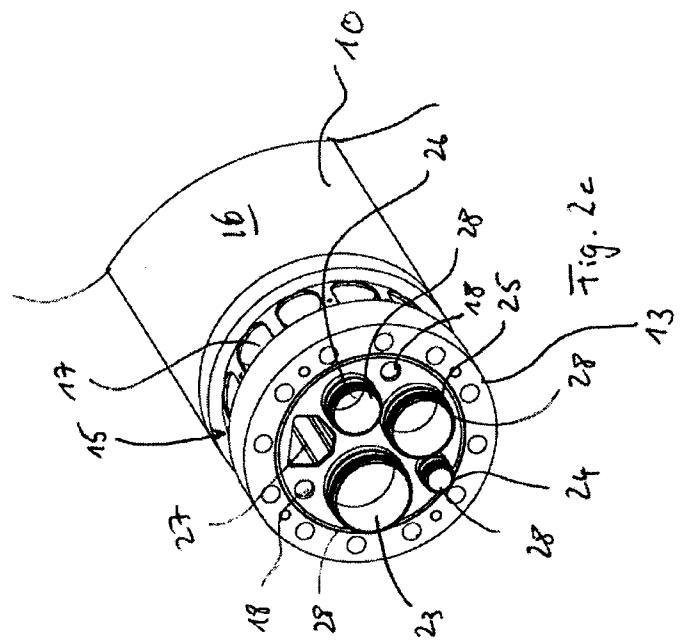
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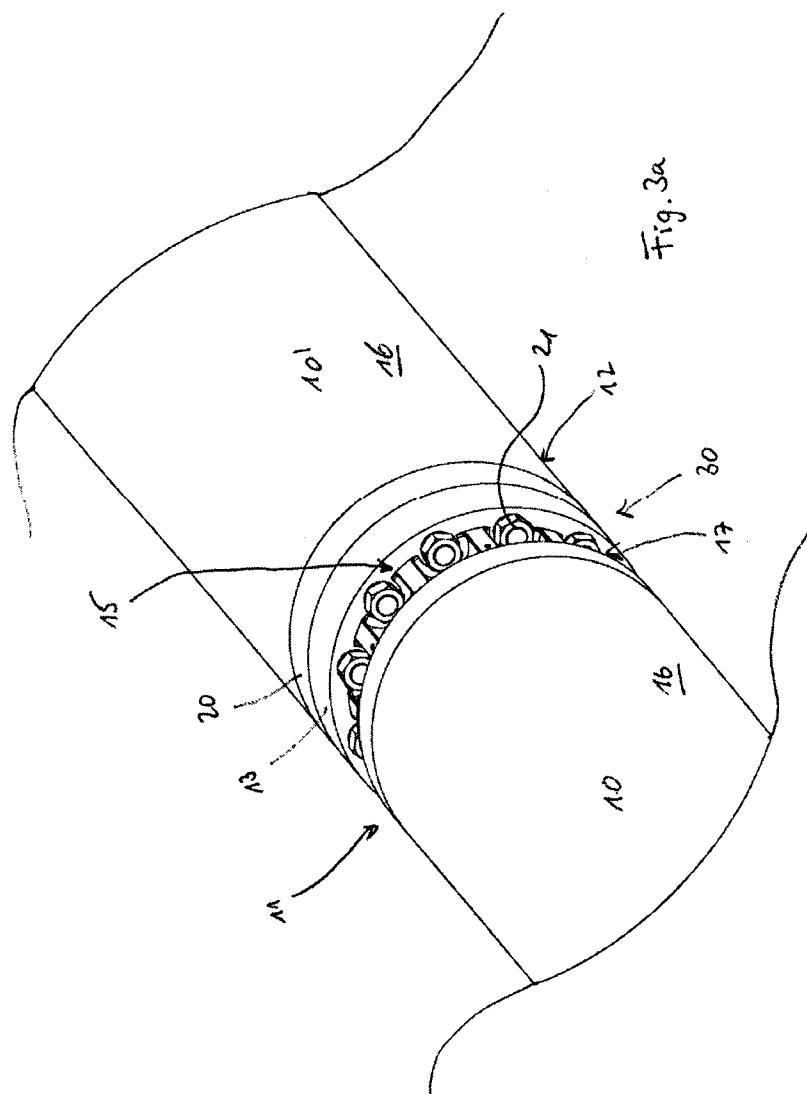
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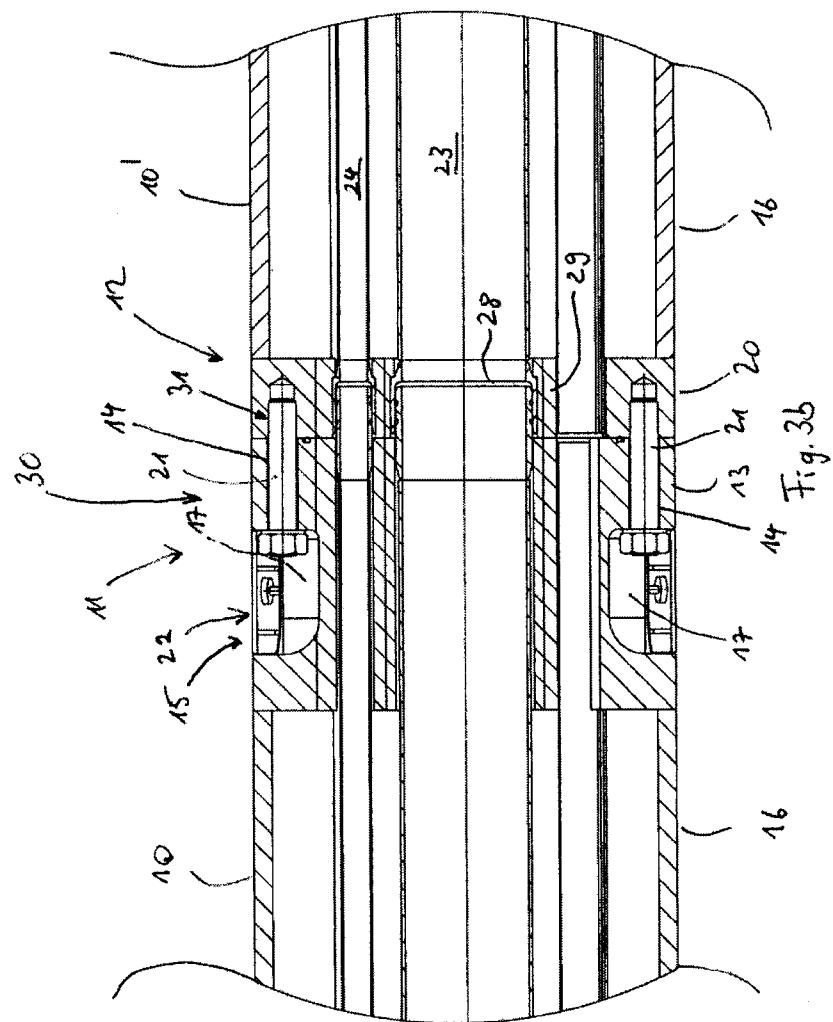
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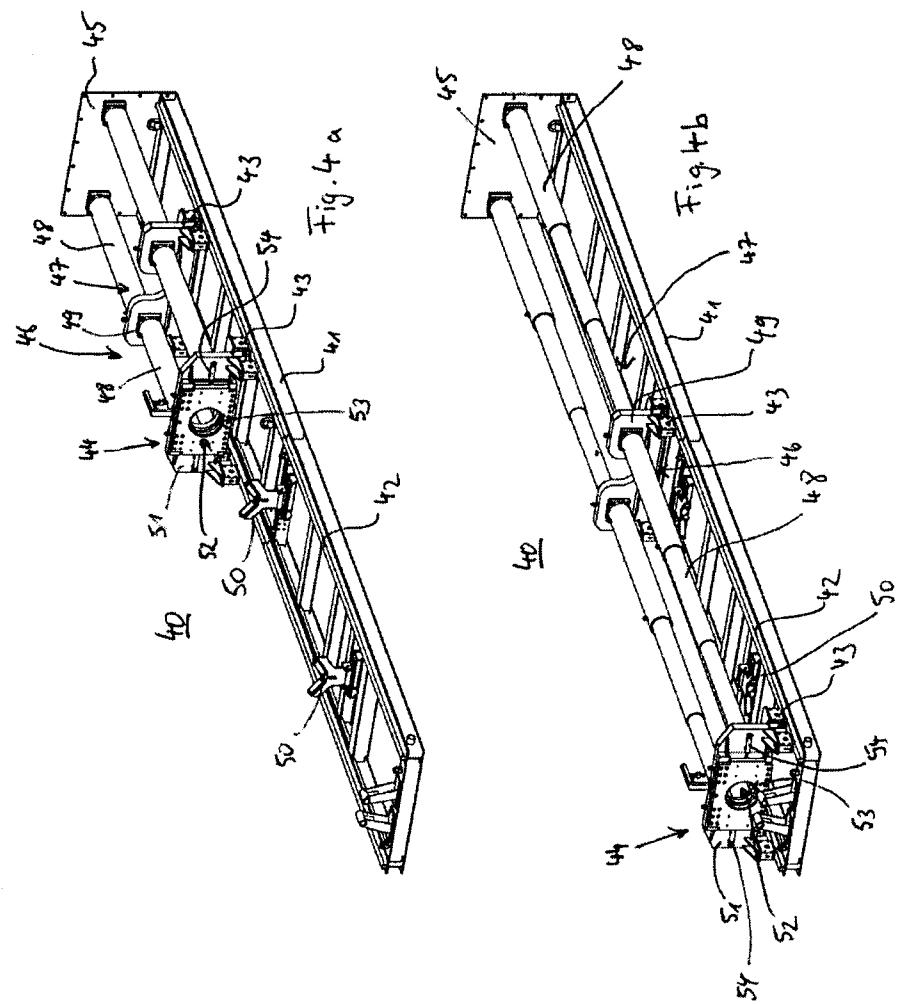
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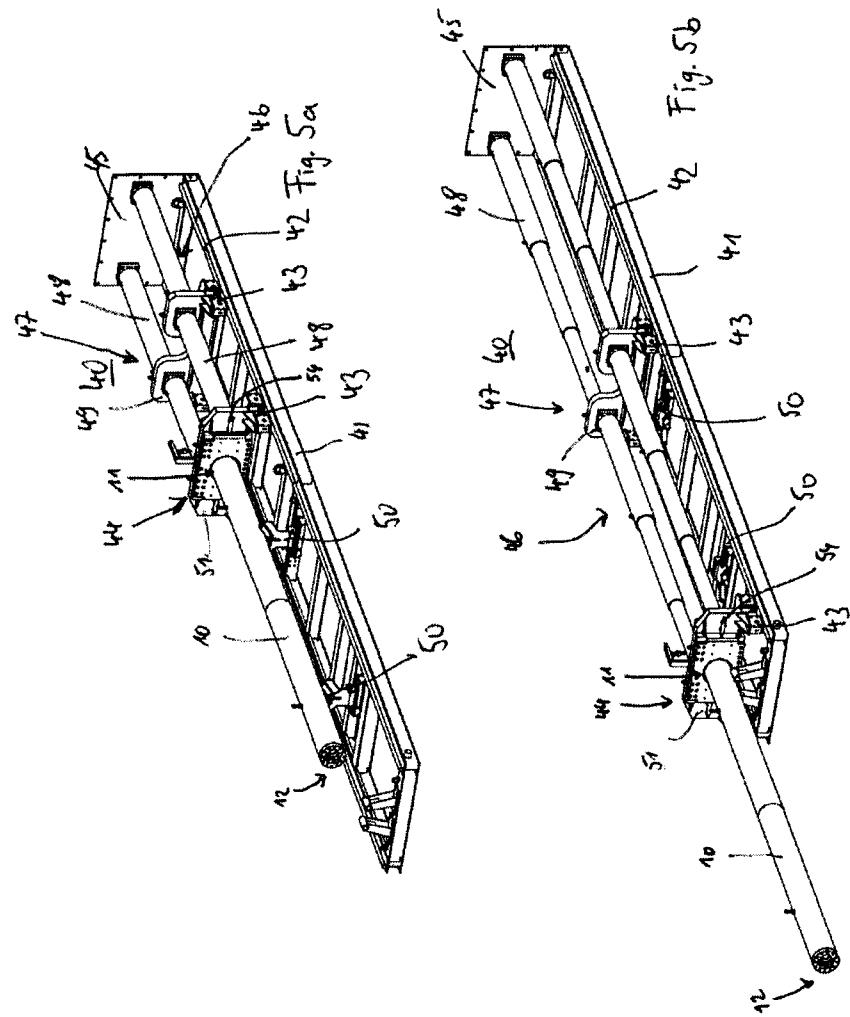
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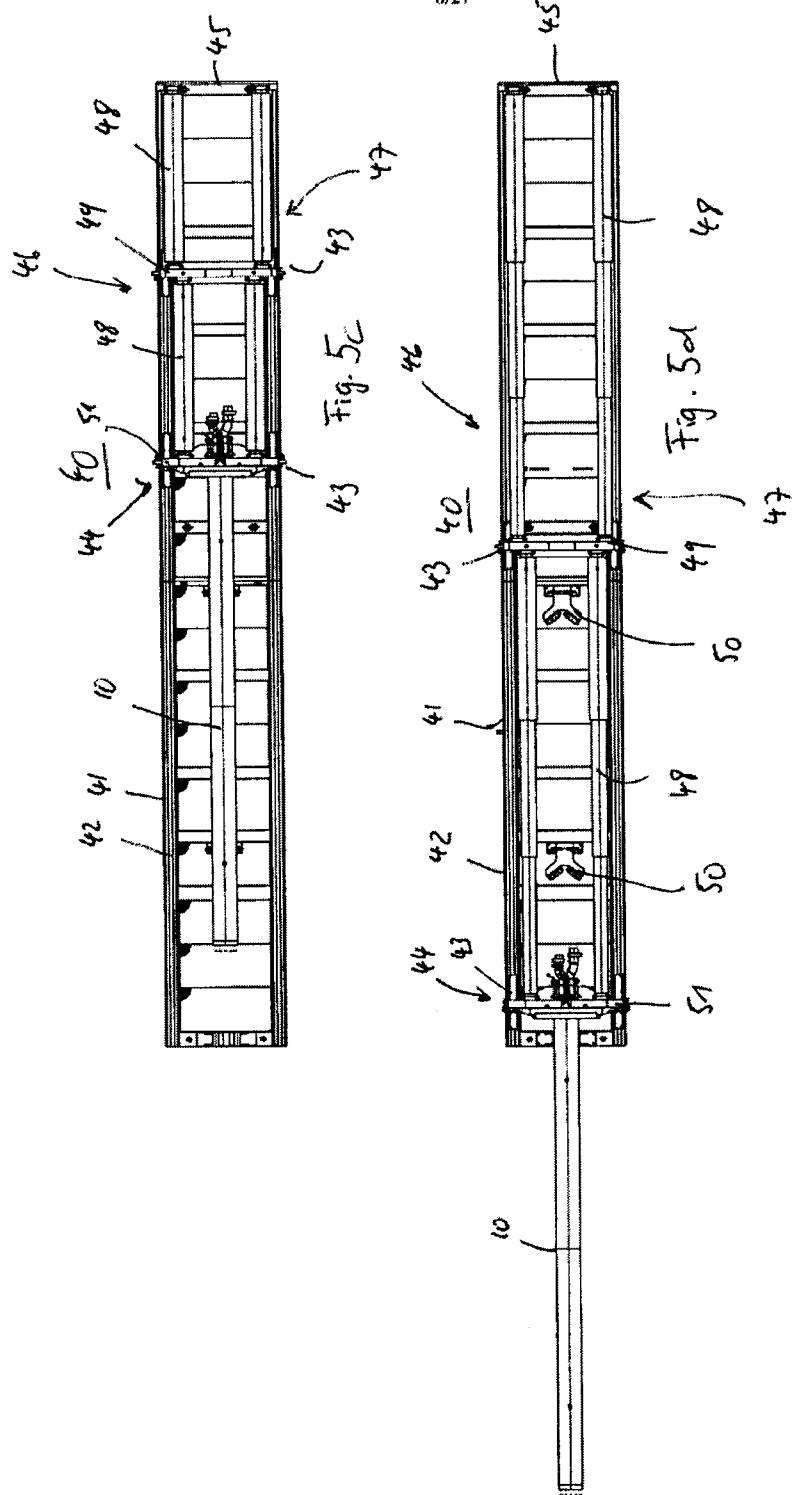
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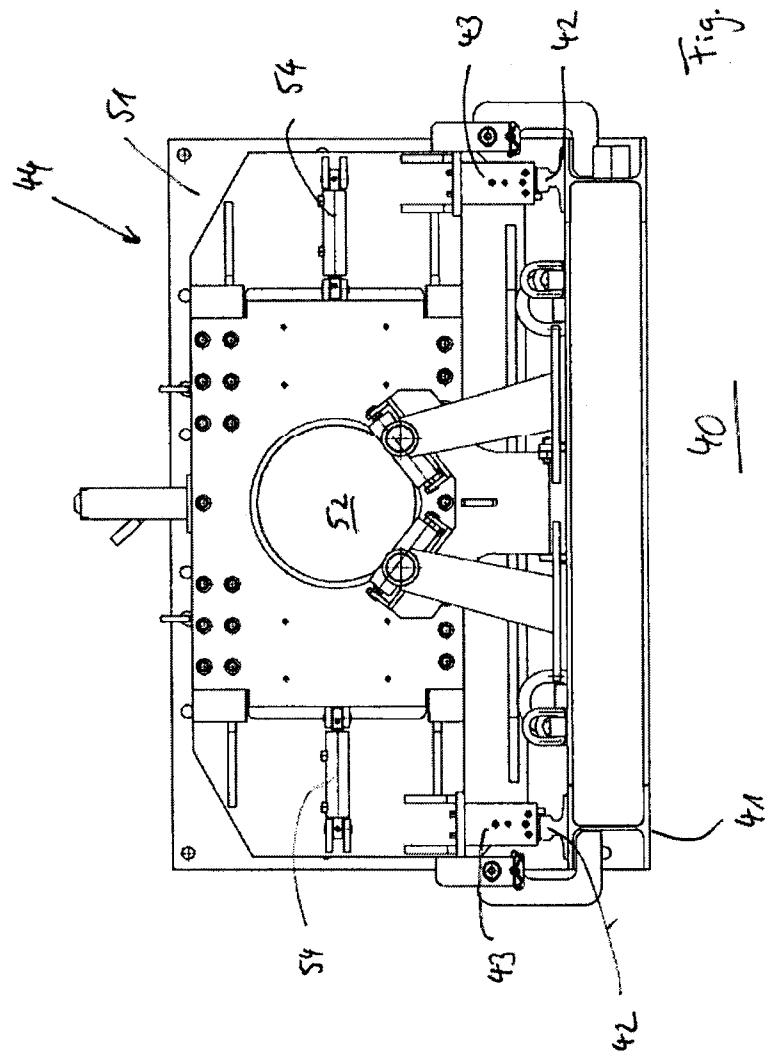
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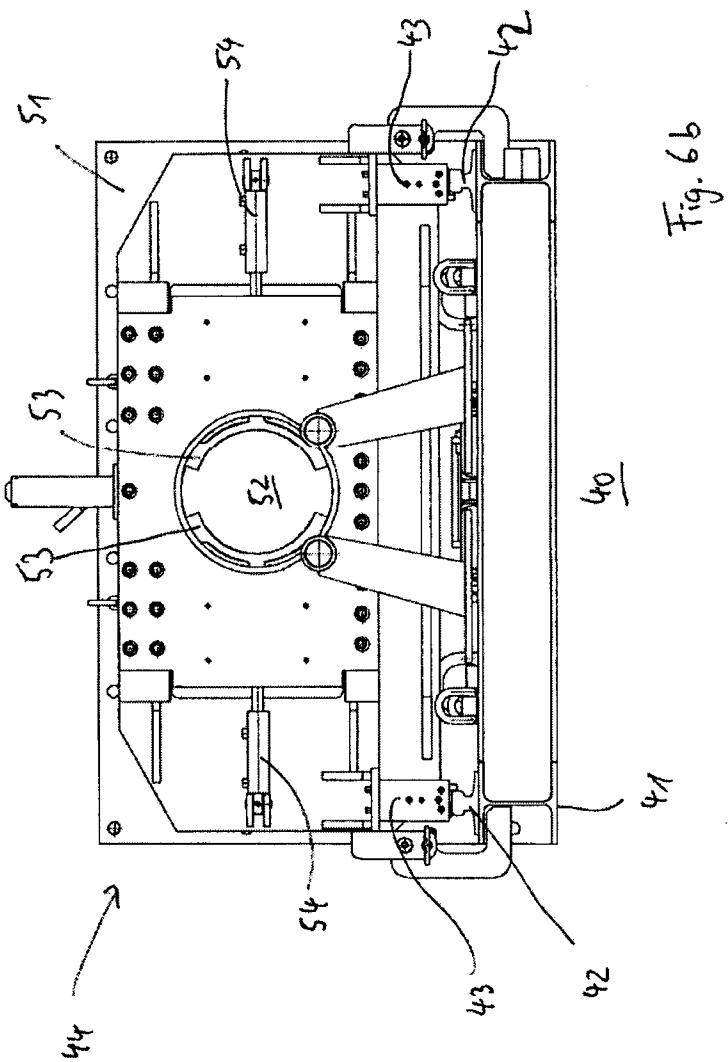
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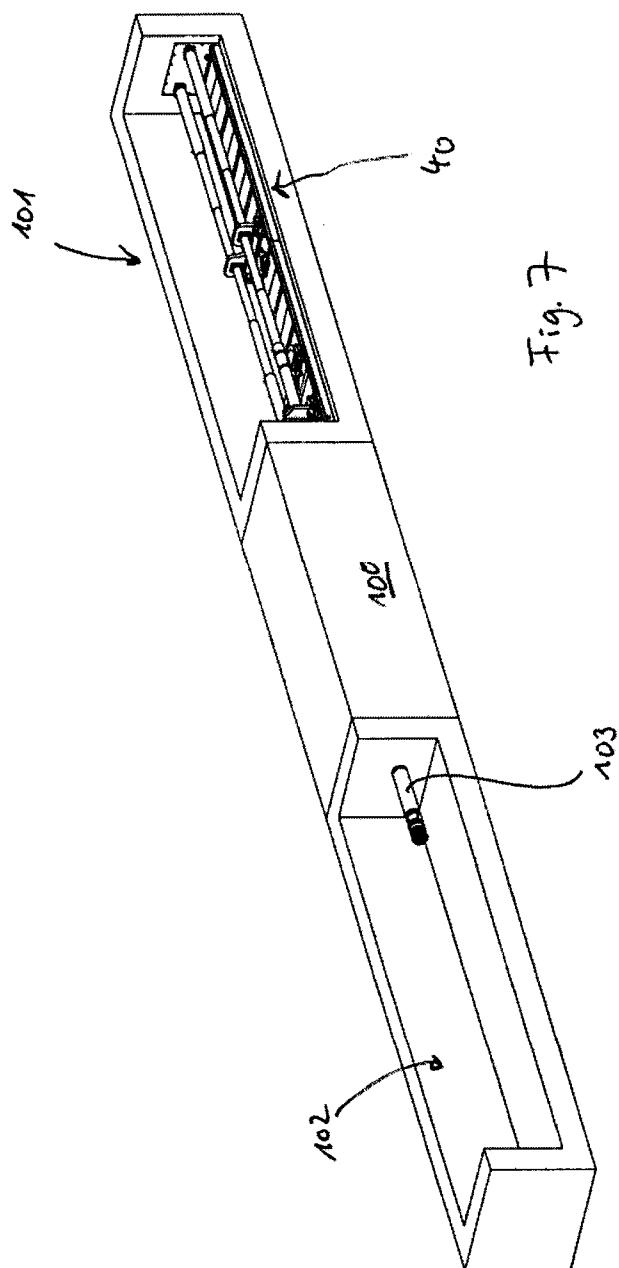
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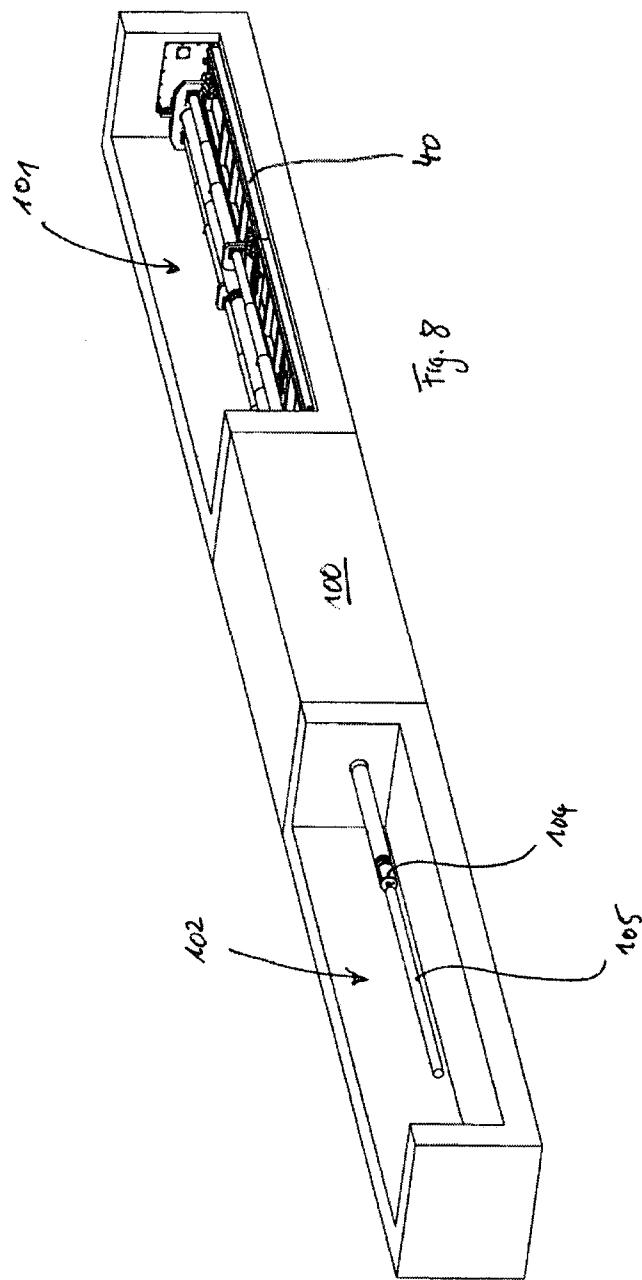
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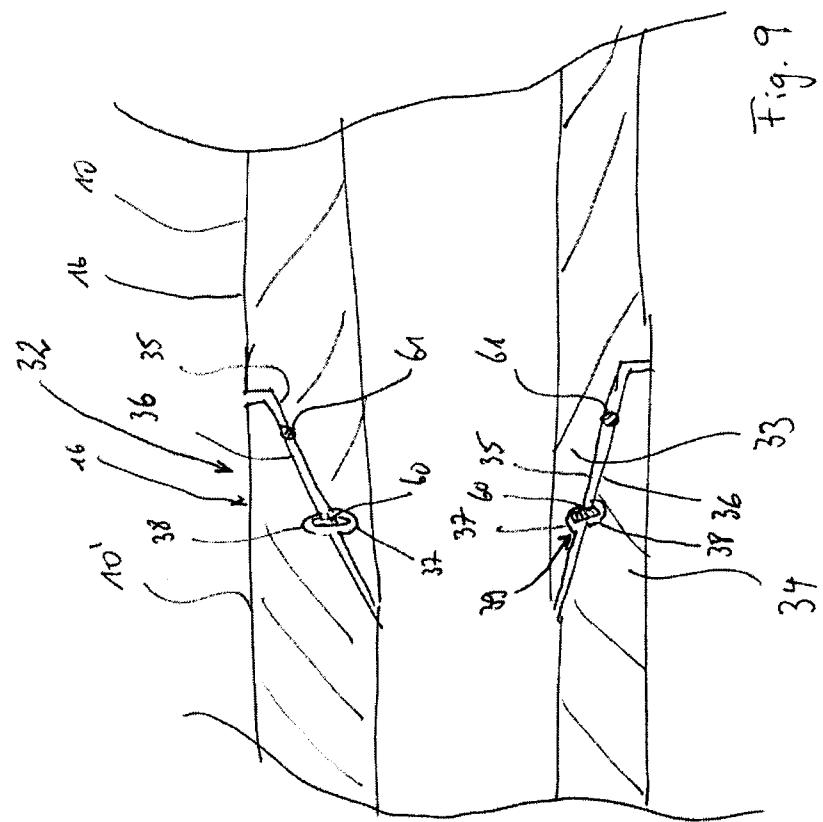
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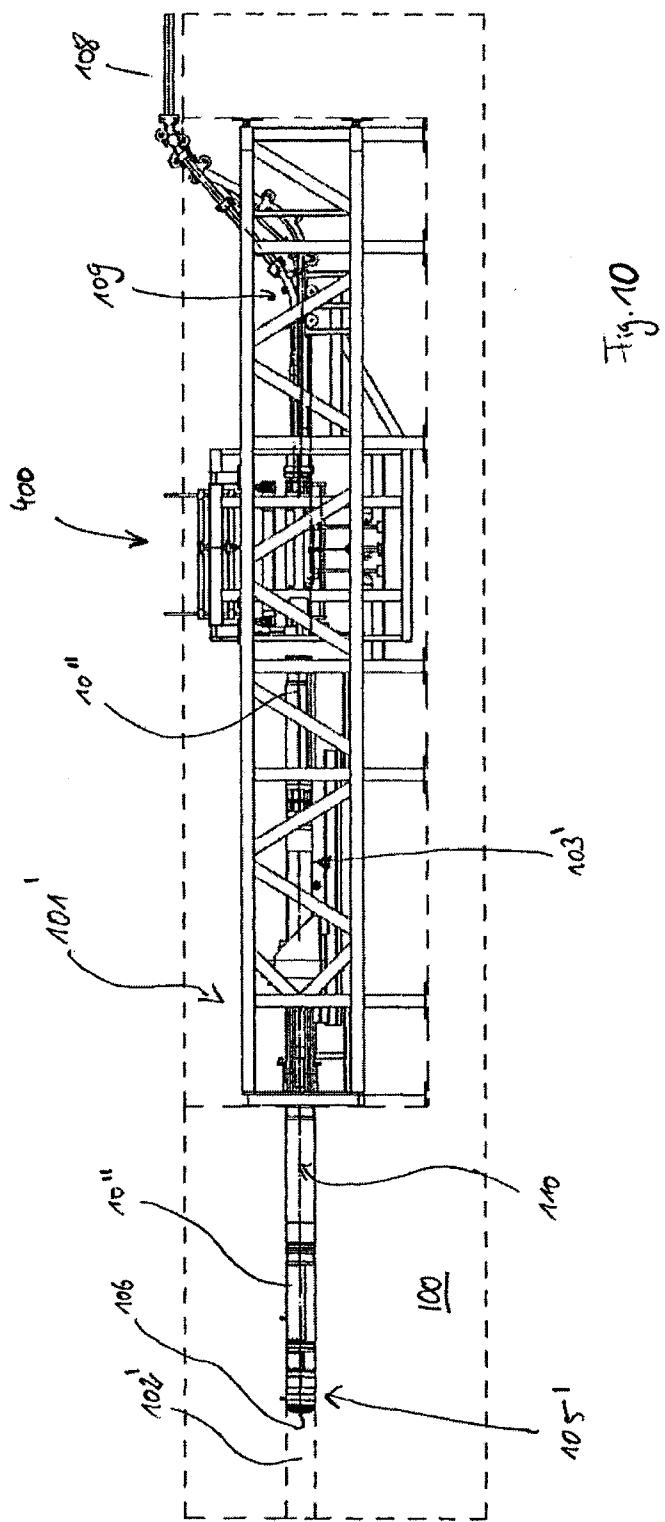
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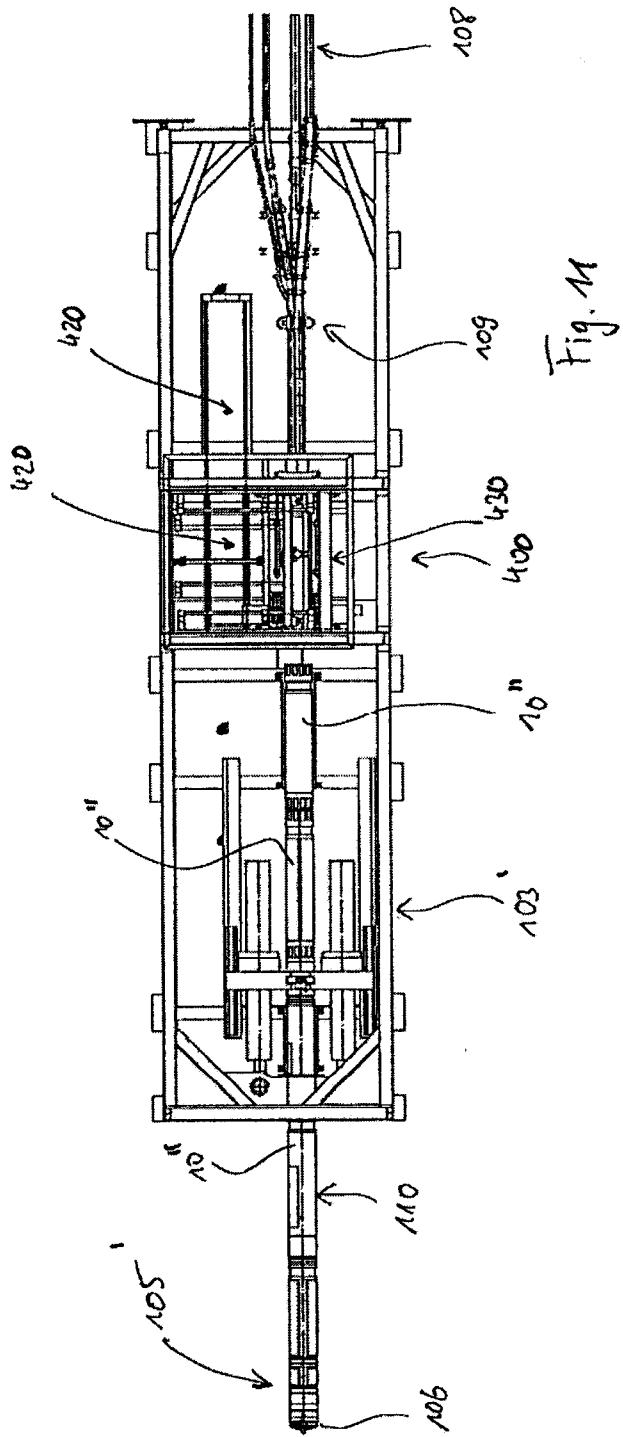


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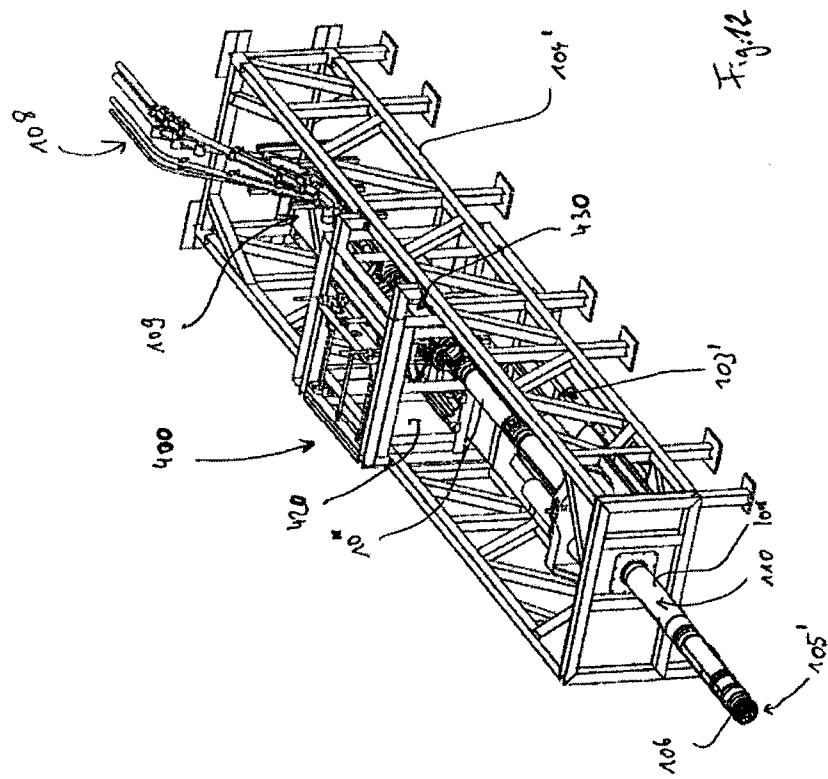
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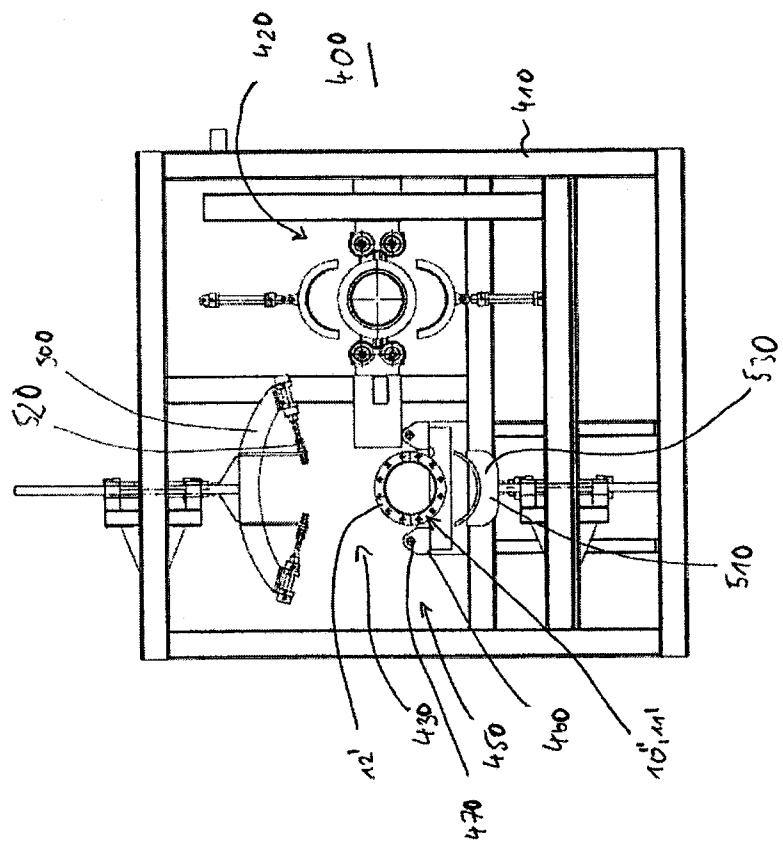
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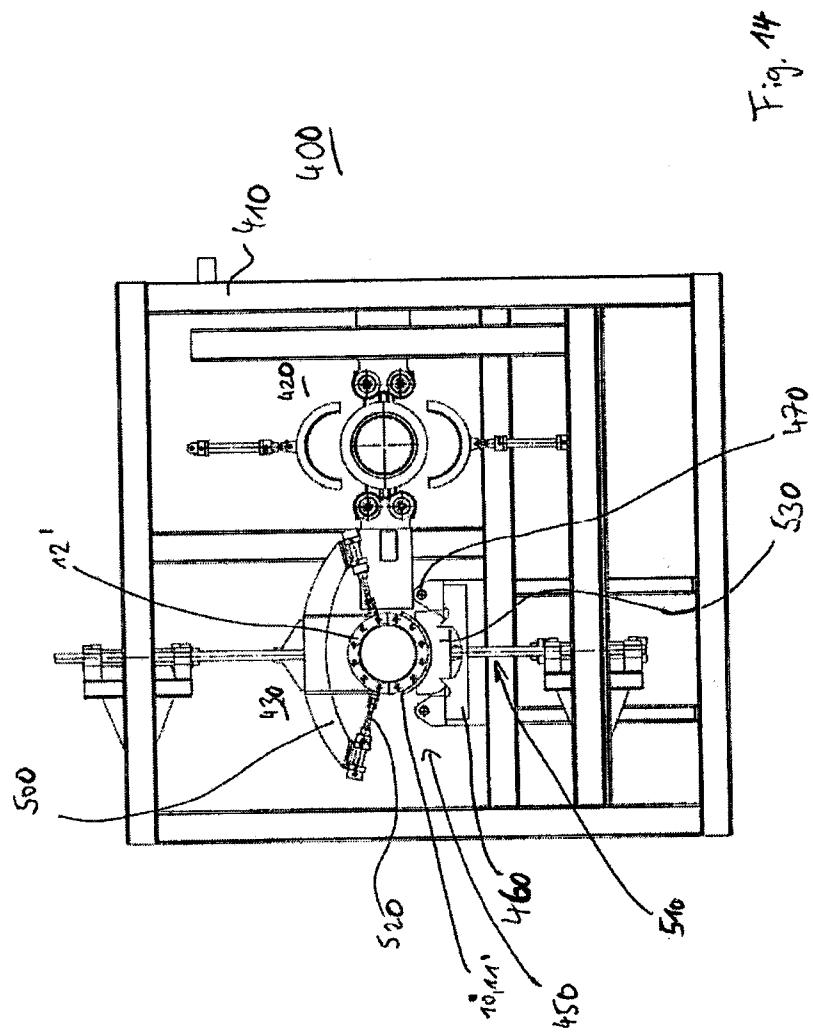
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Fig. 13



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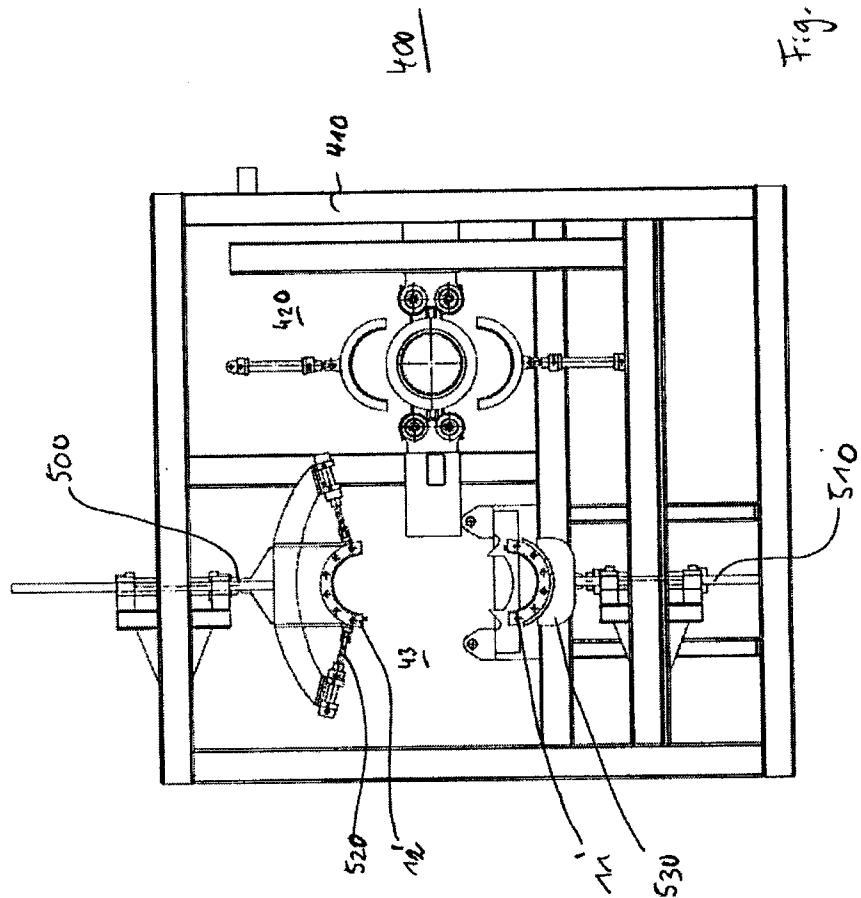
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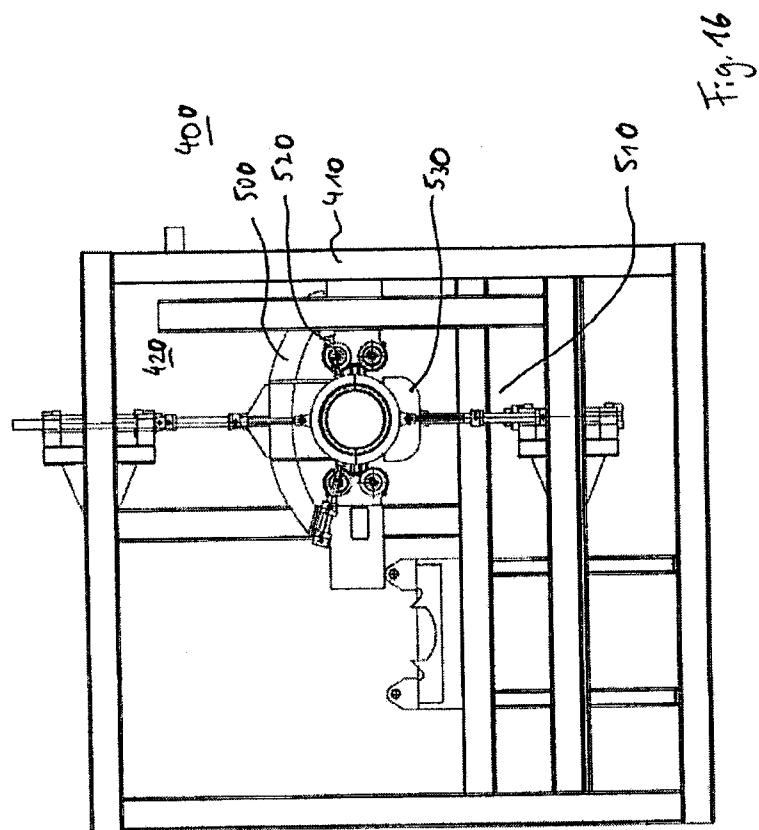
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Fig. 15



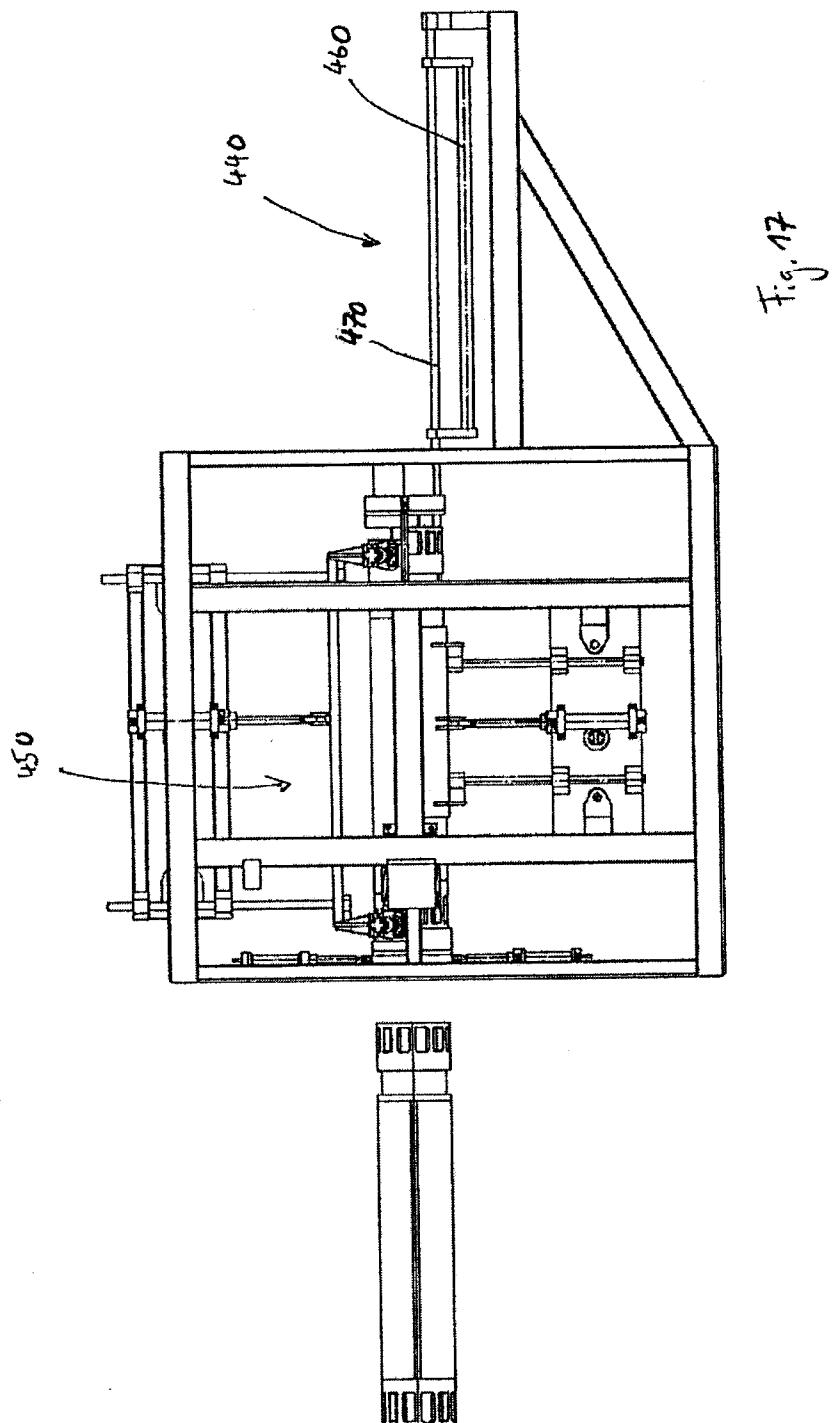
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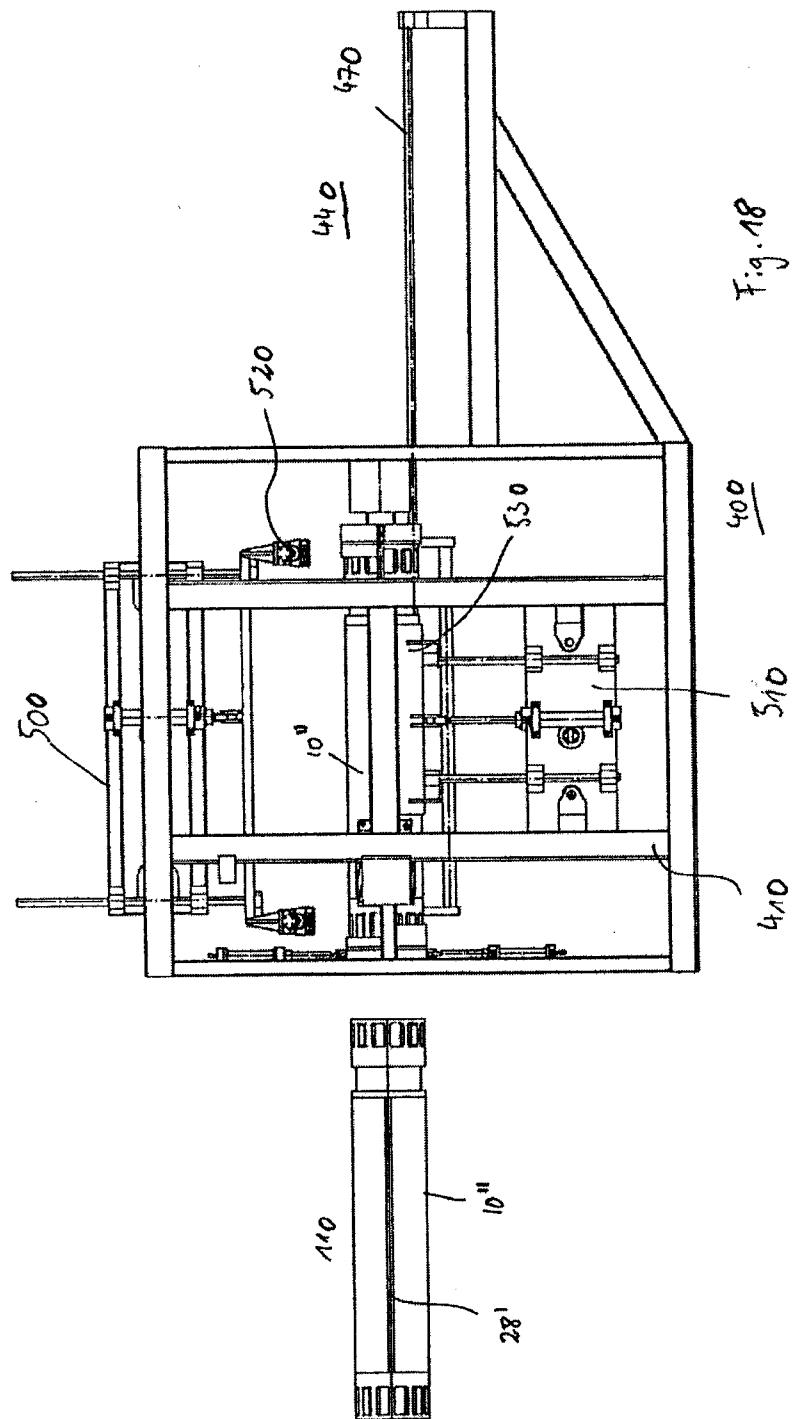
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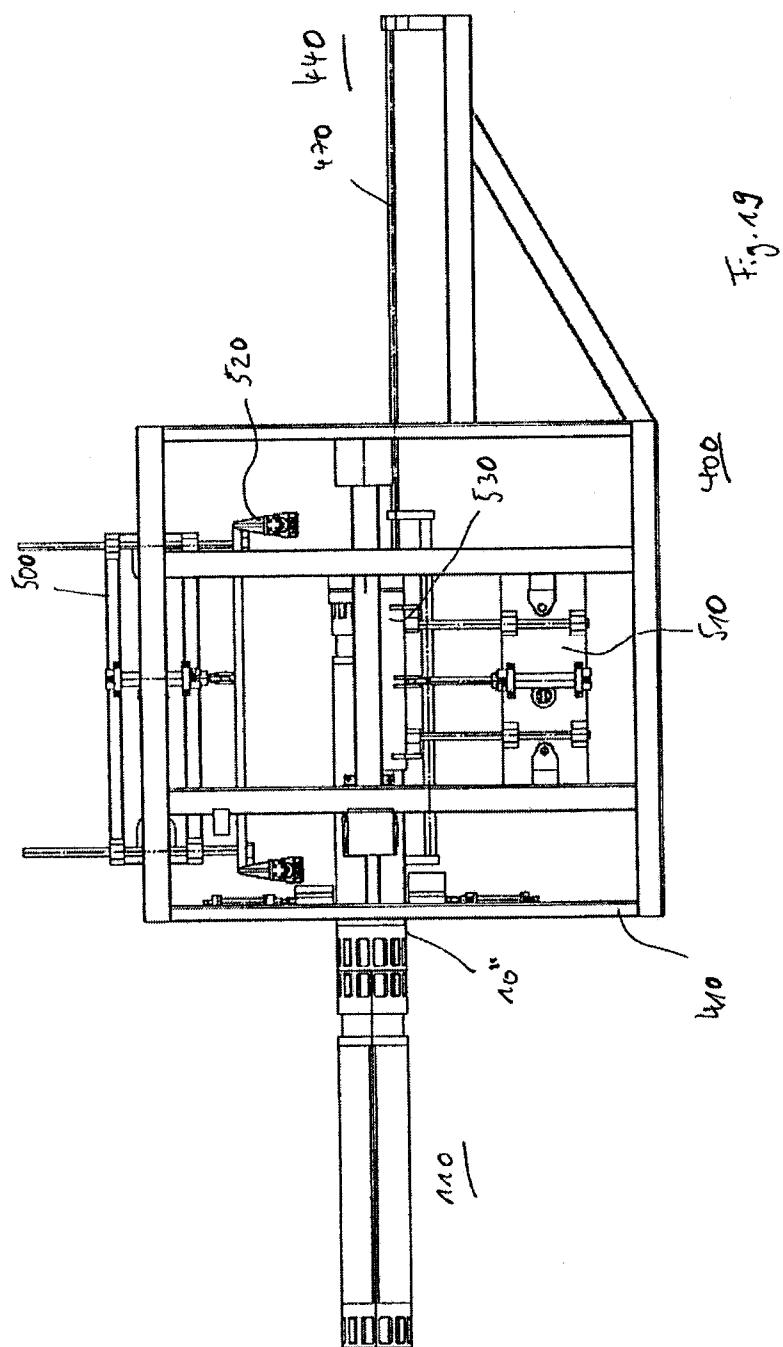
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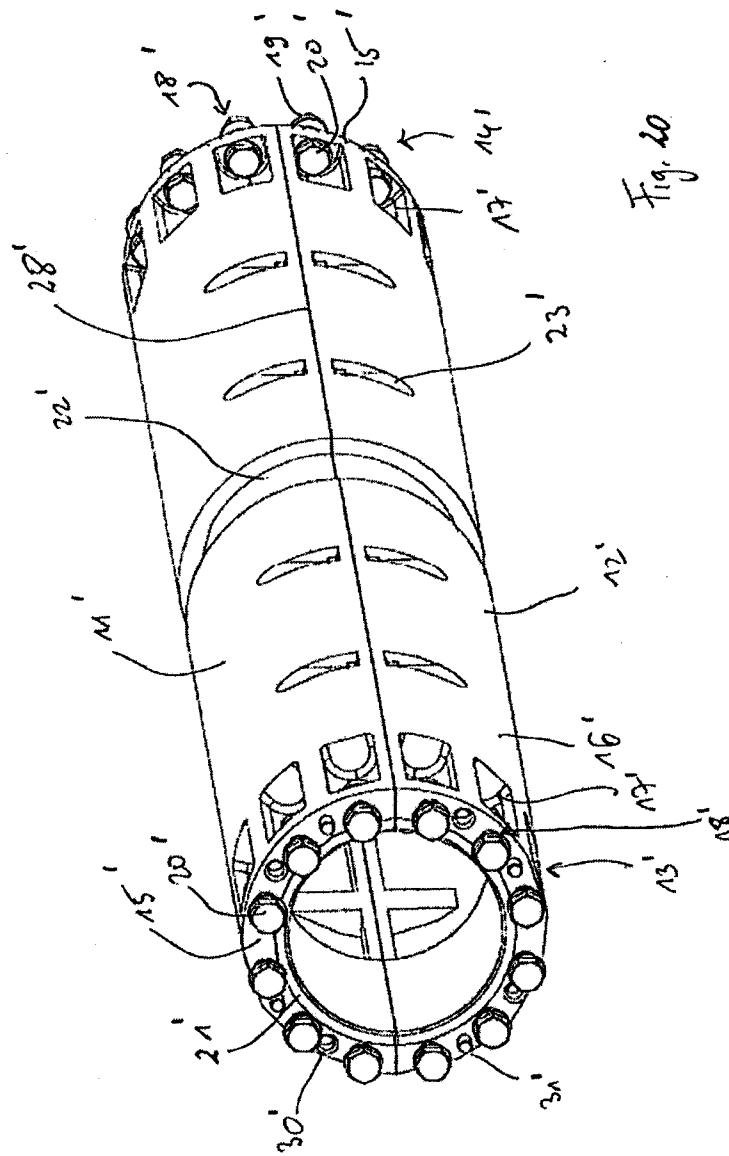
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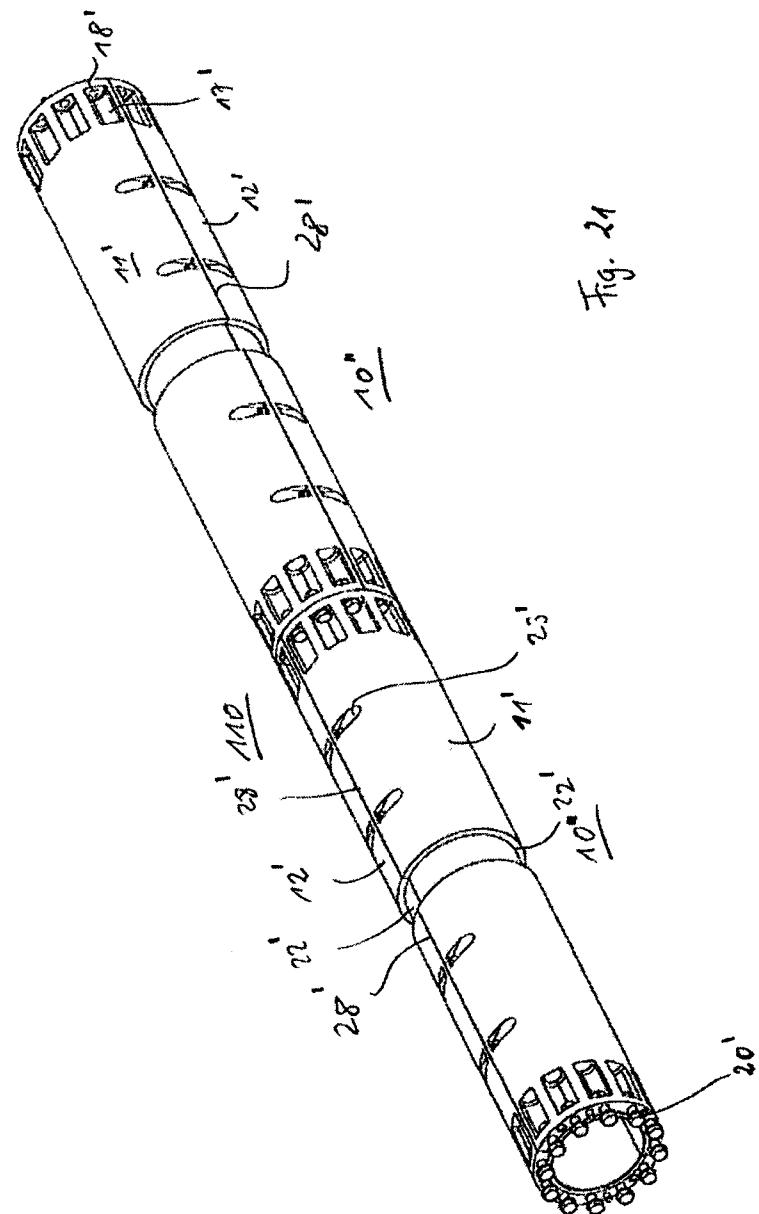
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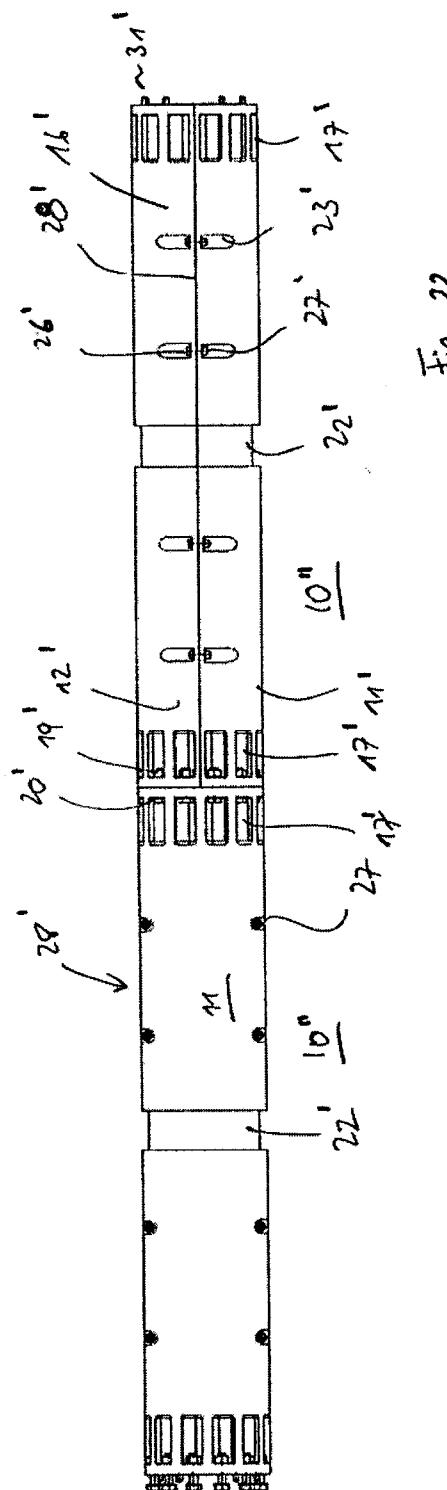
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