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(71)(72) Applicant and Inventor: ILOMÄKI, Valto [FI/FI]; Loilantie 8, FIN-33470 Ylöjärvi (FI).

(74) Agent: NIEMINEN, Taisto; Patenttitoimisto T Nieminen Oy, Kehräsaari B, FIN-33200 Tampere (FI).

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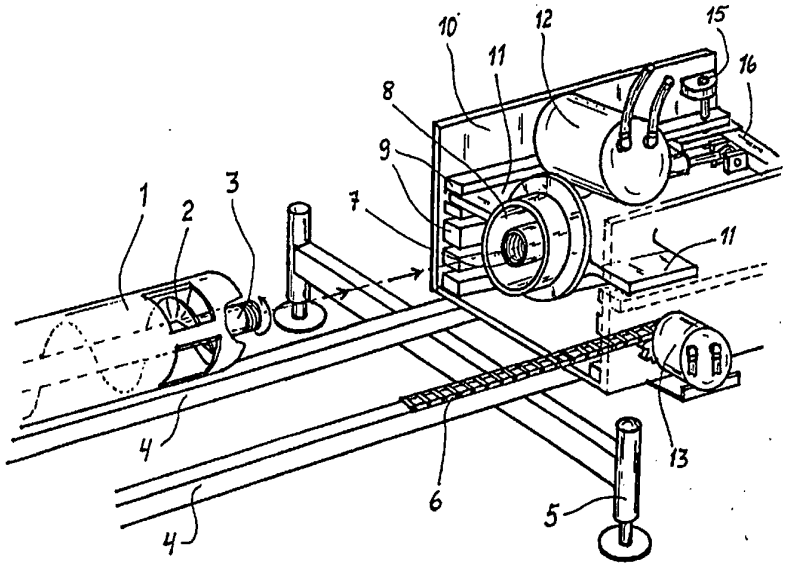

(57) Abstract

Drilling apparatus which comprises a frame operating as an underlay having in the drilling direction mounted guide tracks (4), a rotating and pushing unit which is moved on said guide tracks in the drilling direction and in which unit the devices (9, 11) have been formed for adjusting the height level of the unit in relation to the tracks (4) and of needed force generating devices and a control unit. Different height levels are arranged for the rotating and pushing unit according to different pipe diameters (1) so that the lower surfaces of the pipes take a place essential at the same height level in relation to the guide tracks (4) when it is drilled holes which correspond to different pipe diameters.

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DRILLING APPARATUS

This invention relates to a drilling apparatus which has an advancing unit the height of which unit is adjusted in relation to guide tracks of the base frame in accordance with the diameter of the drilled pipe. By means of the adjusting the lower surface of drilled pipes, being independent of the diameter size, is staying in the same level in relation to the guide tracks of the base frame.

Previously known drilling apparatus which drill in horizontal direction have a support for into soil pushed pipe so that in the front end of the guide tracks there are locating height adjustable supports for different pipe diameters and on the guide tracks movable rotating and pushing unit supports the pushed pipe always on the constant level i.e. that the pipe center locates on the constant level upwards from the guide tracks in spite of different pipe diameters.

When several side by side locating holes are drilled with this construction the support in the front end of the guide tracks has to be adjusted to the different heights when changing the pipe diameter in order to the pushed pipe can be mounted exactly in the same line with the guide tracks. Also in the rotating and pushing unit the rotating center has to be positioned firmly according to the largest pipe diameter when it is mounted firmly to the upper position in the advancing unit defined by the largest pipe diameter. This causes too strain against the base construction when the lever arm of the pushing force is the same maximal lenght when using all sizes of the pipe diameter. This causes bending strain to the base tracks and hard strain to the bearing surface between the advancing unit and guide tracks.

These disadvantages can be avoided using solution according to the invention and charactristic for the invention is what is presented in the patent claims.

The most important advantages for the invention is that there is in the advancing unit a ready supporting construction for the certain sizes of drilled pipes when the advancing unit can be easily mounted on the right level corresponding to every pipe diameter. The lower surface of those into the soil pushed pipes locates in the drilling apparatus always on the same level upwards from the guide tracks when the support device is not needed to adjust even though the diameter size changes. Also the lever arm is always the shortest possible which strains the advancing unit and the base frame when the pipes are pushed.

In the following the invention is described more closely referring the enclosed drawing where
Figure 1 shows a drilling apparatus as an inclined view.
Figure 2 shows a drilling apparatus as a top view.
Figure 3 shows a drilling apparatus as a side view.

In figure 1 there are guide tracks 4 mounted on an adjustable frame on which tracks the advancing unit is moved during drilling. Cylinders for adjusting the height locate in the ends of the crosswise beam 5 in the frame. The advancing unit comprises a housing 10 which is partly like a box, having a bottom and side walls. Supports 9 have been fixed to the inner walls of the housing 10 at different heights. The rotating and pushing unit is mounted on the supports and the sidewars directed lever plates 11 of which unit locate between supports 9 with a clearance allowing gliding. Abovementioned unit has a hydraulic motor 12 as a rotating device which motor rotates by means of a herringbone gear a pipe coupling 7 which locates in a center of the pushing part 8. The drilling pipe comprising conveyor spiral 2 and it's center pipe 3 is fixed to the pipe coupling. Pressurized air is lead via the center pipe 3 to the drill bit in the drill head. The piping 1 is pushed by means of an adapter 8 when the whole advancing unit is moved to the drilling direction on the guide tracks 4. A hydraulic motor 13 and a chain 6 is used for moving the unit.

It is generally used only certain pipe sizes in drilling when the height level of the supports is adjusted according to those sizes so that the lower surface of the pipes 1 locates essential at the same height level in spite of the pipe diameter when the advancing unit is mounted on that support which corresponds the diameter in question. When pipe diameter is changed also the adapter 8 is changed to apply for the pipe. The rotating pipe coupling 7 is generally the same for all sizes of the pipes 1. The pipe 1 has openings for discharging drill waste.

Figure 2 shows drilling apparatus as a top view where the pipe 1 is mounted. The rotating and pushing unit is supported in the longitudinal direction by means of cylinders 14 to the housing 10 of the advancing unit. The cylinders are fixed from their other end to a crosswise beem 16. The crosswise beem 16 is locked by means of pins 15 in the support ends at desired height. The ends of the supports have holes in the same line downwards from the top and the pin 15 is also as long as the hole line.

The cylinders 14 is used during drilling for sensing the pushing force. The pressure generated in the cylinders is controlling the pressure or flow which is lead to the motor 13. Pressure increase in the cylinders 14 stops the advancing motion and pressure decrease in the cylinders controls pressurized flow to the motor 13.

Figure 3 shows drilling apparatus as a side view, in which is seen the chain 6 moving the advancing unit which chain due to it's fixing points 18,19 applies for moving the unit both forwards and backwards by means of the motor 13. A supporting piece 18 locates in the front end of the guide tracks the height of which piece is not needed to adjust when pipe diameters are changed.

Also many other support types can be used when they allow gliding motion in the longitudinal direction and can receive the torsion moment which directs to the frame 11 from the rotating and pushing unit.

CLAIMS

1. Drilling apparatus which comprises of a frame operating as an underlay having in the drilling direction mounted guide tracks (4), a rotating and pushing unit which is moved on said guide tracks in the drilling direction and in which unit the devices (9,11) have been formed for adjusting the height level of the unit in relation to the tracks (4) and of needed force generating devices and a control unit **characterized** in that different height levels are arranged for the rotating and pushing unit according to different pipe diameters (1) so that the lower surfaces of the pipes take a place essential at the same height level in relation to the guide tracks (4) when it is drilled holes which correspond to different pipe diameters.

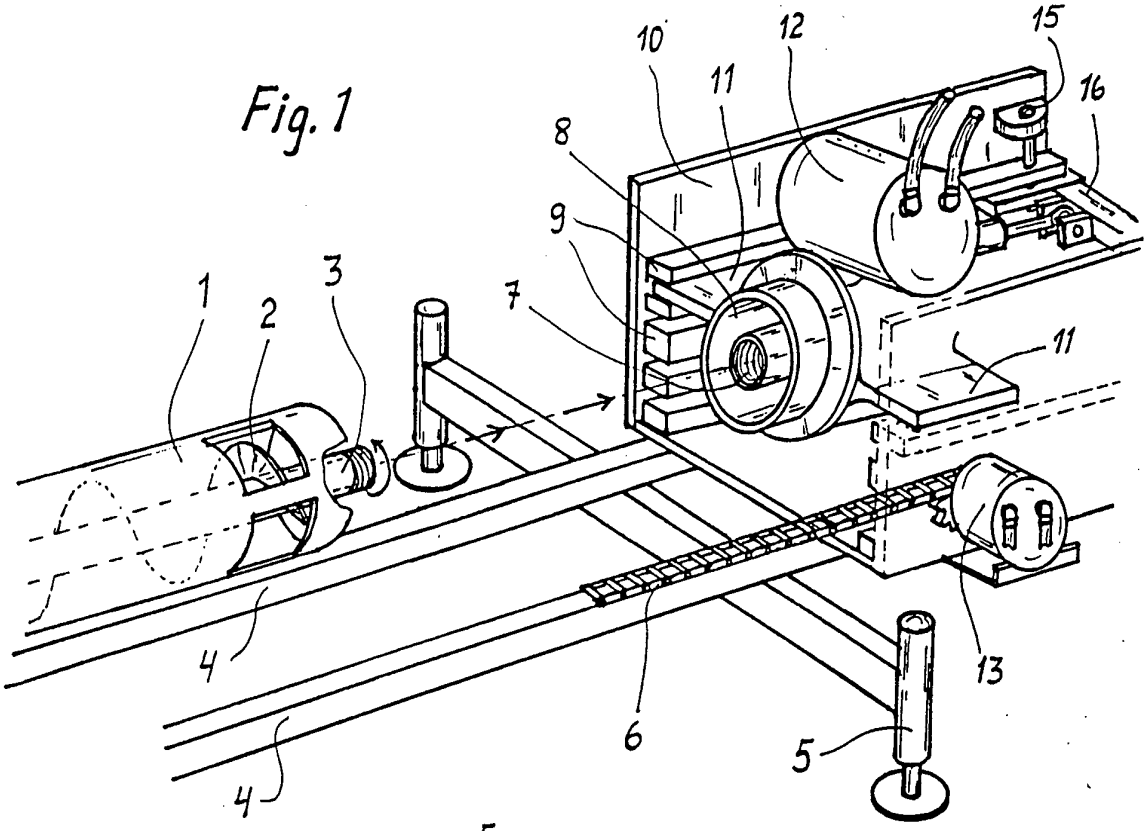
2. Drilling apparatus according to claim 1 **characterized** in that the supporters (9) are planes or similar mounted in the drilling direction on which the rotating and pushing unit can glide in the drilling direction.

3. Drilling apparatus according to claim 1 or 2 **characterized** in that a fastening device (15,16) is formed in the rear end of the supporting planes for fastening the other end of that cylinder (14) which is sensing the pushing force of the drilling.

4. Drilling apparatus according to one of the previous claims 1 - 3 **characterized** in that the fastening point of the cylinder (14) can be adjusted in vertical direction to the heights defined by the planes (9).

5. Drilling apparatus according to one of the previous claims 1 - 5 **characterized** in that the supporting planes (9) are provided to receive the torsion moment having an effect on the rotation unit.

Fig. 1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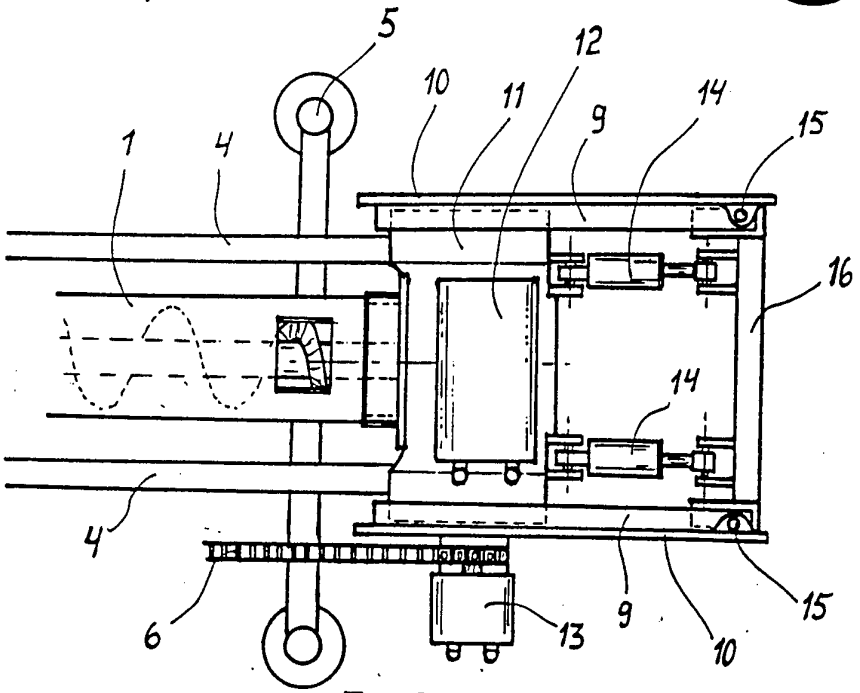
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Fig.2

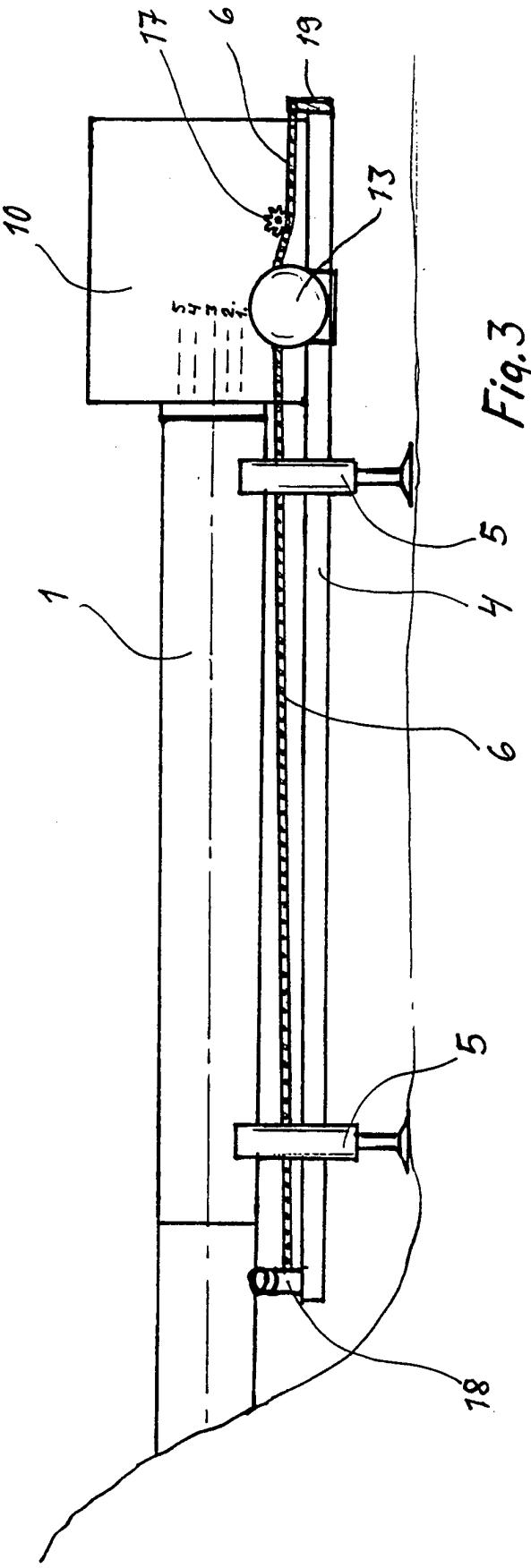

Fig.3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/FI 94/00486

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: E02F 5/18, E21B 7/20
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: B25D, E21B, E02F, E21C

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

SE,DK,FI,NO classes as above

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

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US, A, 3612195 (A.R. RICHMOND), 12 October 1971 (12.10.71), column 1, line 31 - line 38; column 3, line 29 - line 46	1

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

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Information on patent family members

31/12/94

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A- 3612195	12/10/71	NONE	