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(54) Pipe handling equipment and method for a rock drilling machine.

(57) Handling equipment for handling drill tubes at a rock drilling machine, comprising a feed beam (3) adjustable to different slopes, a drifter (20) which is moveable along the feed beam, and an adapter (21) which connects the drifter to the upper end of drill tubes for transmitting percussive and/or rotation power to such drill tubes. The handling equipment comprises a magazine (16) for the drill tubes positioned the feed beam so that the drill tubes in the magazines are essentially parallel with the feed, a grip member (10) for gripping the drill tubes and operation means (4 - 9) for moving a gripped drill tube to a drilling position at the feed beam for screwing on the adapter and possibly on drill tubes already in the hole. The magazine further comprises a spacing means (18) for cooperation with one end of an inner drill tube positioned inside each outer drill tube in the magazine for spacing said one end of the inner drill tube from the corresponding end of the outer drill tube, and a gripping means for gripping the inner drill tube at the portion extending from the outer drill tube during the movement from the magazine to the drilling position at the feed beam.

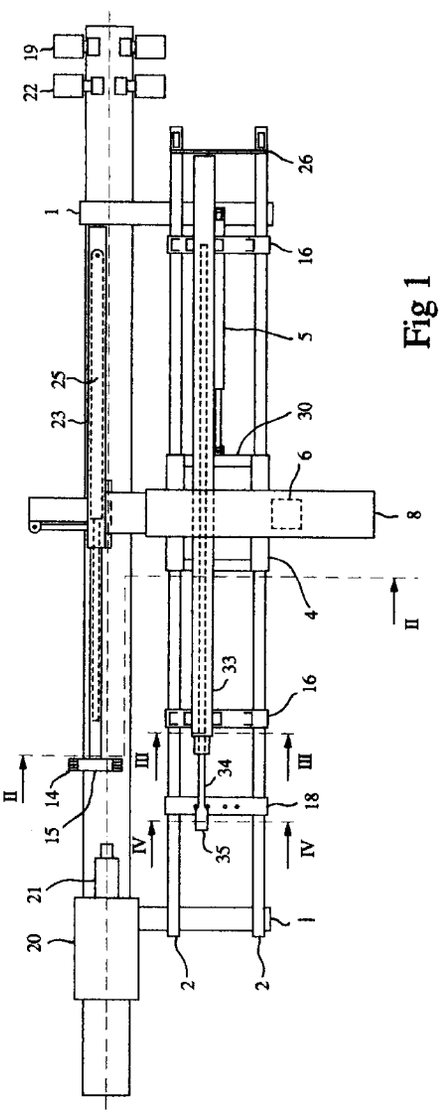

Fig 1

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AREA OF INVENTION

The present invention relates to the area of drilling in soil and rock, especially lining drill tube drilling with double drill tubes, and relates to a handling equipment for handling such drill tubes at the connection of the screw joints thereof and a method of operation of the handling equipment.

PRIOR ART

At lining drill tube drilling in soil and rock, a technique with double drill tubes is often used, whereby the flush fluid is supplied to the drilling tip through the inner drill tube and the drilling mud is transported up to the ground in the space between the outer and the inner drill tube.

There are several drilling methods on the market, which are based on this principle. The drilling is usually performed with heavy, crawling thread supported and chain fed rock drilling machines. The diameter of the drilling hole is often between 100 and 200 mm. The drilling takes place in dependence of the application, in different slopes against the horizontal plane and the drilling depth is seldom more than about 200 m.

The drill tubes are usually interconnected with screw joints, which must be adapted for transmitting considerable torque and shock stresses. Of this reason, the drill rods are usually heavy and cumbersome to handle manually, especially at inclined drilling.

Due to the fact that the drill tubes extend inside each other, problems arise at the joining of the drill tubes, since the joining takes place so that the outer and inner drill tubes are screwed on and off separately.

Different assisting machines have been constructed for making easier the handling of the drill tubes and also for acting as magazines in such rock drilling machines. All such previously known devices suppose that the outer and inner drill tubes are handled each separately, whereby the lighter inner drill tubes are handled manually.

DISCLOSURE OF THE INVENTION

The object of the present invention is to provide a handling equipment to be mounted at a conventional rock drilling machine, making possible to handle both the outer and the inner drill tubes machinally and providing a magazine for the drill tubes to be mounted or taken up. No manual handling of the drill tubes should be necessary.

According to the invention such a handling equipment is installed at a rock drilling machine, comprising a feed beam adjustable to different slopes, a drifter which is moveable along the feed beam, and an adapter which connects the drifter to the upper end of the drill tubes for transmitting percussive and/or rotation power to such drill tubes. The handling equipment comprises a magazine for the drill tubes positioned beside the feed beam so that the drill tubes in the magazine are essentially parallel with the feed beam; a grip member for gripping the drill tubes; and operation means for moving a gripped drill tube to a drilling position at the feed beam for screwing on the adapter and possibly on drill tubes already in the hole.

According to the invention, the magazine further comprises a spacing means for cooperation with one end of an inner drill tube positioned inside each outer drill tube in the magazine for spacing said one end of the inner drill tube from the corresponding end of the outer drill tube, and a gripping means for gripping the inner drill tube at the portion extending from the outer drill tube during the movement from the magazine to the drilling position at the feed beam.

Said operation means comprises according to the invention a first operation device for moving in the horizontal direction parallel with the feed beam; a second operation device for moving in the vertical perpendicular to the feed beam; a third operation device for moving in the horizontal direction perpendicular to the feed beam; said operation devices being activated each separately and independent of the other.

Moreover, the invention comprises a method of operating a handling equipment, comprising a feed beam adjustable to different slopes, a drifter which is moveable along the feed beam, and an adapter connecting the drifter to the upper end of the drill tubes for transmitting percussive and/or rotation power to such drill tubes, said handling equipment comprising a magazine for the drill tubes positioned beside the feed beam so that the drill tubes in the magazine are essentially parallel with the feed beam; a grip member for gripping the drill tubes; and operation means for moving a gripped drill tube to a drilling position at the feed beam for screwing on the adapter and possibly on drill tubes already in the hole. According to the invention the method comprises the following steps: providing several drill tube sets into said magazine, each set of drill tubes comprising an outer tube and an inner tube, the inner drill tube being positioned inside the outer drill tube and extending out from one end of the outer drill tube; gripping one outer drill tube at the middle thereof by said gripp member and at the same time gripping a corresponding inner drill tube by a gripping means at the position of the inner drill tube extending outside the outer drill tube; and moving the outer and inner drill tubes simultaneously to an operating position at said feed beam for cooperation with the adapter and possibly outer and inner drill tubes already present in the hole.

An alternative method according to the invention comprises the following steps: placing outer drill tubes and inner drill tubes separately in said maga-

zine; gripping an inner drill tube by said gripp member and moving it into an operation at the feed beam for cooperation with the adapter and possibly an inner drill tube already present in the hole; gripping an outer drill tube by said gripp member and moving it to a position above the already mounted inner drill tube and moving it outside the inner drill tube for cooperation with the adapter and possibly an outer drill tube already present in the hole, whereby a gripping means can be dispensed with. In the last-mentioned method a simplified handling equipment can be used by omission of the gripping means in the nature of a shear-type gripper. The method supposes that the equipment has a sufficient feed lenght double of the lengths of the drill tubes.

Further preferred embodiments will appear from the following description.

SHORT DESCRIPTION OF THE DRAWINGS

The invention is described in more details below by means of preferred embodiments and with reference to the appended drawings.

Fig. 1 is a schematic plan view of a preferred embodiment of the equipment according to the invention.

Fig. 2 is a side view taken along line II - II in Fig. 1 and shows a cradle according to the invention.

Fig. 3 is a side view taken along line III - III in Fig. 1 and shows a magazine according to the invention.

Fig. 4 is a side view taken along line IV - IV in Fig. 1 and shows a spacing magazine for the upper ends of the inner drill tubes.

Fig. 5 is a side view showing a shear-type gripper according to the invention.

Fig. 6 is a schematic plan view similar to Fig. 1 and shows an alternative embodiment of the invention.

DETAILED DESCRIPTION OF THE INVENTION

The equipment for handling drill tubes is intended to be mounted on a rock drilling machine of conventional construction. In Fig. 1 only a few parts of the rock drilling machine is shown, viz. a feed beam 3, fixture members 19,22 for holding the ends of the drill tubes during screwing on and off, a drifter 20 for driving the drill tubes and an adapter 21 interconnecting the upper ends of the drill tubes with the drifter. The feed beam 3 can be adjusted into different slope angles in dependence of the direction of the intended drill hole. The actual drilling work takes place by means of the drifter 20, which transmits percussive and rotation power via the adapter 21 to the drill tubes. The drifter is moved along the feed beam for example by means of chains.

Hereinbelow, the handling equipment according to the invention will be described in its rest position in which the feed beam is horizontal and the directions will be defined in view thereof. It is noted that the feed beam during operation is adjusted to the desired angle in relation to the ground for the intended drill hole and that the entire equipment according to the invention follows such movement. Said angle can be adjusted normally between 0° - 100° in relation to the horizontal plane.

A preferred embodiment of the invention will now be described with particular reference to Figs. 1 and 2. The handling equipment comprises two transverse support beams 1 attached to the bottom side of the feed beam 3 and extending beside the feed beam. Two longitudinal guide beams 2 are attached to the transverse support beams 1 parallel with the feed beam. The guide beams 2 are interconnected by several transverse members 16, 18, 26, which are described in more details below.

Between said transverse members 16, a cradle 4 is moveable along the guide beams 2 and parallel with the feed beam. A first hydraulic cylinder 5 is connected between the cradle and on transverse support beam 1 for moving the cradle along the guide beams.

The cradle 4 is shown in more details in Fig. 2 which is a side view, however with a shear-type gripper 14 (to be described below) removed. The transverse support beam 1, the longitudinal guide beams 2 and the feed beam 3 are shown by broken lines in Fig. 2.

The cradle 4 comprises two longitudinal box members 27, 28 interconnected by two transverse beams 29, 30, one of which is shown in Fig. 2. The longitudinal box members 27, 28 encloses the guide beams 2 and are moveable along the guide beams.

Attached to one longitudinal box member 28 is a pillar 6, which extends vertically upwards from the cradle. The pillar is constructed of two box girders extending telescopically inside each other. The inner box girder is extendable out from the outer box girder by means of an internal second hydraulic cylinder 7.

A boom 8 is mounted to the upper end of the inner box girder of the pillar 6, and extends horizontally and perpendicular towards the feed beam. The boom 8 is also constructed of two box girders telescopically extending inside each other and the relative movement takes place by means of a third hydraulic cylinder 9.

At the outer extendable part of the boom 8, there is provided a grip claw 10 pivotable around an articulated bolt 11 by means of a fourth hydraulic cylinder 12. Moreover, there is an abutment in the form of an elongated plate 13, which in cross-section forms a right angle. The plate 13 is attached to the moveable part of the boom 8 and extends in parallel with the feed beam 3.

The grip claw 10 is adapted, in cooperation with said elongated plate 13, to grip and hold stationary a drill tube with different diameter normally within the interval of between 38 and 133 mm. The grip claw 10 urges the drill tubes against the elongated plate 13

thereby maintaining the drill tube parallel with the feed beam.

At the moveable part of the boom 8, there is also attached a rod 23 extending horizontally and parallel with the feed beam 3, c.f. also Fig. 1. The rod 23 is telescopically extendable in the axial direction by means of a fifth hydraulic cylinder 25 and is constructed of two box girders telescopically extending inside each other.

At the free end of the rod 23 is mounted a shear-type gripper 14 with a pertaining sixth hydraulic cylinder 15. The shear-type is shown in more details in Fig. 5. The shear-type gripper is positioned at a distance from the grip claw 10 and the distance is adjustable by the rod 23 by means of the hydraulic cylinder 25.

As mentioned above, there is provided transverse members at fixed positions along the guide beams 2. Two such transverse members are constructed as magazine members 16 and one such magazine member is shown in more details in Fig. 3. The magazine member comprises a transverse beam 16 and four vertical U-beams 31 spaced apart in the transverse direction by a distance so that outer drill tubes 33 can be placed in the space between two adjacent U-beams 31. In Fig. 3 there is shown two compartments 32 for outer drill tubes each housing a maximum of four outer drill tubes. Each outer drill tube encloses an inner drill tube 34 as described in more details below.

The drill tubes are retained by means of plate springs 17 or spring loaded holders 24 so that they cannot fall out from the magazine at vertical or so called negative drilling when the feed beam 3 is vertical or slopes more than 90° in relation to the horizontal.

The magazine members 16 are placed at a distance from each other corresponding to the length of the outer drill tubes. Preferably, each magazine member is positioned 0,2 - 0,4 meters from the end of the outer drill tubes, so that the distance between the magazine members 16 is as large as possible. The magazine members 16 are preferably welded to the guide beams 2, but it is possible to have one (or several) of the magazine member 16 (the upper) adjustable or replaceable for adoption to drill tubes of different lengths and diameters. At the bottom end of the guide beams 2, there is placed an abutment plate 26, which prevents the drill tubes from moving in the axial direction when the feed beam is inclined.

To the left of the left magazination member 16, in Fig. 1, there is mounted a spacing member 18 shown in more details in Fig. 4, for cooperation with the upper end of inner drill tubes 34 positioned inside the outer drill tubes in the magazine. Each inner drill tube is provided with a jointing sleeve 35 comprising screw windings for connection to a lower inner drill tube in the drill hole. Said jointing sleeve 35 forms an enlargement of the upper end of each inner drill tube. Said spacing member 18 comprises several vertical rods 36 as shown in Fig. 4 spaced apart for engagement below the enlargement of the jointing sleeves 35 for preventing the inner drill tubes to enter inside the outer drill tubes. Thus, each inner drill tube extends out from or to the left of the outer drill tube as shown in Fig. 1.

The operation of the handling equipment according to the invention will now be described with reference to Figs. 1 and 2.

When the drilling starts, the outer drill tubes are placed between the magazine members 16 and the inner drill tubes are placed inside the outer drill tubes and hang in the space member 18. The inner drill tubes are placed manually in the outer drill tubes or the shear-type gripper is used as described more closely below.

The first outer drill tube and the first inner drill tube are each provided with drill tips, normally with tungsten carbide tips, but other constructions can also be used together with the invention.

By means of operation valves at the control panel of the drilling machine, all hydraulic cylinders 5,7,9,12,15 and 25 can be activated. With such operation valves, the shear-type gripper 14 is adjusted, in its open position, over the first inner drill tube 34, immediately below its jointing sleeve 35 between the space member 18 and the magazine members 16. The open grip claw 10 is at the same time positioned over the corresponding outer drill tube 33 and approximately at its longitudinal middle point. The boom 8 and the upper part of the pillar 6 are now adjusted and moved against the drill tubes so that the plate 13 will be placed firmly against the outer side of the outer drill tube. Then, both the grip claw 10 and the shear-type gripper 14 is activated by means of respective hydraulic cylinders, whereby both the inner drill tube and the outer drill tube are captured in a position parallel with the feed beam 3.

By activation of hydraulic cylinders 5, 7 and 9, the captured drill tubes can be moved into the drilling centre position above the feed beam 3 and down through the drill tube guidings 19, 22 at the lower end of the feed beam. By means of the drifter 20, first the inner drill tube is screwed to the adapter, whereupon the shear-type gripper 14 is opened. Then, the outer drill tube is screwed to the adapter, whereupon the grip claw 10 is opened. Both drill tubes are now connected to the adapter. At continued rotation of the adapter, the inner and outer drill tubes are screwed to the upper ends of corresponding drill tubes already placed in the drill hole guided by the drill tube guidings 19, 22.

Both drill tubes are now connected to the drifter and the drilling starts. When the drifter has moved along the feed beam to its bottom position, the drill tubes are screwed off from the adapter by means of

the drifter and a drill tube releaser 22 of known construction at the lower end of the feed beam. Now, the drifter is moved to its upper position, whereupon a new length of outer and inner drill tubes are screwed on the drill tubes already inside the drill hole and so on.

At the taking up of the drill rod, the same operations are done as with the downwards drilling, but in opposite order, whereupon the grip claw and the shear-type gripper operate as an abutment when the drill tubes by means of the drifter are screwed off the adapter. Each loosened drill tube length is placed in position in the magazine between the U-beams 31 in the magazine 16.

In several cases, there is drilled with double drill tube systems only to a part of the drill hole, whereupon the drilling continues with only the inner drill tubes. It often occurs that the inner drill tubes are taken up separately and that the outer drill rod is temporarily left in the earth. The inner drill tubes 34 are then placed at a certain space 37 in the magazine between two U-beams 31 in the magazine, c.f. Fig. 3 to the left, from where they later by means of the equipment can be placed inside the outer drill tubes when these have arrived in place.

By using the shear-type gripper 14, an inner drill tube 34 can be placed in position inside an outer drill tube 33 already placed in the magazine space 32 in the following way. The inner drill tube is positioned in the space 37 to the left in Fig. 3. In order that the shear-type gripper 14 should be able to grip around the inner drill tube at the middle point thereof, the cradle 4 is moved to the far right in Fig. 1 and the shear-type gripper is withdrawn as far as possible towards the cradle 4. Then, the shear-type gripper will be positioned at the middle of the inner drill tube and one such drill tube is gripped and lifted from the magazine. Then, the cradle 4 is moved to the left in Fig. 1 at the same time as the rod 23 is extended in its full length. By this movement, the inner drill tubes will be positioned to the left of the mouth of the outer drill tube positioned in the magazine and can be fed inside the outer drill tube by operating the pillar, the boom, the rod 23 and the cradle 4. The inner drill tube can of course only be moved inside the outer drill tube to the half length thereof, but the continued movement takes place either with the gravitational force if the feed beam is sloping or by gripping the outer drill tube by the shear-type gripper at a position further out.

Several modifications of the handling equipment shown in Fig. 1 are obvious to a skilled person. A few modifications will be mentioned below but it is realized that several other modifications are within the scope of the invention.

One alternative embodiment of the invention is shown in Fig. 6, which corresponds to Fig. 1. In this embodiment, the drill tubes are reversed so that the enlarged jointing sleeve 35 is positioned downwards, to the right in Fig. 6. Also the direction of the shear-type gripper 14 is reversed. The spacing member is replaced by a stop member 38 preventing the outer drill tubes 33 to reach the abutment plate 26. Instead the inner drill tubes 34 extend through the outer drill tubes and extend beyond the stop member 38 until the abutment plate 26. Thus, the inner drill tubes 33 can be gripped by the shear-type gripper 14 below the outer drill tubes 33. Otherwise the operation is the same and should be evident from Fig. 6. However, the adapter must be replaced by an alternative adapter, in which the screw windings cooperating with the inner drill tubes are made as inner windings in a hole 39 of the adapter. This construction is more rugged. In all other respects the same construction is used.

The above constructions can also be further modified. One possibility is to provide the pillar 6 with a possibility to rotate around a vertical axis, so that the rod 23 can be adjusted so that it is always parallel with the feed beam.

It is also possible to use the handling equipment according to the invention in other methods, e.g. by handing the outer and inner drill tubes separately. First an inner drill tube is gripped by the grip claw 10 and placed in position at the feed beam. The inner drill tube is connected to the adapter and screwed to the inner drill tube already in the hole. Then, the adapter is disengaged from the inner drill tube and the drifter and adapter is withdrawn to the left as much as possible. Then, an outer drill tube positioned in the space 37 is gripped by the grip claw 10 and moved to a position so that it can be placed outside the inner drill tube already present at the feed beam. Finally, the adapter again engages the upper end of the outer and inner drill tubes and the outer drill tube is at the same time screwed to the outer drill tube already in the hole. The drilling machine is now ready for continued work. It is obvious that the drifter and adapter must be moveable the double distance of the length of each of the drill tubes in this case. It is also obvious that an outer drill tube can be mounted before an inner drill tube. The shear-type gripper 14 is not used and can be removed if the equipment is to be used exclusively according to this method.

It is of course possible to adapt the invention to other types of drill tube handling equipments in which other types of engagement members are used instead of the grip claw and shear-type gripper.

By using the above described handling equipment mounted on a machine for soil and rock drilling of standard construction and of the type described above, the following advantages are obtained:

1) The difficult and heavy work with more or less manually handling of heavy drill tubes at the drilling work is completely eliminated.

2) The drilling can be performed with one operator instead of at least two as previously required.

3) The time for the drilling work can be reduced

considerably by faster handling of the drill tubes.
4) The accident hazard at the manual handling is eliminated.

The above described embodiment has been used in practice and it has been shown that the operator very soon obtains a skill for how to use the different valves to the hydraulic cylinders and a very high precision can be obtained. If the inner drill tubes are placed inside the outer drill tubes by means of the shear-type gripper during the time the drilling machine performs work, several assembled inner and outer drill tubes are present for simultaneous movement to the working position and the connection to the adapter and the drill tubes already in the hole is very fast.

It is possible to use modern technique for automatization of several of the movements necessary when operating the drill tube handler according to the invention. Thus, the valves to the hydraulic cylinders can be operated by a microprocessor in a certain sequence, which corresponds to a normal handling sequence. The operator can monitor the operation of the device and can intervene if necessary. It is also possible to place all controls of the valves in a operator cabin at the drilling machine so that the operator is conveniently placed in his normal operating chair.

Other modifications occur to a skilled person reading this specification and the intent is that such modifications obvious to a skilled person should be encompassed within the scope of the invention. The invention is only limited by the appended patent claims.

Claims

1. Handling equipment for a rock drilling machine, said rock drilling machine comprising a feed beam (3) adjustable to different slopes, a drifter (20) which is moveable along the feed beam, and an adapter (21) connecting the drifter to the upper end of the drill tubes for transmitting percussive and/or rotation power to such drill tubes, said handling equipment comprising a magazine (16) for the drill tubes positioned beside the feed beam so that the drill tubes in the magazine are essentially parallel with the feed beam; a grip member (10) for gripping the drill tubes; and operation means (5, 7, 9) for moving a gripped drill tube to a drilling position at the feed beam for screwing on the adapter and possibly on drill tubes already in the hole,
characterized in that the magazine further comprises

a spacing member (18) for cooperation with one end of an inner drill tube (34) positioned inside each outer drill tube (33) in the magazine for spacing said one end of the inner drill tube from the corresponding end of the outer drill tube, and

a gripping means (14) for gripping the inner drill tube at the portion extending from the outer drill tube.

2. Handling equipment according to claim 1, **characterized** in that the operation means for moving a gripped drill tube comprises

a first operation means (4,5) for moving in the horizontal direction parallel with the feed beam;

a second operation means (6,7) for moving in the vertical direction perpendicular to the feed beam;

a third operation means (8,9) for moving in the horizontal direction perpendicular to the feed beam;

and in that the operation means are activated each separately and independent of each other for gripping a drill tube and moving and placing it in position at the feed beam.

3. Handling equipment according to anyone of the previous claims, **characterized** in that said gripping means (14) is a shear-type gripper adapted at a rod (23) which is telescopically extendible so that the shear-type gripper is adjustable and can be placed adjacent the upper end of an inner drill tube.

4. Handling equipment according to anyone of the previous claims, **characterized** in that said grip member (10) and said gripping means (14) are moveable parallel with said feed beam.

5. Handling equipment according to anyone of the previous claims, **characterized** by

two transverse support beams (1) attached to the feed beam (3) and extending beside said feed beam;

two longitudinal guide beams (2) attached to said support beams and extending parallel to the feed beam;

a cradle (4) moveable along said guide beams by means of a hydraulic cylinder (5);

a pillar (6) attached to the cradle (4) and extending in the vertical direction and extendible by means of a hydraulic cylinder (7);

a boom (8) attached to the upper end of the pillar and extending in the horizontal direction perpendicular to and towards the feed beem and extendible by means of a hydraulic cylinder (9).

6. Handling equipment according to claim 5, **characterized** in that the magazine comprises:

a transverse member (16) attached to the guide beams (2); and

several vertical beams (31) spaced apart a distance corresponding to the diameter of the outer drill tubes.

7. Handling equipment according to claim 5 or 6, **characterized** in that said a spacing member comprises:

a transverse member (18) attached to the guide beams (2); and

several vertical rods (36) spaced apart a distance corresponding to the diameter of the inner drill tubes.

8. Handling equipment according to claim 5, 6 or 7, **characterized** in that said magazine and or spacing member are provided with spring loaded holders (17,24) for retaining said drill tubes.

9. A method of operating a handling equipment according to claim 1, comprising a feed beam (3) adjustable to different slopes, a drifter (20) which is moveable along the feed beam, and an adapter (21) connecting the drifter to the upper end of the drill tubes for transmitting percussive and/or rotation power to such drill tubes, said handling equipment comprising a magazine (16) for the drill tubes positioned beside the feed beam so that the drill tubes in the magazine are essentially parallel with the feed beam; a grip member (10) for gripping the drill tubes; and operation means (5,7,9) for moving a gripped drill tube to a drilling position at the feed beam for screwing on the adapter and possibly on drill tubes already in the hole,

characterized in that the method comprises the following steps:

providing several drill tube sets into said magazine, each set of drill tubes comprising an outer tube and an inner tube, the inner drill tube being positioned inside the outer drill tube and extending out from one end of the outer drill tube;

gripping one outer drill tube at the middle thereof by said gripp member and at the same time gripping a corresponding inner drill tube by a gripping means at the position of the inner drill tube extending outside the outer drill tube; and

moving the outer and inner drill tubes simultaneously to an operating position at said feed beam for cooperation with the adapter and possibly outer and inner drill tubes already present in the hole.

10. A method of operating a handling equipment according to claim 1, comprising a feed beam (3) adjustable to different slopes, a drifter (20) which is moveable along the feed beam, and an adapter (21) connecting the drifter to the upper end of the drill tubes for transmitting percussive and/or rotation power to such drill tubes, said handling equipment comprising a magazine (16) for the drill tubes positioned beside the feed beam so that the drill tubes in the magazine are essentially parallel with the feed beam; a grip member (10) for gripping the drill tubes; and operation means (5,7,9) for moving a gripped drill tube to a drilling position at the feed beam for screwing on the adapter and possibly on drill tubes already in the hole,

characterized in that it comprises the following steps:

placing outer drill tubes and inner drill tubes separately in said magazine;

gripping an inner drill tube by said gripp member and moving it into an operation position at the feed beam for cooperation with the adapter and possibly an inner drill tube already present in the hole; and

gripping an outer drill tube by said gripp member and moving it to a position above the already mounted inner drill tube and moving it outside the inner drill tube for cooperation with the adapter and possibly an outer drill tube already present in the hole, whereby a gripping means (14) can be dispensed with.

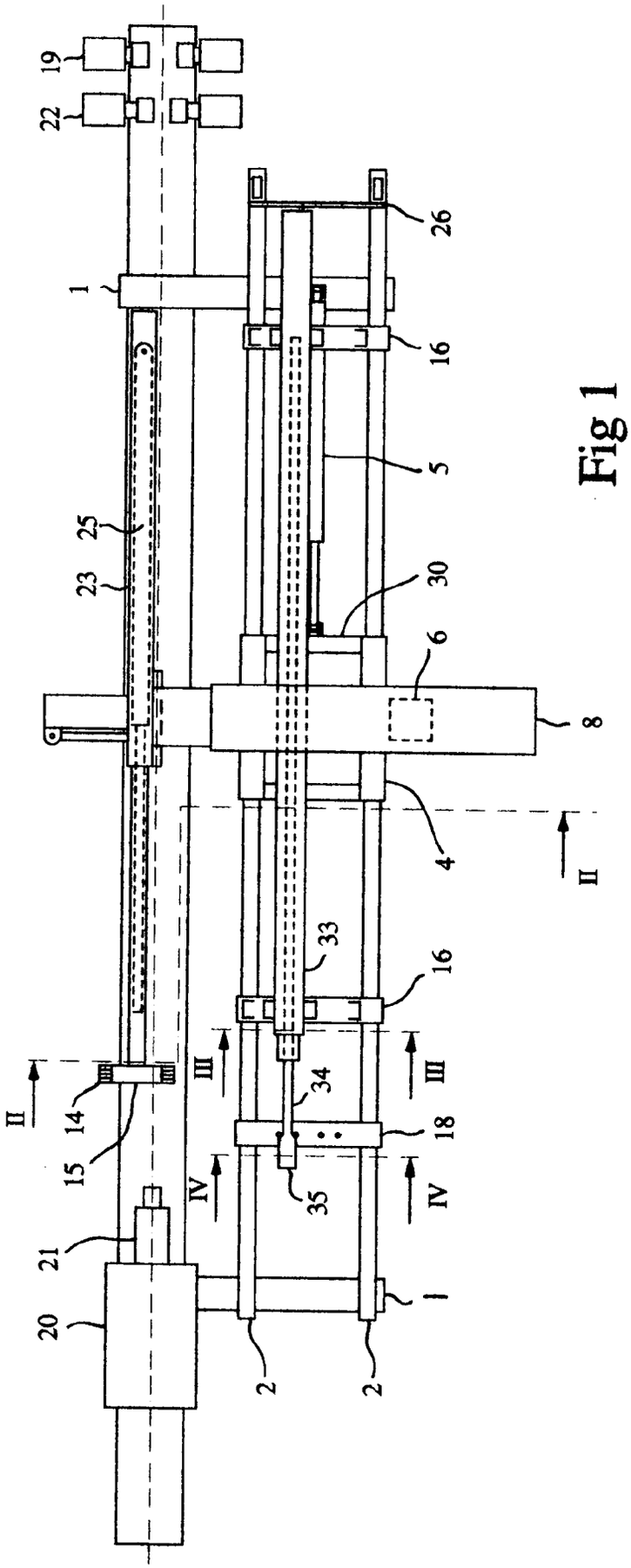
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Fig 1

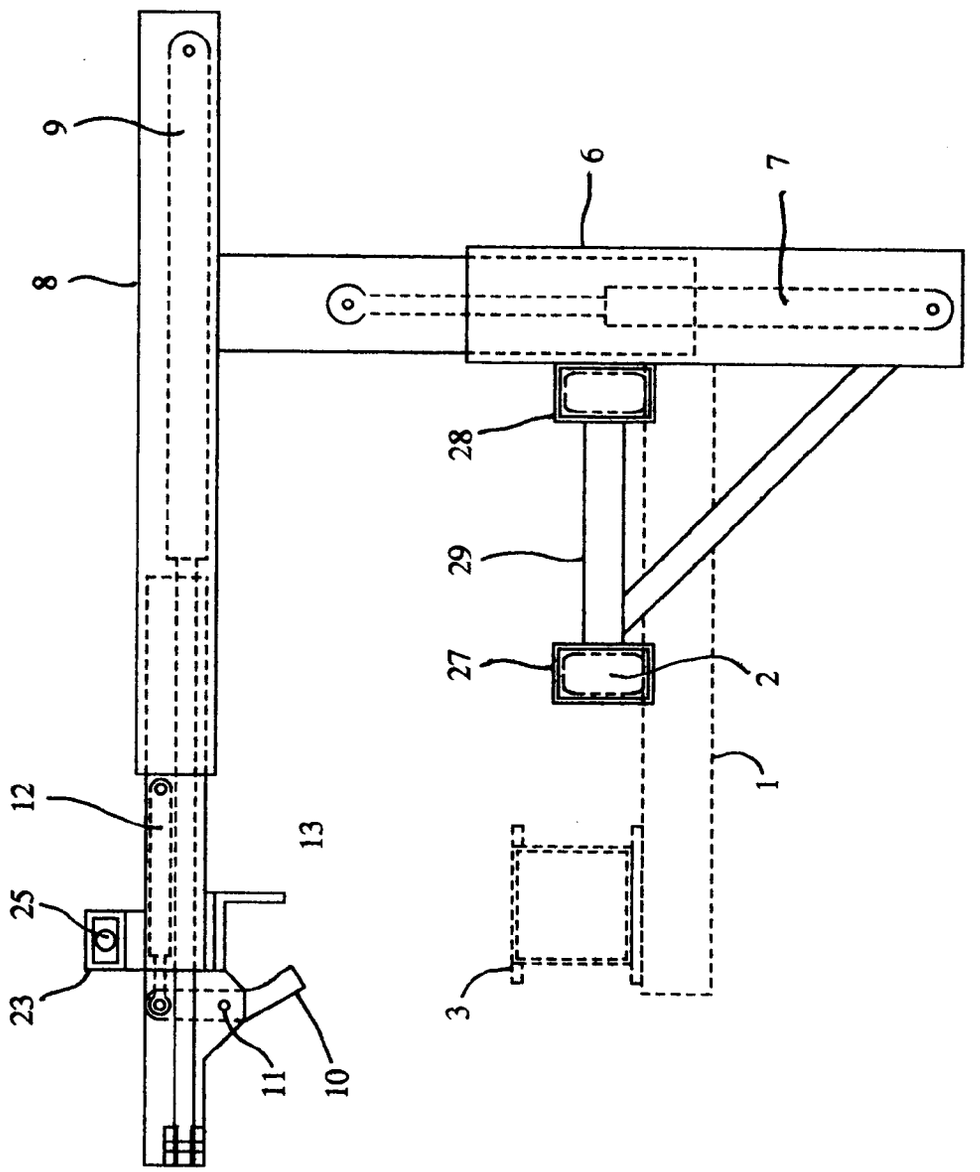

Fig 2

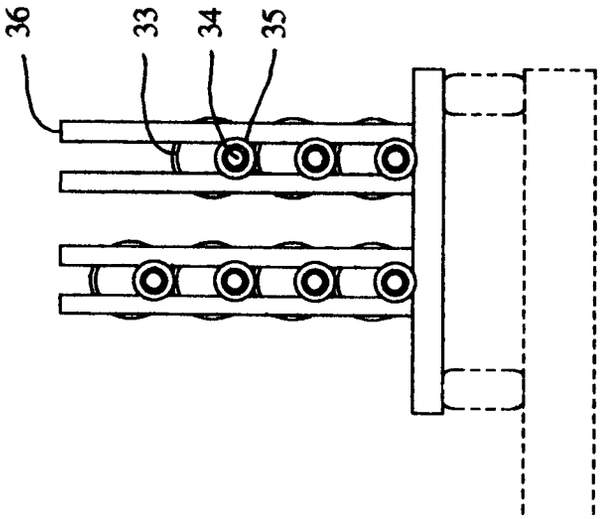

Fig 4

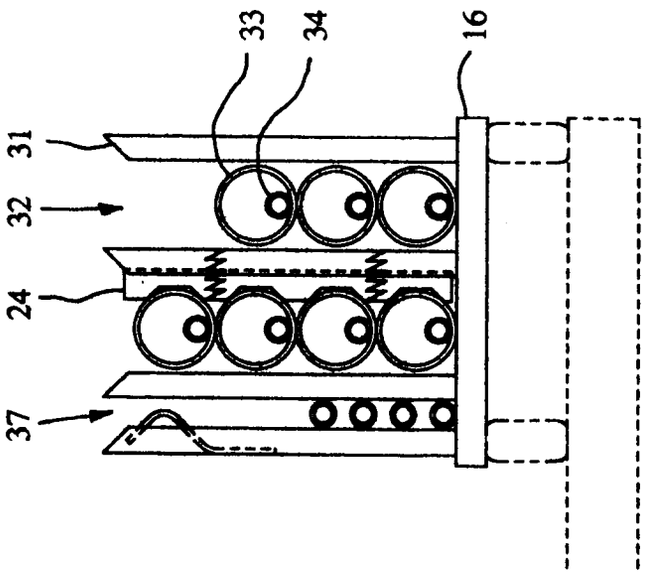

Fig 3

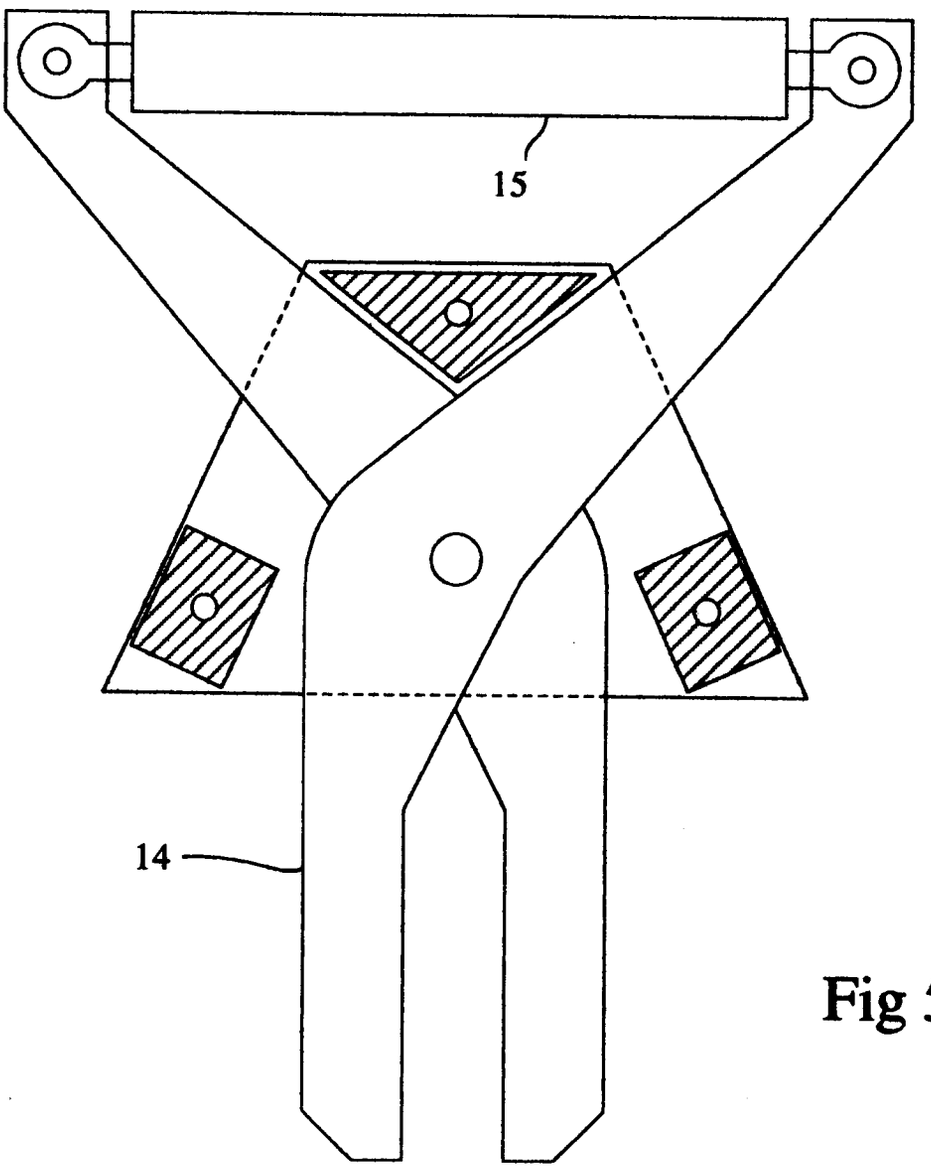

Fig 5

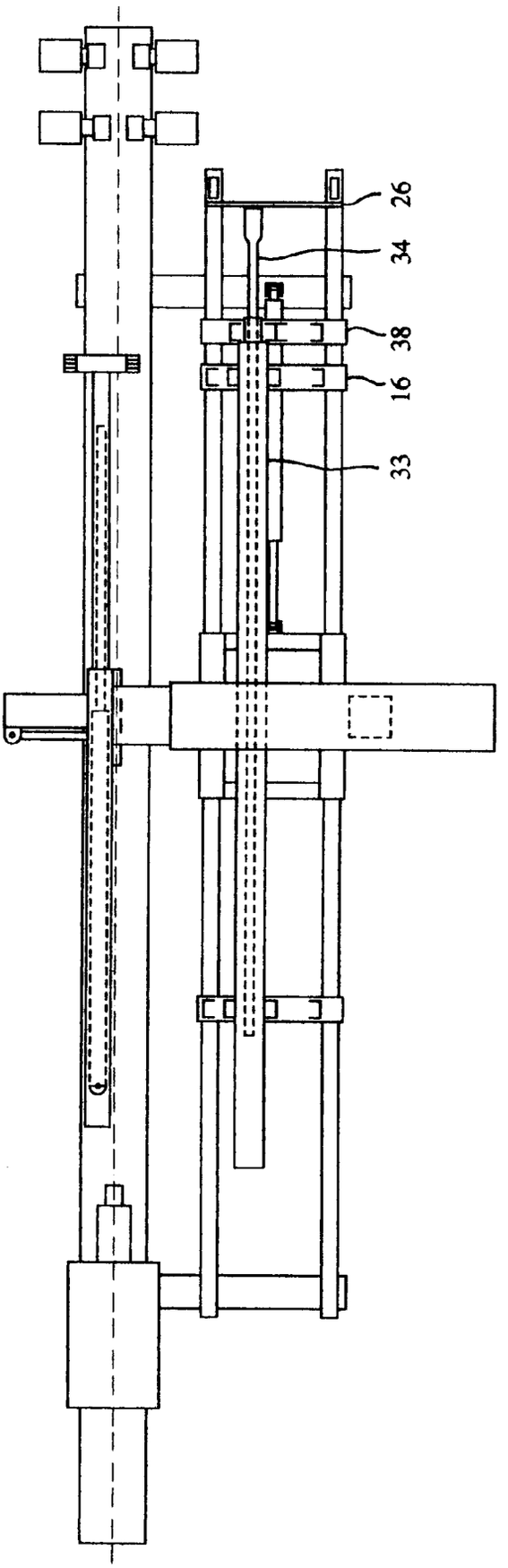

Fig 6

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 93 85 0062

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	US-A-3 734 208 (OTTO) * column 1, line 40 - line 64 * * column 7, line 20 - column 8, line 30; figures 1,3,4 *	1,9,10	E21B19/20
A	US-A-4 102 409 (LAGERSTEDT) * column 1, line 34 - column 2, line 52; figures *	1,9,10	
A	US-A-4 117 941 (MCCLESKEY ET AL.) * column 1, line 36 - column 2, line 44; figures *	1,9,10	
A	US-A-4 765 401 (BOYADJIEFF) * abstract; figures *	1,9,10	
A	US-A-2 730 246 (STONE) * claim 1; figures *	1,9,10	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			E21B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	01 JULY 1993	LINGUA D.G.

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