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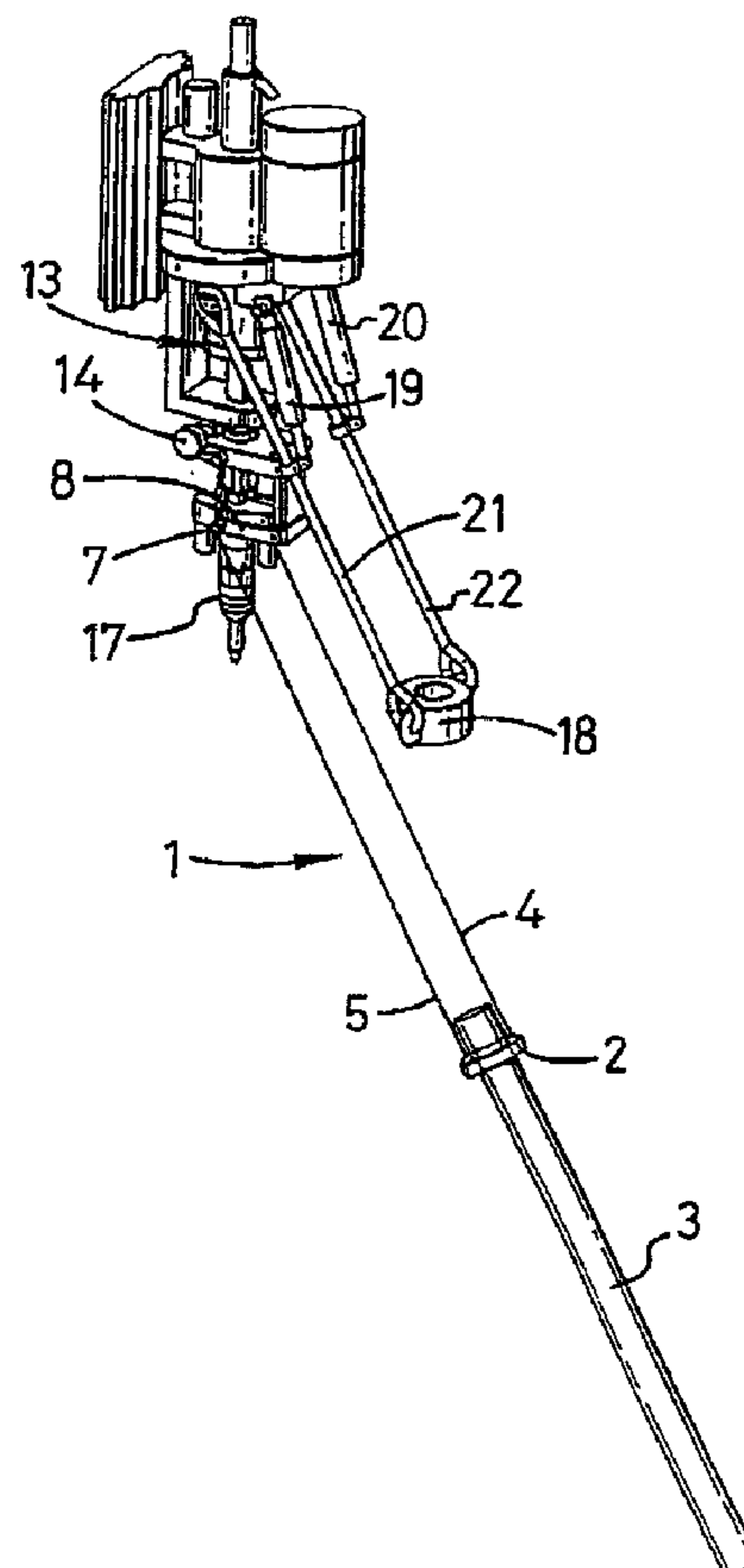
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(54) Titre : PROCEDE ET APPAREIL DE RACCORDEMENT DE TUBAGES UTILISANT UNE COMMANDE  
SUPERIEURE

(54) Title: METHOD AND APPARATUS FOR CONNECTING TUBULARS USING A TOP DRIVE



(57) Abrégé/Abstract:

An apparatus for facilitating the connection of tubulars, said apparatus comprising a winch (15), at least one wire line (4, 5) and a device (2) for gripping a tubular (3), the arrangement being such that, in use, the winch (15) can be used to winch said at least one wire (4, 5) and said device (2) to position a tubular (3) below said top drive.



**ABSTRACT**

An apparatus for facilitating the connection of tubulars, said apparatus comprising a winch (15), at least one wire line (4, 5) and a device (2) for gripping a tubular (3), the arrangement being such that, in use, the winch (15) can be used to winch said at least one wire (4, 5) and said device (2) to position a tubular (3) below said top drive.

METHOD AND APPARATUS FOR CONNECTING TUBULARS USING A TOP  
DRIVE

This is a divisional application of Canadian Patent Application Serial No.  
5 2,340,994 filed on August 16, 1999.

This invention relates to a method and apparatus for facilitating the connection of  
tubulars using a top drive and is, more particularly but not exclusively, for facilitating the  
connection of a section or stand of casing to a string or casing.

10

It should be understood that the expression "the invention" and the like used  
herein may refer to subject matter claimed in either the parent or the divisional  
applications.

15

In the construction of wells such as oil or gas wells, it is usually necessary to  
line predrilled holes with a string of tubulars known as casing. Because of the size of  
the casing required, sections or stands of say two sections of casing are connected to  
each other as they are lowered into the well from a platform. The first section or stand  
of casing is lowered into the well and is usually restrained from falling into the well by  
20 a spider located in the platform's floor. Subsequent sections or stands of casing are  
moved from a rack to the well centre above the spider. The threaded pin of the section  
or stand of casing to be connected is located over the threaded box of the casing in the  
well to form a string of casing. The connection is made-up by rotation therebetween.

1a

It is common practice to use a power tong to torque the connection up to a predetermined torque in order to perfect the connection. The power tong is located on the platform, either on rails, or hung from a derrick on a chain. However, it has recently been proposed to use a top drive for making such connection.

5 Prior to the present invention, pipe handling devices moved pipes to be connected to a tubular string from a rack to the well centre using articulated arms or, more commonly, a pipe elevator suspended from the drilling tower.

The present invention provides an alternative to these devices.



Accordingly, a first aspect of the present invention provides an apparatus for facilitating the connection of tubulars, said apparatus comprising a winch, at least one wire line and a device for gripping a tubular the arrangement being such that, in use, the winch can be used to winch said at least one wire and said device to position a tubular  
5 below said top drive. In some embodiments the apparatus further comprises a suspension unit for coupling the tubular to the top drive. In some embodiments, the suspension unit has a static part fixed with respect to a top drive and a dynamic part movable relative thereto. In some embodiments, the winch is located on the static part of the suspension unit. In some embodiments, the apparatus comprises a guide located on the dynamic part  
10 of the suspension unit. In some embodiments, the apparatus comprises a pulley wheel on the static part of the suspension unit.

According to a second aspect of the present invention there is provided a method of facilitating the connection of tubulars using a top drive and comprising the steps of attaching at least one wire to a tubular, the wire depending from the top drive or from a  
15 component attached thereto, and winching the wire and the tubular upwards to a position beneath the top drive.

According to a third aspect of the present invention there is provided an apparatus for facilitating the connection of tubulars using a top drive, said apparatus comprising an elevator and a pair of bails, characterised in that said elevator is, in use, movable in  
20 relation to said pair of bails.

According to a fourth aspect of the present invention there is provided an apparatus for facilitating the connection of tubulars using a top drive, said apparatus comprising an elevator (102) and a pair of bails (103, 104), characterised in that said elevator (102) is, in use, movable relative to said pair of bails (103, 104).

2a

According to an aspect of the present invention there is provided a method for connecting tubulars using a top drive, the method comprising:

- providing the top drive with a first gripping member;
- providing a second gripping member coupled to an elongated link;
- 5 retaining a first tubular with the second gripping member;
- lifting the first tubular relative to the elongated link;
- engaging the first tubular with the first gripping member; and
- rotating the first gripping member, thereby connecting the first tubular to a second tubular.

10 According to another aspect of the present invention there is provided an apparatus for connecting tubulars, the apparatus comprising:

- a top drive;
- a first gripping member adapted for rotation by the top drive;
- an elongated link coupled to the top drive; and
- 15 a second gripping member coupled to the elongated link, the second gripping member movable along the elongated link.

According to a further aspect of the present invention there is provided a method for connecting tubulars using a top drive, comprising:

- providing the top drive with a first gripping member;
- 20 providing a second gripping member coupled to an elongated link;
- moving the elongated link and the second gripping member laterally to engage a first tubular;
- retaining the first tubular with the second gripping member;
- lifting the first tubular relative to the elongated link;
- 25 moving the second gripping member and at least a portion of the first tubular into substantial alignment with the first gripping member;
- engaging the first tubular with the first gripping member; and
- rotating the first gripping member, thereby connecting the first tubular to a second tubular.



2b

According to a further aspect of the present invention there is provided an apparatus for facilitating the connection of tubulars using a top drive, said apparatus comprising:

an elevator, and

5 a pair of bails, wherein said elevator is movable along said pair of bails.

According to a further aspect of the present invention there is provided an apparatus for facilitating the connection of tubulars using a top drive, said apparatus comprising:

an elevator having pins; and

10 a pair of bails comprising slots in which said pins are disposed, wherein said elevator is movable along said pair of bails.

According to a further aspect of the present invention there is provided an apparatus for facilitating the connection of tubulars using a top drive, said apparatus comprising:

15 an elevator; and

a pair of bails which are attached to an axle disposed on the top drive and which are moveable thereabout, wherein said elevator is movable along said pair of bails.

According to a further aspect of the present invention there is provided an apparatus for facilitating the connection of tubulars using a top drive, said

20 apparatus comprising:

an elevator;

a pair of bails which are attached to an axle disposed on the top drive and which are moveable thereabout, wherein said elevator is movable along said pair of bails; and at least one piston and cylinder for moving said pair of bails.

25 According to a further aspect of the present invention there is provided a method for facilitating the connection of tubulars using a top drive, said method comprising:

using an elevator to move a tubular to a position below said top drive, wherein the elevator is connected to the top drive using a pair of bails and wherein the elevator is

30 movable along said pair of bails.

2c

According to a further aspect of the present invention there is provided an apparatus for facilitating the connection of a first tubular to a second tubular using a top drive, comprising:

- a first gripping member for retaining the first tubular, and
- 5 a pair of bails, wherein the first gripping member is movable along the pair of bails.

According to a further aspect of the present invention there is provided a method for facilitating the connection of a first casing to a second casing using a top drive, comprising:

- providing the top drive with a first gripping member coupled to a pair of bails;
- 10 retaining the first casing; and
- moving the first gripping member relative to the pair of bails.

Aspects of the present invention are provided by the following clauses.

#### 15 **Clauses:**

1. An apparatus for facilitating the connection of tubulars using a top drive and comprising a winch (15), at least one wire (4, 5), and a device (2) for gripping a tubular (3), the arrangement being such that, in use, the winch (15) can be used to winch said at  
20 least one wire (4, 5) and said device (2) to position a tubular (3) below said top drive.
2. An apparatus according to clause 1, further comprising a suspension unit (9) for coupling the tubular to the top drive.
- 25 3. An apparatus according to clause 2, wherein said suspension unit (9) has a static part fixed with respect to a top drive and a dynamic part movable relative thereto.
4. An apparatus according to clause 3, wherein said winch (15) is located on said static part of said suspension unit (9).
- 30 5. An apparatus according to clause 4, comprising a guide (7) located on said dynamic part (8) of said suspension unit (9).



2d

6. An apparatus according to clause 5, comprising a pulley wheel (11) on said static part of said suspension unit (9).

7. A method of facilitating the connection of tubulars using a top drive and comprising the steps of attaching at least one wire to a tubular, the wire depending from the top drive or from a component attached thereto, and winching the wire and the tubular upwards to a position beneath the top drive.

8. An apparatus for facilitating the connection of tubulars using a top drive, said apparatus comprising an elevator (102) and a pair of bails (103, 104), characterised in that said elevator (102) is, in use, movable relative to said pair of bails (103, 104).

9. An apparatus according to clause 8, wherein, in use, said elevator (102) is movable along said pair of bails (103, 104).

10. An apparatus according to clause 8 or 9, further comprising a piston (117, 118) and cylinder (119, 120) operatively connected between said pair of bails (103, 104) and said elevator (102).

11. An apparatus according to clause 10, wherein said piston (117, 118) and cylinder (119, 120) are pneumatically or hydraulically operable.

12. An apparatus according to any of clause 8 to 11, wherein said pair of bails (103, 104) comprise slots (116, 116a) in which pins (115) of said elevator (102) are arranged.

13. An apparatus according to any of clause 8 to 12, wherein said pair of bails (103, 104) are attached to a top drive on an axle (106) and are movable thereabout.

14. An apparatus according to clause 13, further comprising at least one piston and cylinder (108, 109) for moving said pair of bails (103, 104) and said axle (106).

15. A method for facilitating the connection of tubulars using a top drive, said method comprising the step of using an elevator to move a tubular to a position below said top

2e

drive, wherein the elevator depends from the top drive or from a component attached thereto.

16. A method according to clause 15, wherein the elevator is connected to the top drive or to said component by way of a pair of bails, the method comprising the step of using said elevator to move said tubular in relation to said pair of bails towards or away from a tool for gripping said tubular.

For a better understanding of the present invention and in order to show how the same may be carried into effect reference will now be made, by way of example, to the accompanying drawings in which:

Figures 1a to 1e are perspective views of an apparatus in accordance with a first embodiment of the present invention at various stages of operation; and

Figures 2a to 2d are perspective views of an apparatus in accordance with a second embodiment of the invention at various stages of operation.

Referring to Figures 1a to 1e there is shown an apparatus which is generally identified by reference numeral 1.

5       The apparatus 1 comprises a clamp 2 for retaining a tubular 3. The clamp 2 is suspended on wires 4, 5 which are connected thereto on opposing sides thereof. The wire 5 passes through an eye 6 in lug 7 which is attached to a spherical bearing in arm 8 of a suspension unit 9 at the point at which the arm 8 is connected to a hydraulic motor 10. The wire is connected to the hydraulic motor 10 in a corresponding manner. The  
10       suspension unit 9 is of a type which enables displacement of the tubular 3 when connected to a tool 17 (see below), relative to a top drive 13, along a number of different axes. The wires 4, 5 pass across the suspension unit 9 and over pulley wheels 11 which are rotatably arranged on a plate 12. The plate 12 is fixed in relation to a top drive generally identified by reference numeral 13. The wires 4, 5 then pass over drums  
15       14 to which the wires 4, 5 are also connected. The drums 14 are rotatable via a hydraulic winch motor 15.

      In use, the clamp 2 is placed around a tubular below a box 16 thereof. The hydraulic winch motor 15 is then activated, which lifts the tubular 3 (conveniently from a rack) and towards a tool 17 for gripping the tubular 3 (Fig. 1b). The tubular 3  
20       encompasses the tool 17 at which point the hydraulic winch motor 15 is deactivated (Fig. 1c). During this operation the elevator 18 is held away from the tool 17 by piston and cylinders 19, 20 acting on bails 21 and 22. The suspension unit 9 allows the hydraulic motor 10 and the arrangement depending therebelow to move in vertical and horizontal planes relative to the top drive 13. The eyes 6 in lugs 7 maintain the wires 4



and 5 in line with the tubular 3 during any such movement. The tool 17 may now be used to connect the tubular to the tubular string. More particularly, the tool may be of a type which is inserted into the upper end of the tubular, with gripping elements of the tool being radially displaceable for engagement with the inner wall of the tubular so as to secure the tubular to the tool. Once the tool is secured to the tubular, the hydraulic motor 10 is activated which rotates the tool 17 and hence the tubular 3 for engagement with a tubular string held in a spider.

The clamp 2 is now released from the tubular 3, and the top drive 13 and hence apparatus 1 is now lifted clear of the tubular 3. The elevator 18 is now swung in line with the apparatus 1 by actuation of the piston and cylinders 19 and 20 (Fig. 1d).

The top drive 13 is then lowered, lowering the elevator 18 over the box 16 of the tubular 3. The slips in the elevator 18 are then set to take the weight of the entire tubular string. The top drive is then raised slightly to enable the slips in the spider to be released and the top drive is then lowered to introduce the tubular string into the borehole.

Referring to Figures 2a to 2d there is shown an apparatus which is generally identified by reference numeral 101.

The apparatus 101 comprises an elevator 102 arranged at one end of bails 103, 104. The bails 103, 104 are movably attached to a top drive 105 via axles 106 which are located in eyes 107 in the other end of the bails 103, 104. Piston and cylinders 108, 109 are arranged between the top drive 105 and the bails. One end of the piston and cylinders 108, 109 are movably arranged on axles 110 on the top drive. The other end of the piston and cylinders 108, 109 are movably arranged on axles 111, 112 which are

located in lugs 113, 114 located approximately one-third along the length of the bails 103, 109.

The elevator 102 is provided with pins 115 on either side thereof and projecting therefrom. The pins 115 are located in slots 116 and 116a. A piston 117, 118 and  
5 cylinder 119, 120 are arranged in each of the bails 103, 104. The cylinders are arranged in slot 121, 122. The piston 117, 118 are connected at their ends to the pins 115. The cylinders 119, 120 are prevented from moving along the bails 103, 104 by cross members 123 and 124. A hole is provided in each of the cross members to allow the pistons to move therethrough.

10 In use, a tubular 125 is angled from a rack near to the well centre. The tubular may however remain upright in the rack. The clamp 102 is placed around the tubular below a box 126 (Figure 2a). The top drive is raised on a track on a derrick. The tubular is lifted from the rack and the tubular swings to hang vertically (Figure 2b). The piston and cylinders 108, 109 are actuated, extending the pistons allowing the bails 103,  
15 104 to move to a vertical position. The tubular 125 is now directly beneath a tool 127 for internally gripping and rotating the tubular 125 (Figure 2c). The pistons 117, 118 and cylinders 119, 120 are now actuated. The pins 115 follow slot 116 and the clamp 102 moves upwardly, lifting the tubular 125 over the tool 127 (Figure 2d). The tool 127 can now be actuated to grip the tubular 125.

20 At this stage the elevator 102 is released and the top drive 105 lowered to enable the tubular 125 to be connected to the string of tubulars in the slips and torqued appropriately by the top drive 105.

The pistons 117, 118 and cylinders 119, 120 are meantime extended so that after the tubular 125 has been connected the top drive 105 can be raised until the elevator 102

is immediately below the box. The elevator 102 is then actuated to grip the tubular 125 firmly. The top drive 105 is then raised to lift the tubular string sufficiently to enable the wedges in the slips to be withdrawn. The top drive 105 is then lower to the drilling platform, the slips applied, the elevator 102 raised for the tubular 125 and the process  
5 repeated.



The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A method for connecting tubulars using a top drive, the method comprising:  
providing the top drive with a first gripping member;  
providing a second gripping member coupled to an elongated link;  
retaining a first tubular with the second gripping member;  
lifting the first tubular relative to the elongated link;  
engaging the first tubular with the first gripping member; and  
rotating the first gripping member, thereby connecting the first tubular to a second tubular.
2. The method of claim 1, wherein the first gripping member comprises at least one movable gripping element for engaging the first tubular.
3. The method of claim 2, wherein the at least one gripping element is radially movable.
4. The method of any one of claims 1 to 3, further comprising actuating a motive member to lift the first tubular relative to the elongated link.
5. The method of claim 4, wherein the motive member comprises a fluid operated piston and cylinder assembly.
6. The method of any one of claims 1 to 5, further comprising displacing the second gripping member laterally relative to the top drive.
7. The method of any one of claims 1 to 6, further comprising providing a suspension unit operatively coupled to the top drive.
8. The method of claim 7, further comprising actuating the suspension unit, thereby displacing the second gripping member laterally relative to the top drive.

9. The method of any one of claims 1 to 8, further comprising retaining a weight of the tubulars and disengaging a third gripping member from the second tubular.
10. The method of any one of claims 1 to 9, further comprising pivoting the second gripping member into alignment with the first gripping member.
11. The method of any one of claims 1 to 10, further comprising aligning the first gripping member with the first tubular.
12. The method of any one of claims 1 to 11, wherein lifting the first tubular comprises moving the second gripping member along the elongated link.
13. An apparatus for connecting tubulars, the apparatus comprising:
  - a top drive;
  - a first gripping member adapted for rotation by the top drive;
  - an elongated link coupled to the top drive; and
  - a second gripping member coupled to the elongated link, the second gripping member movable along the elongated link.
14. The apparatus of claim 13, further comprising a motive member adapted to move the second gripping member along the elongated link.
15. The apparatus of claim 14, wherein the motive member comprises a fluid operated piston and cylinder assembly.
16. The apparatus of any one of claims 13 to 15, wherein the first gripping member comprises at least one movable gripping element for engaging the first tubular.
17. The apparatus of claim 16, wherein the at least one gripping element is radially movable.
18. The apparatus of claim 16 or 17, wherein the at least one gripping element comprises a plurality of gripping elements.

19. The apparatus of claim 18, wherein the at least one gripping element comprises slips.
20. The apparatus of any one of claims 13 to 19, further comprising a motive member for moving the elongated link laterally relative to the top drive.
21. The apparatus of any one of claims 13 to 20, further comprising a support member for coupling the first gripping member to the top drive.
22. The apparatus of claim 21, wherein the support member is adapted to displace the first gripping member laterally relative to the top drive.
23. The apparatus of any one of claims 13 to 22, wherein the second gripping member comprises an elevator.
24. The apparatus of any one of claims 13 to 23, wherein at least one of the tubulars comprises a casing.
25. The apparatus of any one of claims 13 to 24, wherein the first gripping member is at least partially insertable into a first tubular for engagement therewith.
26. A method for connecting tubulars using a top drive, comprising:
  - providing the top drive with a first gripping member;
  - providing a second gripping member coupled to an elongated link;
  - moving the elongated link and the second gripping member laterally to engage a first tubular;
  - retaining the first tubular with the second gripping member;
  - lifting the first tubular relative to the elongated link;
  - moving the second gripping member and at least a portion of the first tubular into substantial alignment with the first gripping member;
  - engaging the first tubular with the first gripping member; and
  - rotating the first gripping member, thereby connecting the first tubular to a second tubular.



27. The method of claim 26, wherein the first gripping member comprises at least one movable gripping element.
28. The method of claim 27, wherein the at least one gripping element is radially movable.
29. The method of claim 27 or 28, wherein the at least one gripping element comprises a plurality of slips.
30. The method of any one of claims 26 to 29, further comprising providing the elongated link with a motive member.
31. The method of claim 30, further comprising actuating the motive member to move the second gripping member relative to the elongated link.
32. The method of any one of claims 26 to 31, wherein the elongated link is operatively coupled to a motive member and further comprising operating the motive member to move the elongated link laterally relative to the top drive.
33. The method of any one of claims 30 to 32, wherein the motive member comprises a fluid operated piston and cylinder assembly.
34. The method of any one of claims 26 to 33, wherein the first gripping member is rotated by the top drive.
35. An apparatus for facilitating the connection of tubulars using a top drive, said apparatus comprising:  
an elevator, and  
a pair of bails, wherein said elevator is movable along said pair of bails.
36. An apparatus as claimed in claim 35, further comprising a piston and cylinder operatively connected between said pair of bails and said elevator.

37. An apparatus as claimed in claim 36, wherein said piston and cylinder are pneumatically or hydraulically operable.

38. An apparatus for facilitating the connection of tubulars using a top drive, said apparatus comprising:

an elevator having pins; and

a pair of bails comprising slots in which said pins are disposed, wherein said elevator is movable along said pair of bails.

39. An apparatus for facilitating the connection of tubulars using a top drive, said apparatus comprising:

an elevator; and

a pair of bails which are attached to an axle disposed on the top drive and which are moveable thereabout, wherein said elevator is movable along said pair of bails.

40. An apparatus for facilitating the connection of tubulars using a top drive, said apparatus comprising:

an elevator;

a pair of bails which are attached to an axle disposed on the top drive and which are movable thereabout, wherein said elevator is movable along said pair of bails; and  
at least one piston and cylinder for moving said pair of bails.

41. A method for facilitating the connection of tubulars using a top drive, said method comprising:

using an elevator to move a tubular to a position below said top drive, wherein the elevator is connected to the top drive using a pair of bails and wherein the elevator is movable along said pair of bails.

42. A method of claim 41, wherein the elevator moves said tubular towards or away from a tool for gripping said tubular.

43. An apparatus for facilitating the connection of a first tubular to a second tubular using a top drive, comprising:  
a first gripping member for retaining the first tubular, and  
a pair of bails, wherein the first gripping member is movable along the pair of bails.
44. The apparatus of claim 43, further comprising a piston and cylinder assembly operatively coupling the pair of bails to the first gripping member.
45. The apparatus of claim 44, wherein the piston and cylinder assembly are pneumatically or hydraulically operable.
46. The apparatus of claim 43, wherein the pair of bails comprises one or more slots and the first gripping member includes one or more pins, wherein the one or more pins are disposed in the one or more slots.
47. The apparatus of claim 43, further comprising a second gripping member coupled to the top drive.
48. The apparatus of claim 47, wherein the second gripping member is rotatable by the top drive.
49. The apparatus of claim 47, wherein the second gripping member comprises radially displaceable gripping elements for engaging the first tubular.
50. The apparatus of claim 43, wherein each of the first and second tubulars comprises one or more casings.
51. A method for facilitating the connection of a first casing to a second casing using a top drive, comprising:  
providing the top drive with a first gripping member coupled to a pair of bails;  
retaining the first casing; and  
moving the first gripping member relative to the pair of bails.



52. The method of claim 51, further comprising aligning the first casing to a second gripping member.

53. The method of claim 52, further comprising engaging the first casing with the second casing.

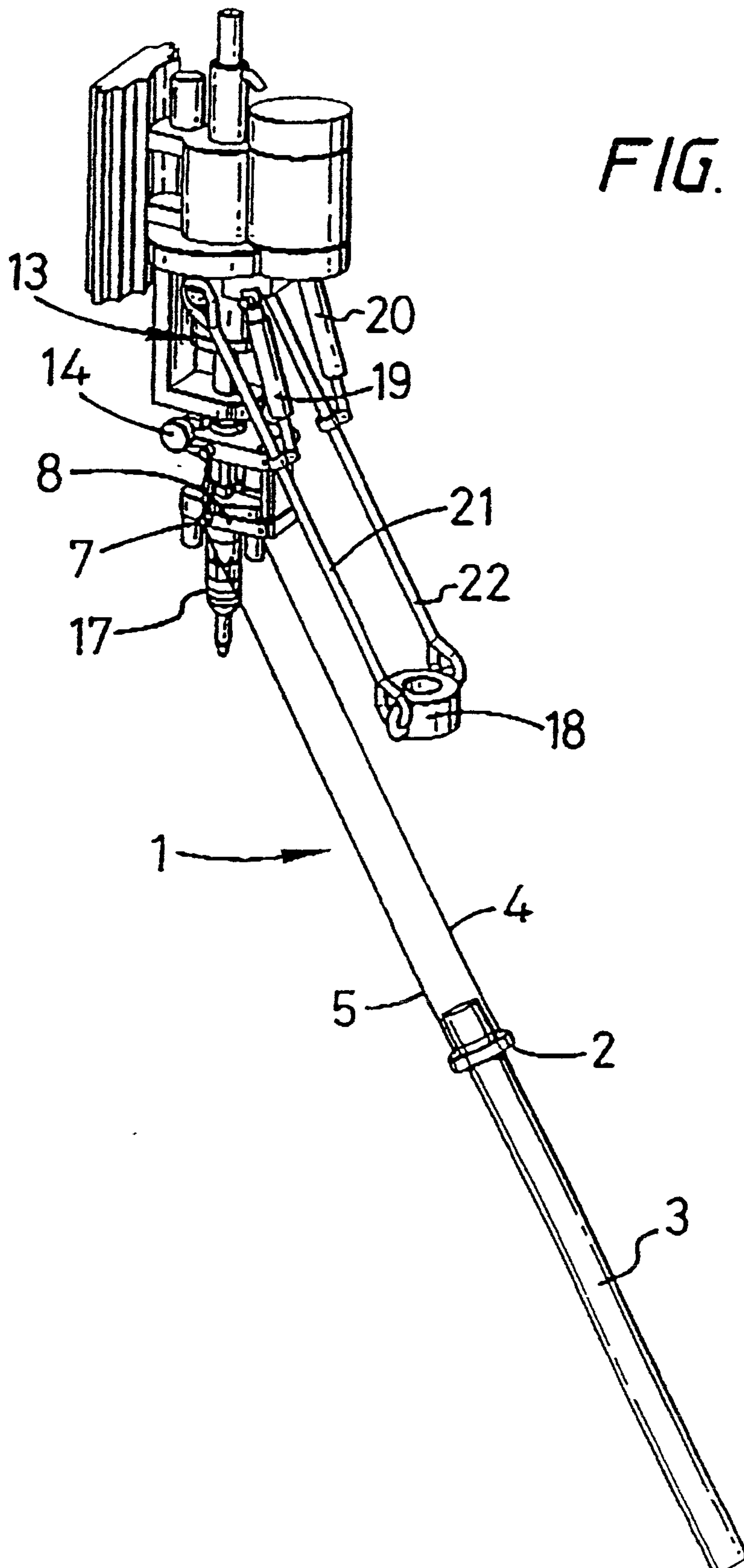
54. The method of claim 53, further comprising releasing the first gripping member from the first casing and rotating the first casing relative to the second casing.

55. The method of claim 52, wherein the second gripping member comprises one or more radially displaceable gripping elements.

56. The method of claim 52, further comprising inserting the second gripping member into the first casing.

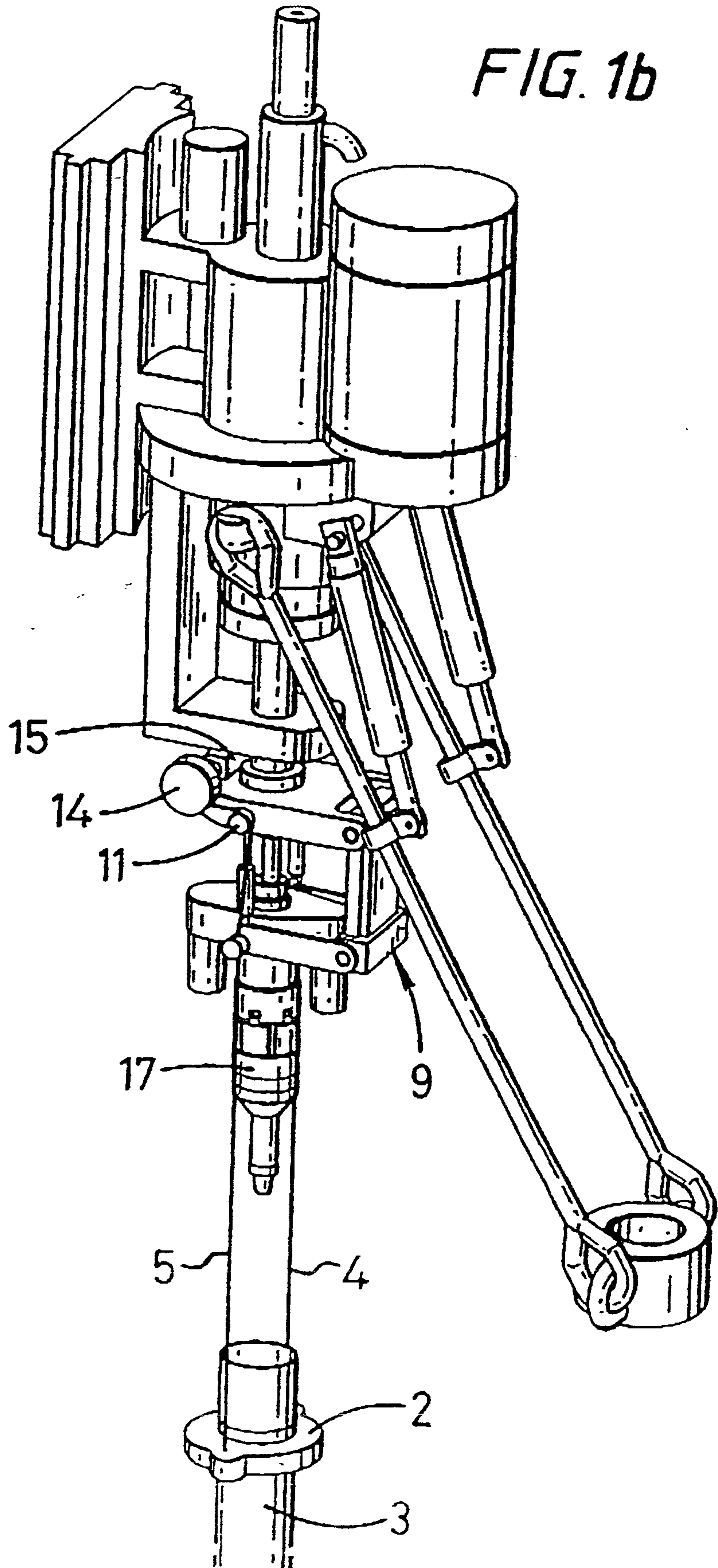
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FIG. 1a



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FIG. 1b

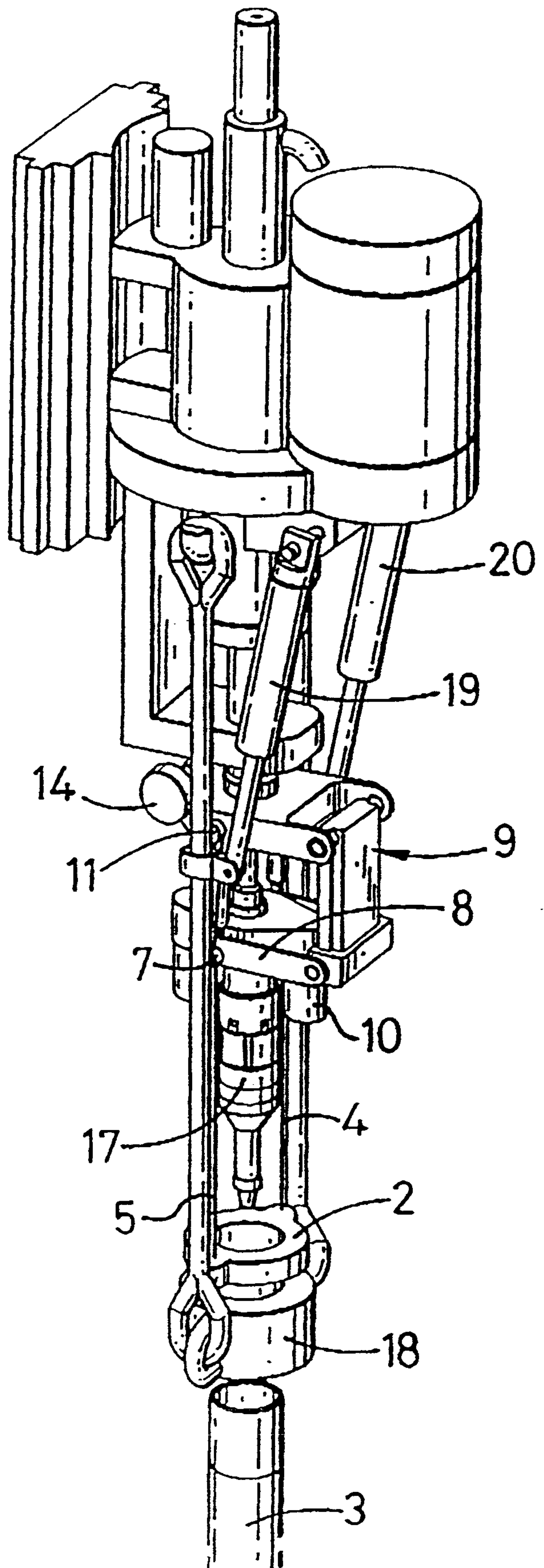






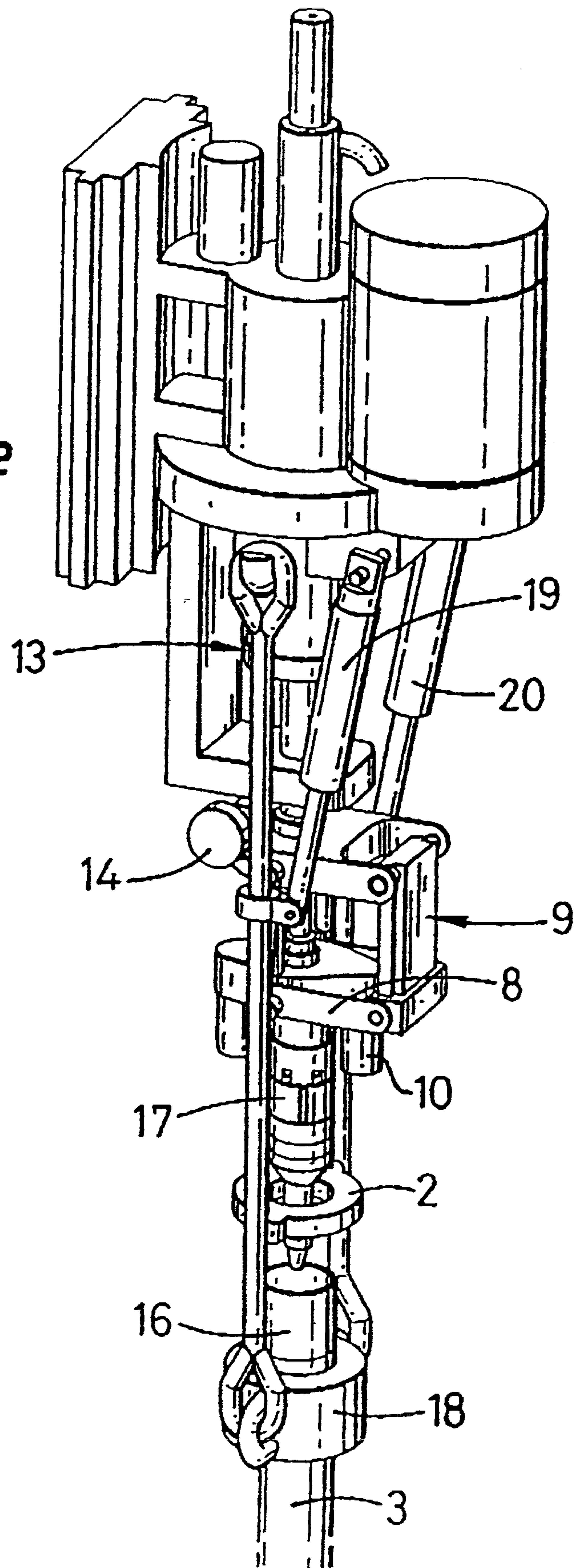
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FIG. 1d



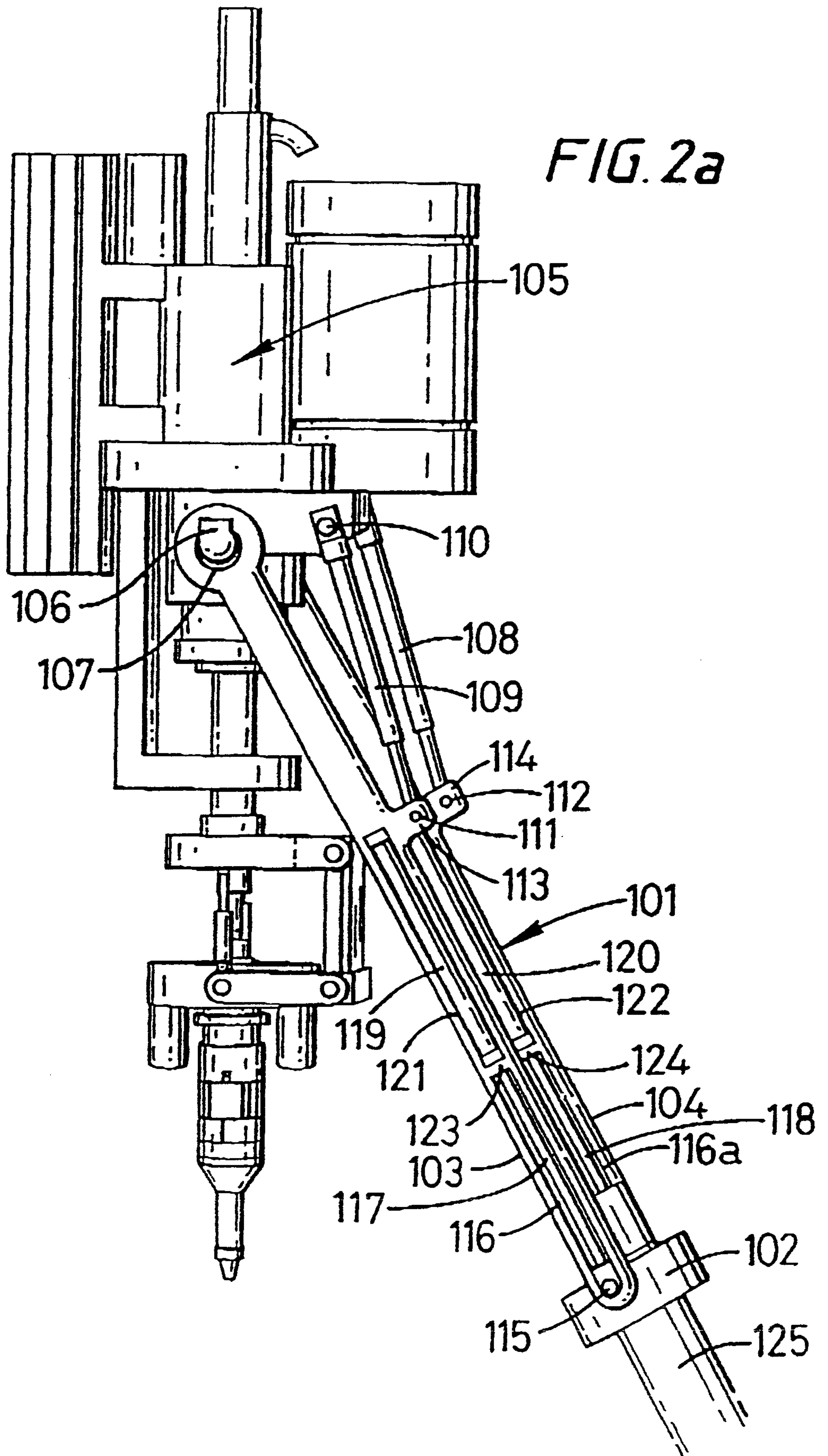
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FIG. 1e



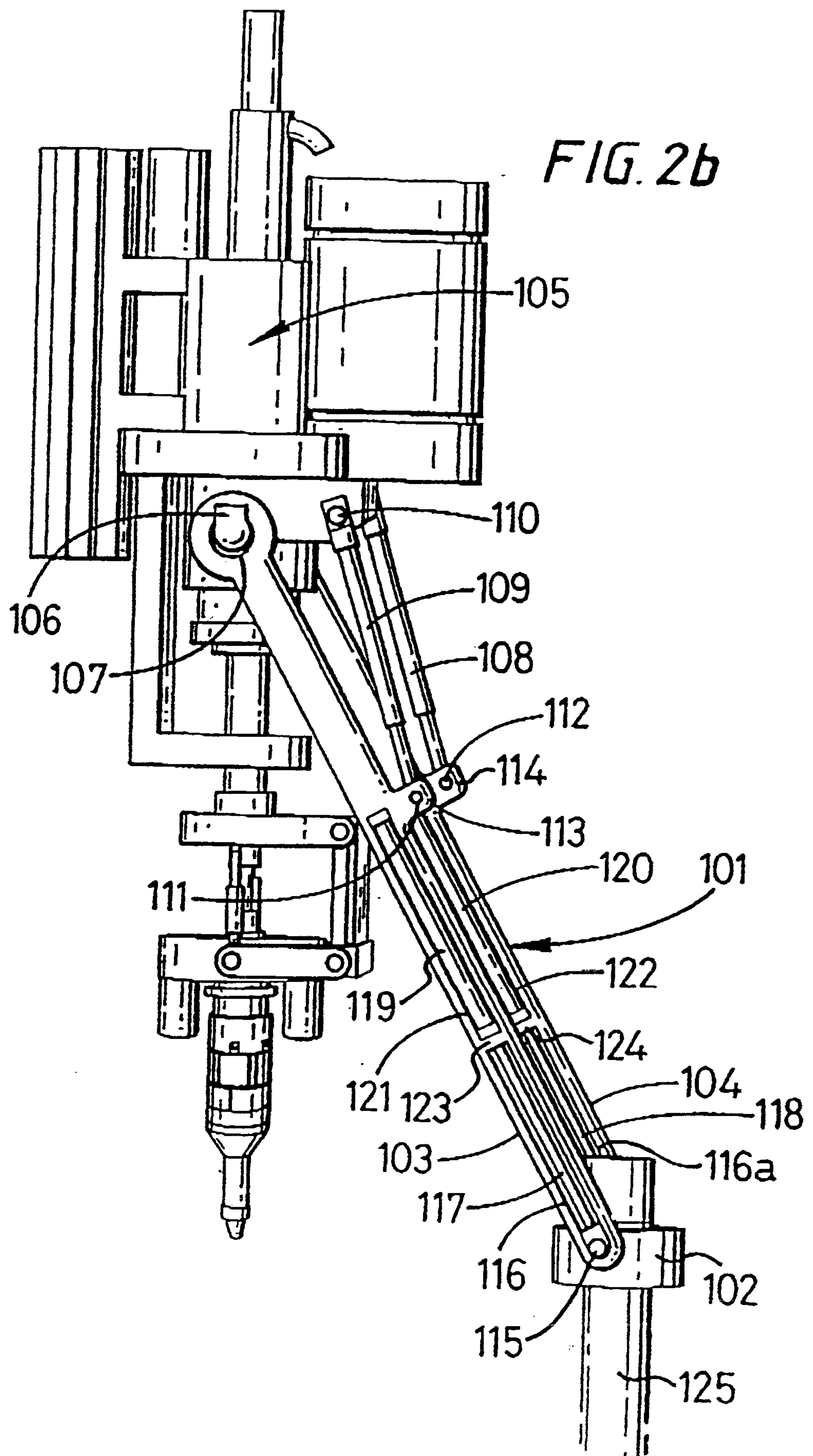


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**FIG. 2b**



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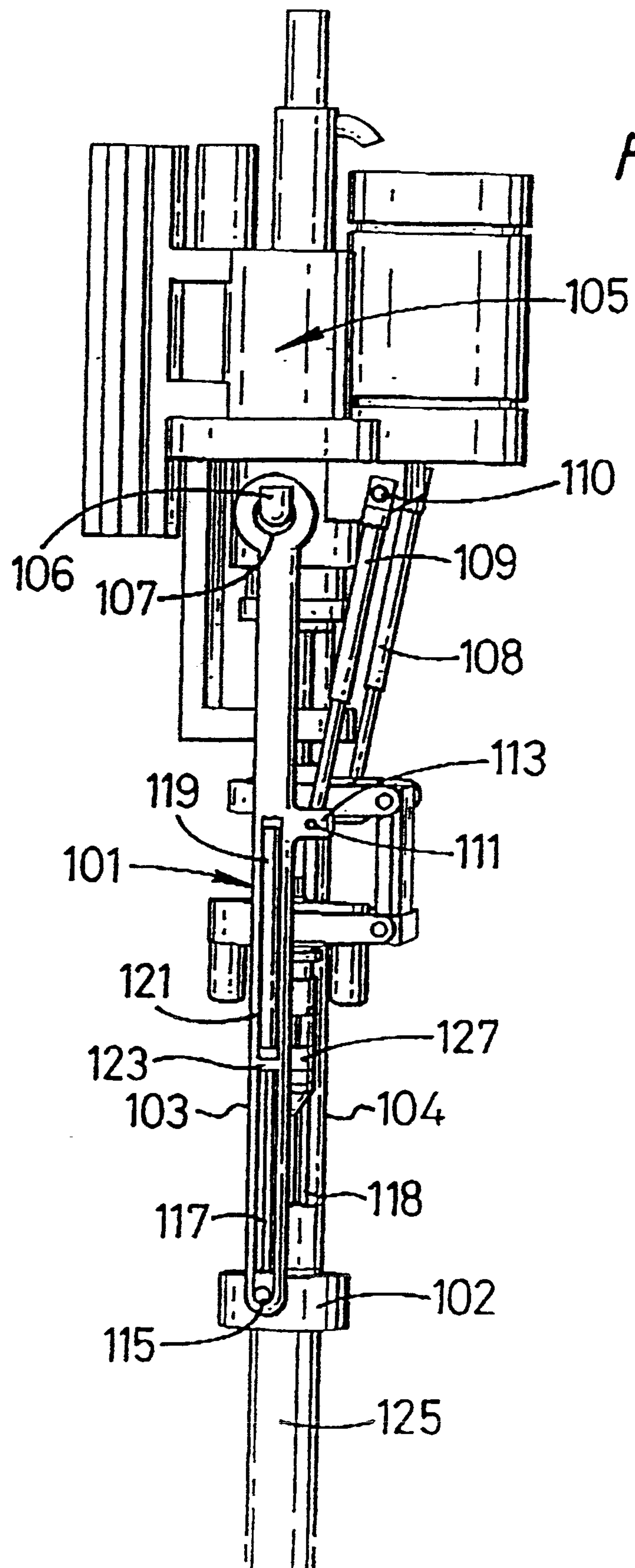


FIG. 2c



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FIG. 2d

