(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 103 283**
A2

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **83108909.9**

(22) Date of filing: **09.09.83**

(51) Int. Cl.³: **E 21 B 7/20**, E 02 D 7/26, E 02 D 7/22

(30) Priority: **13.09.82 IT 2322182**

(43) Date of publication of application: **21.03.84 Bulletin 84/12**

(84) Designated Contracting States: **AT CH DE FR GB IT LI NL**

(71) Applicant: **E.L.S.E. EDILIZIA LAVORI SOTTOSUOLO ESTRAZIONI S.p.A., Via Giuseppe Sacchi, 7, I-20121 Milan (IT)**

(72) Inventor: **Vandoni, Carlo, of Viale Tunisia 13, I-20124 Milan (IT)**

(74) Representative: **Dr. Ing. A. Racheli & C., Viale San Michele del Carso, 4, I-20144 Milano (IT)**

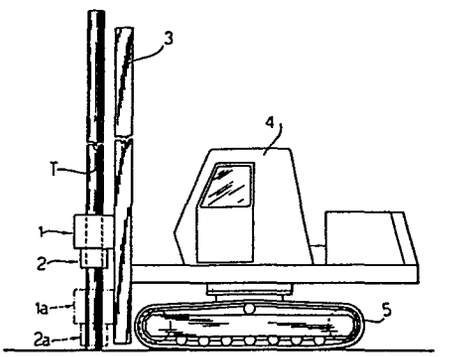
(54) An apparatus for inserting a tool into the ground and continuously rotating it.

(57) The inventive apparatus comprises a hollow implement for selectively gripping and rotating a tool carrier tube (T) penetrating into said hollow implement, said implement including:

a) an actuating head (1) for maintaining the tool carrier tube (T) in rotation;

b) a vice (2) made integral with said rotating hollow means, which vice is operated by a not rotating hollow jack (50) arranged concentrically to said rotating hollow means, which jack is suitable to receive therein said tool carrier tube.

Preferably, the jack (50) has an axially secured hollow piston (29), while the jacket thereof (38) is movable and controls the radial displacement of the tube gripping jaws (33) through inclined planes or surfaces (27a, 33a).



EP 0 103 283 A2

Applicant:

E.L.S.E. EDILIZIA LAVORI SOTTOSUOLO ESTRAZIONI S.p.A.

Via Giuseppe Sacchi, 7

IT - 20121 MILAN

"AN APPARATUS FOR INSERTING A TOOL INTO THE GROUND AND CONTINUOUSLY ROTATING IT"

This invention relates to devices for insertion of rotating tools into the ground. Such tools are normally mounted at the end of a tube. For the sake of brevity, the word "tube " will be used herainafter for indicating any elongate drilling means which may be caused to penetrate into the ground.

An apparatus of this type has been described in U.S. Patent No. 3,763,654. In this patent, the insertion of thin long tubes is foreseen. These can penetrate into the ground only owing to the excavating effect of a water jet

outflowing from the tube end, whereby this device can be used only in sandy grounds. The embodiment according to U.S. Patent No. 3,763,654 provides that the tool is axially and rotatably moved. The axial movement is given by three vertical jacks which cannot ensure a simultaneous advancement of the three pistons imparting the thrust, and accordingly a perfectly axial advancement of the tool. Moreover the rotary movement takes place along small circle arcs, and is controlled by one or two horizontally arranged jacks. Therefore, an even rotation at a high r.p.m. cannot be carried out.

Additionally, the jaw grip, also controlled by three jacks, may occur any time at a different position, not exactly coincident with the axis of the device controlling the tool advancement and rotation. This could cause the distortion of the tool carrier tube and inaccuracies in hole execution.

This device of the prior art allows only the use of drilling devices for which the rotation can be discontinuously imparted; for example, use cannot be made of tricones, diamonded tools for the drilling of rocks or alluvial grounds, etc.

Therefore, it is the object of the present invention to impart a continuous rotation, also at a high rate of r.p.m., to a long tool carrier tube, while exerting

thereon a perfectly centered thrust coaxial with the axis of rotation of said tool carrier tube.

The above object has been achieved as specified in Claim 1. Other advantageous improvements consist in providing the hollow jack with the piston axially integral with the sleeve, while the jacket is movable along the penetration axis, so that during its stroke if controls by means of inclined planes, the radial displacement of the gripping jaws of the tool carrier tube.

A further advantageous improvement consists in mounting the jaws as a pendulum with the suspension point integral with the sleeve.

Preferably, the gripping jaws are interchangeable to accomodate different tube diameters.

A further improvement of the invention provides that the actuating head is fitted with a floating sleeve, so that the tube advancement can for some length be independent of the advancement of the rotating head. Thus, the threads normally provided at each end of the tube lengths are not damaged during the lead-in step.

The invention will now be further explained with reference to an exemplary embodiment as shown in the

accompanying drawings, in which:

Fig. 1 is a schematic side view showing an apparatus for pile driving on which an apparatus according to the invention is mounted;

Fig. 2 is an axial sectional view showing the vice forming part of the apparatus;

Fig. 3 is a sectional view taken at right angles to the apparatus axis;

Fig. 4 is a sectional view according to VWXYZ of Fig. 5 showing the actuating head; and

Fig. 5 is a plan view of the head shown in Fig. 4.

Referring first to Fig. 1, it will be seen that the inventive apparatus comprises an actuating head 1 mounted on a column 3 carried by a structure 4 movable on tracks, wheels or sliding blocks 5. Said actuating head 1 is vertically driven along the column 3 by known means provided on the column, which applies axial forces relative to tube T and directed in both directions. That is forces serving both to drive the tube T into the ground and withdraw it. The actuating head 1 performs the function of causing the hollow central shaft 15 and sleeve 16 integral therewith to rotate by means of two hydraulic motors 23 (Fig. 4).

The vice 2 is provided integral with the sleeve 16. Its function is that of selectively gripping and disengaging the tube T. Both said head 1 and vice 2 are hollow, so as

to allow the passage therethrough of said tube T which projects below and above thereto. After the tube has been gripped, said head 1 and vice 2 move downward. When the positions 1a and 2a, shown by broken lines in Fig. 1, are reached respectively by vice and head, said vice releases the tube T and moves upward along the tube to grip it again at the position shown by full line.

Referring now to Figs. 4 and 5, the construction of the actuating head 1 will now be explained. The outlet shaft 40 of each hydraulic motor 23 can be connected to both the pinion 41 and gear 42 by means of the clutch 49. Said pinion 41 and gear 42 respectively mesh with the gear wheels 43 and 44 integral with the shaft 45, on which the pinion 46 is also mounted. The latter drives the wheel 47 integral with the hollow shaft 15.

Said hollow shaft 15 is slidably connected to a sleeve 16 which is integral for rotation with the shaft 15, but axially free. The sleeve 16 has an integral flange 16a, to which the flange 37a of said vice 2 is bolted (Figgs. 2 and 3). Thus, as soon as the free stroke of said sleeve 16 is resumed, the axial displacement caused by column 3 can be transferred to the vice 2. The torque produced by the hydraulic motors 23, is transferred to the vice 2 which thus causes the rotation of tube T.

The vice 2 has a ring 37 coaxial with the hollow shaft 15. Said ring 37 has a flange 37a which is made integral with the flange 16a. Said ring 37 is provided with ears 37b, each of which having a rod 48 pivoted thereto by a pin 48a. The movable jaws 33 are secured by screws 36 to the end of rods 48, so that such jaws are pendulum mounted. Thus, they can be readily replaced by other jaws of different sizes, such as to accomodate tubes T of different diameters. At the rear, each jaw 33 has a sloping surface 33a cooperating with the sloping surface 27a of a plate 27 mounted on a collar 26 providing for radially displacing said jaw 33 whenever said collar is axially moved. Said jaw 33 is held at opening position by springs 30.

The axial movement carried out by the collar 26 is imparted to the latter by a hollow jack 50 which does not rotate. The jack 50 is supported by the ring 37 through the two thrust bearings 21 and bushing 28 and is arranged concentrically to the ring 37 and sleeve 16. It consists of a hollow piston 29 and jacket 38. The piston 29 is axially secured to the ring 37 by screws 29a and flat bushing 39 penetrating into a notch 39a integral with said piston 29. The jacket 38 is axially movable together with the collar 26 which does not rotate. This is provided with a notch 26, in which the flat bushing 59 slides. Bushing 49 is integral with said jacket 38 by the screw 24. Through the sloping surfaces 27a and 33a said collar 26

radially operates the jaws 33. The oil, as selectively introduced by connections 20 (only one of which is shown in Fig. 2), supplies for example the chamber A, causing the jacket 38 to be upward moved and thus releasing the tube T. On the other hand, the clamping of the latter is carried out when oil under pressure is introduced into the chamber B.

Thus, it will be seen that a perfectly centered operation of the vice 2 is ensured. This clamping can be indefinitely repeated at each gripping of tube T.

E.L.S.E. EDILIZIA LAVORI SOTTOSUOLO ESTRAZIONI S.p.A.
IT - 20121 MILAN

C L A I M S

1. An apparatus for inserting and rotating tools penetrating into the ground, providing a hollow implement (12) for selectively gripping and rotating a tool carrier tube (T) which penetrates into said hollow implement, characterized in that said implement comprises:

a) an actuating head (1) for maintaining said tool carrier tube T in rotation by a motor (23) and a suitable kinematic chain (41 - 47) driving a rotating hollow means (15, 16);

b) a vice (2) made integral with said rotating hollow means (15, 16), which is operated by a not rotating hollow jack (50) arranged concentrically to said rotating hollow means (15, 16), which jack is suitable to receive therein the tool carrier tube (T);

- so that said tube (T) can be operated by applying thereto;
- a torque at high r.p.m.;
- an axial force in any direction.

2. An apparatus as claimed in Claim 1, characterized in that said actuating head (1) comprises a hydraulic motor (23).

3. An apparatus as claimed in Claim 1, characterized in that the jack (50) has an axially secured hollow piston (29), while the jacket (38) thereof is movable and controls the radial displacement of the tube (T) gripping jaws (33) through inclined surfaces (27a, 33a).

4. An appartus as claimed in Claim 1, characterized in that said jaws (33) are pendulum mounted with the suspension pin (48a) integral with the rotating hollow means (15, 16).

5. An apparatus as claimed in Claim 4, characterized in that said jaws (33) are interchangeable to accomodate different diameters of the tube (T).

6. An apparatus as claimed in any of the preceding claims, characterized in that said head (1) is provided with a floating sleeve (16), so that for same length the advacement of said tube (T) is independent of the thrust exerted on the implement.

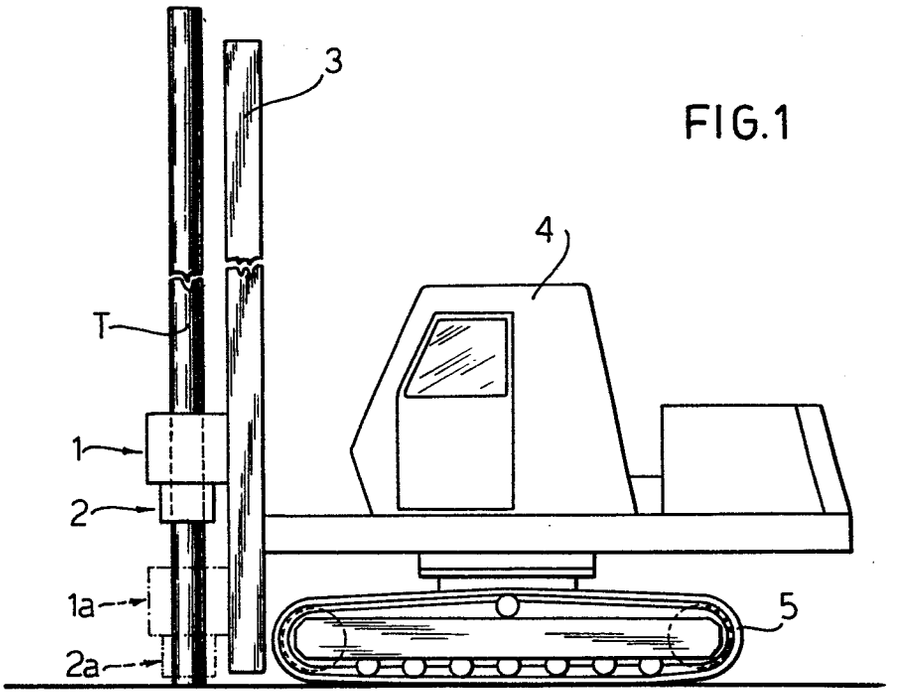


FIG.1

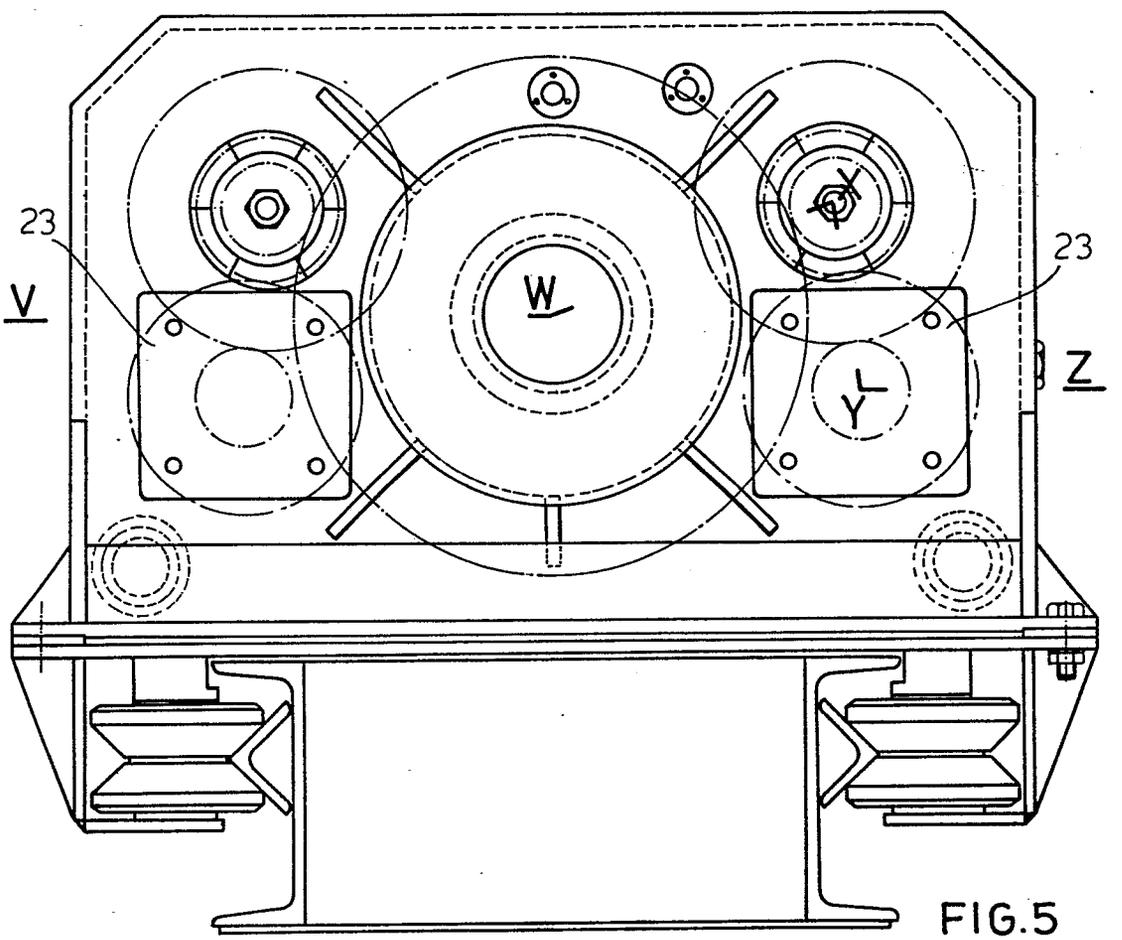


FIG.5

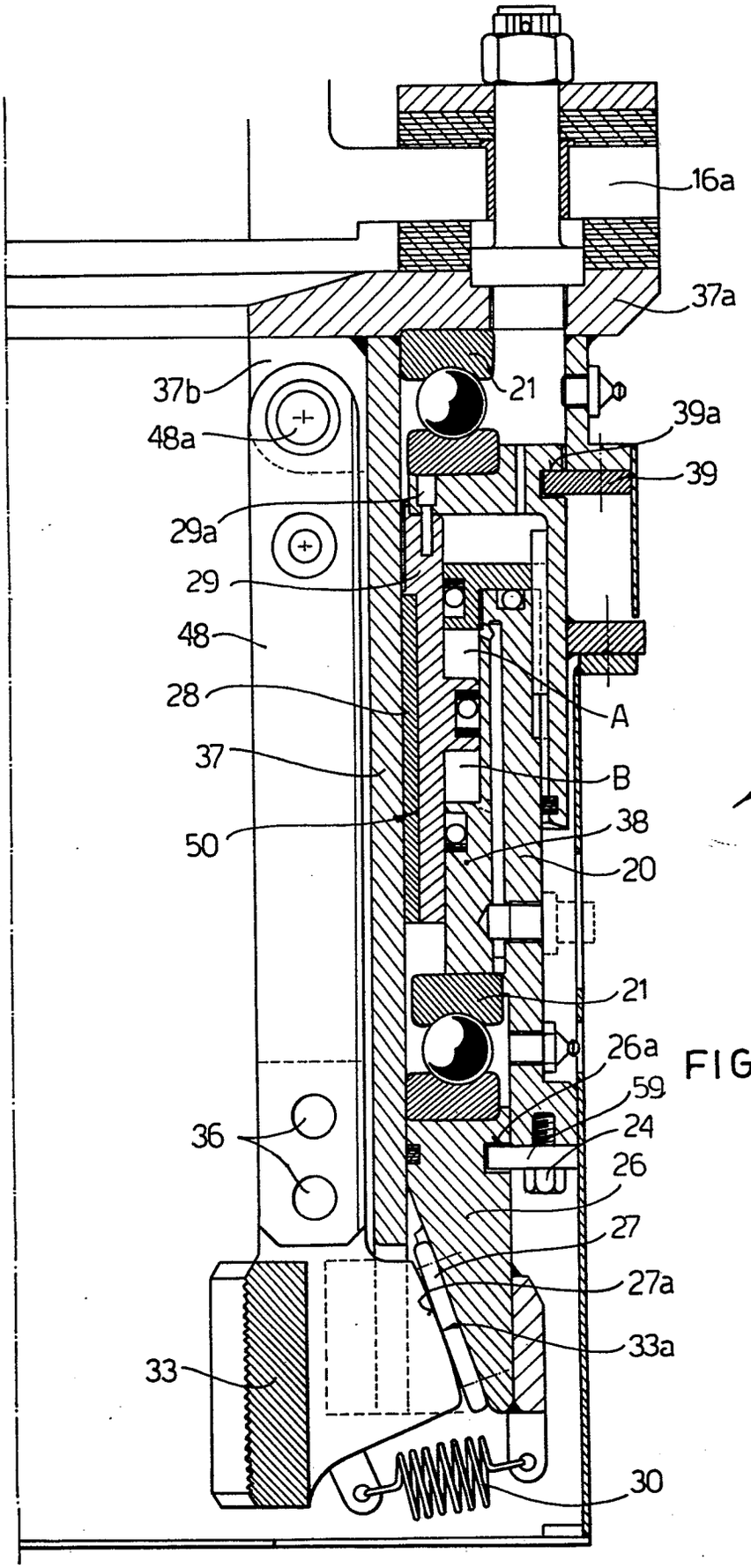

16a
37a
37b
21
39a
48a
39
29a
29
48
28
A
37
B
38
50
20
21
26a
59
36
24
26
27
27a
33a
33
30
2

FIG.2

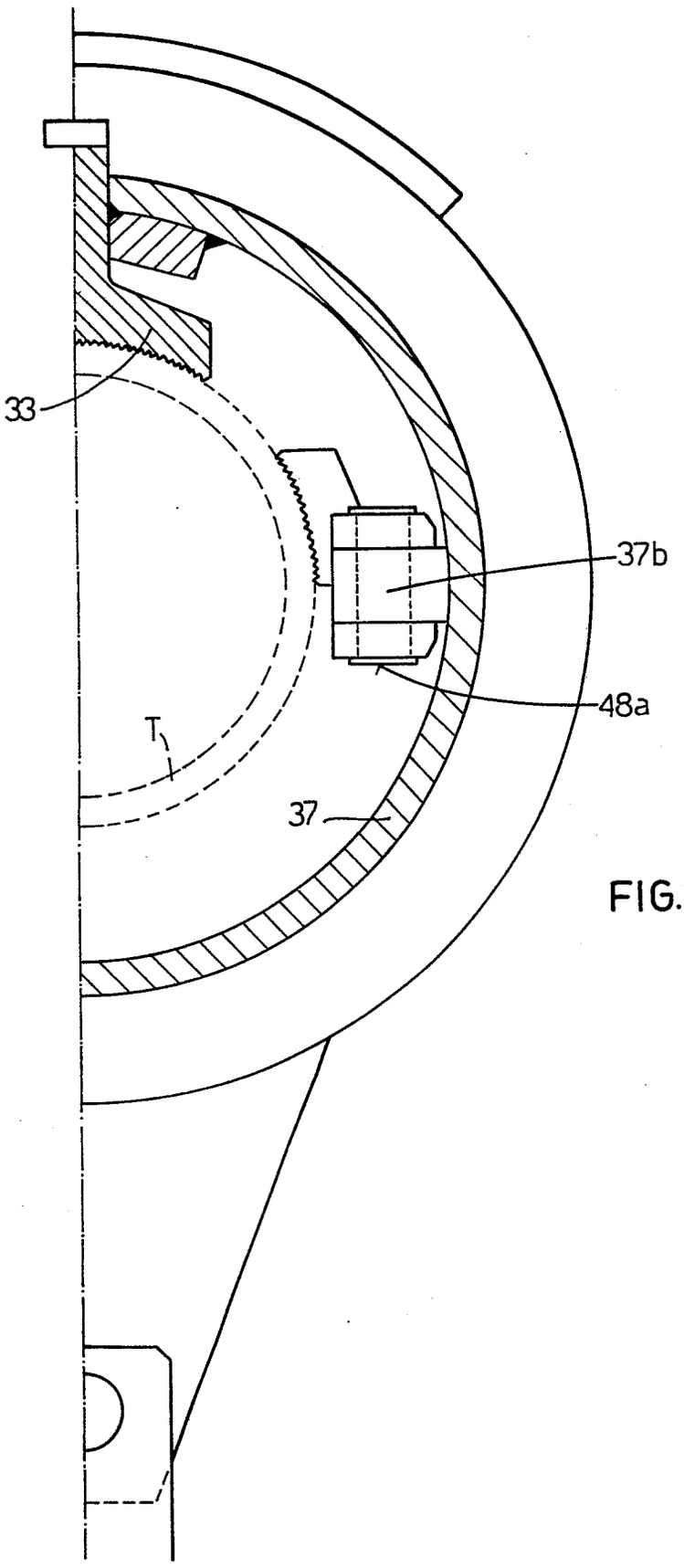


FIG.3

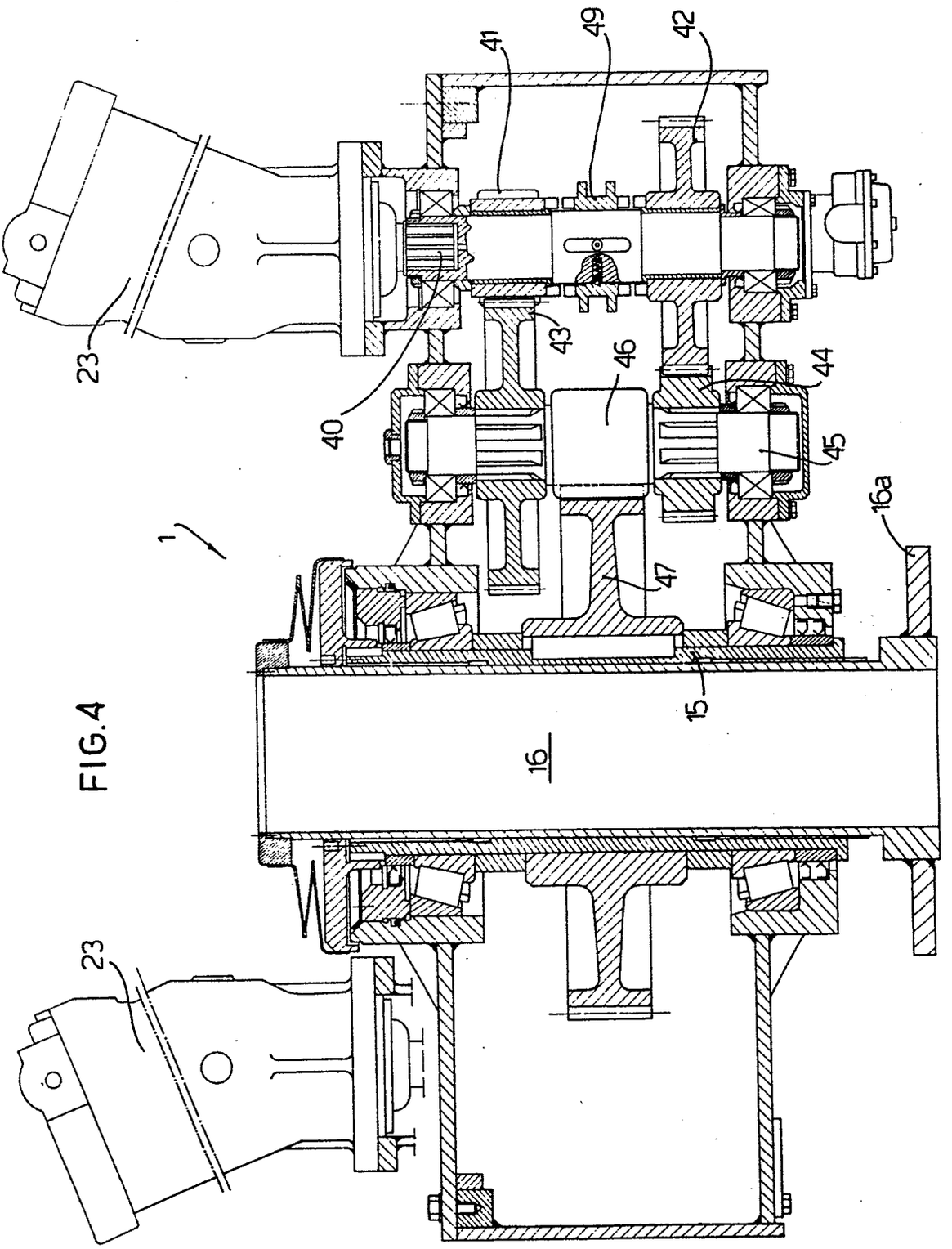


FIG.4