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

(11) EP 1 980 709 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
15.10.2008 Bulletin 2008/42

(51) Int Cl.:
E21B 7/20 *(2006.01)* ***E21B 3/02*** *(2006.01)*
E21B 19/16 *(2006.01)* ***E21B 19/14*** *(2006.01)*

(21) Application number: **08006077.5**

(22) Date of filing: **28.03.2008**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MT NL NO PL PT RO SE SI SK TR
Designated Extension States:
AL BA MK RS

(30) Priority: **12.04.2007 IT TO20070253**

(71) Applicant: **SOILMEC S.p.A.**
47023 Cesena,
Forli (IT)

(72) Inventor: **Puntel, Patrizio**
47023 Cesna (FO) (IT)

(74) Representative: **Lotti, Giorgio**
Corso Vittorio Emanuele II 61
10128 Torino (IT)

(54) Method for simultaneous handling and loading of drilling rods and casings by means of two independent rotaries

(57) Method for simultaneous handling and loading of drilling rods and casings by means of a machine equipped with two independent rotaries (1 and 2), slidably mounted, independent of one another, on the mast (9) of the machine; there being positionable alongside the mast (9) the loader (3) for loading rods (7) and casings (8), there being applied on the mast (9), at the bottom end, three vices (4, 5 and 6), designed for unscrewing/screwing the rods (7) and casings (8); the method is characterized by the following operations carried out in succession:

a) operation of loading the rods/casings to carry out drilling in the earth down to the desired depth;

b) operation of extraction of the battery of the rods, including the starting rod provided with the bit, and the casings that contain them, setting them resting in the loader, this operation being carried out in the following steps, namely: the first step b1) of extraction and arrangement of the rods (7) in the loader, and the second step b2) of extraction and arrangement of the casings (8) in the loader.

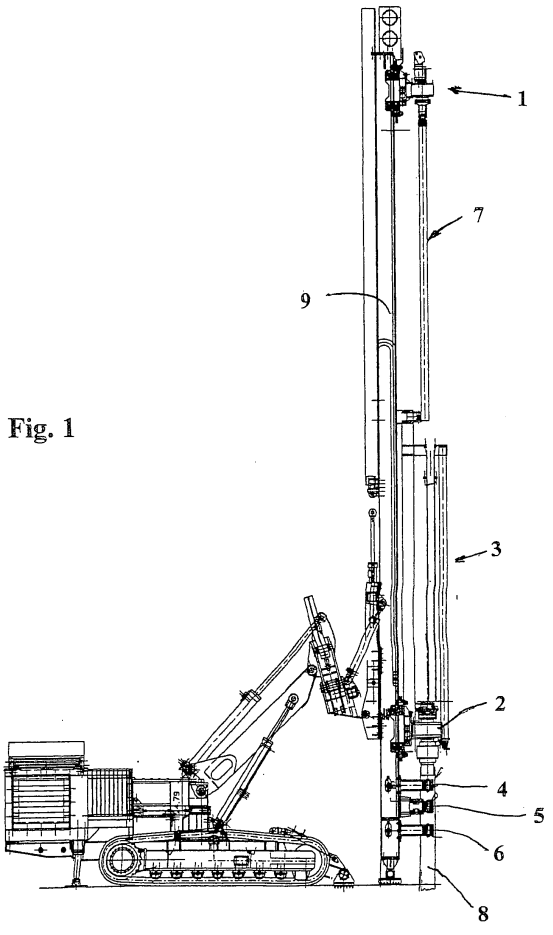

Fig. 1

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Description

[0001] The present invention relates to a method for simultaneous handling and loading of drilling rods and casings by means of two independent rotaries.

[0002] The equipment is based upon the possibility, due to the capacity for sliding throughout the length of the mast of the two, top and bottom, rotating end pieces, of performing the monoeuvre of loading of a drilling battery made up of rods and casings for drilling a hole in the earth and its subsequent recovery to bring the battery itself back into a resting condition in the automatic loader.

[0003] For handling the rods and rods/casings in earth-drilling machines, the following equipment is mainly used: loaders, articulated cranes, mixed systems of cranes plus gripping accessories or winch end pieces.

[0004] The equipment consisting of loaders may be of the following types:

a. rack loaders, with possibilities of stocking rods or rods and casings on the mast and with hydraulic manipulating gripper that picks the rod up off the rack and positions it at pile centre;

b. revolver loaders, with possibilities of stocking rods or rods and casings on the mast and with a system for hydraulic rotation of the supporting arm or jib of the loader that picks the rod up from the rack and positions it at pile centre;

c. simplified-rack loaders: in some machines for digging wells the rack is fixed to the mast, and the rotary, provided with lateral displacement, moves to pick the rod up; the advantage lies in the fact that the manipulator is not required, and the limit is represented by the fact that the rods can be just a few, two or three at the most;

d. well-rack loaders: in well-drilling machines the rack is located on the basic machine and an arm picks the rod and sets it aligned (larger number of rods, more complex system).

[0005] As compared to the use of double loaders or single loaders for rods and single loaders for pipes or of both types of loaders of the revolver type considerable reductions in terms of weights and volumes are obtained, as well as a greater simplicity of manoeuvre.

[0006] For the above and further purposes that will be more clearly understandable from what follows, the invention proposes a method for simultaneous handling and loading of drilling rods and casings by means of two independent rotaries according to Claim 1.

[0007] The method according to the invention will now be described with reference to the annexed plates of drawings, in which:

- Figure 1 illustrates an earth-drilling machine provided with the equipment that implements the method according to the present invention;
- Figures 2 to 5 are schematic representations of the machine of Figure 1, which illustrate the sequence of drilling, with simultaneous loading of rods and casings;
- Figures 6 to 9 show, once again schematically, the sequence of extraction of just the rods; and
- Figures 10 to 13 show, once again schematically, the sequence of extraction of just the casings.

[0008] Represented in Figure 1 is the machine according to the invention. It basically has two rotaries 1 and 2 slidably mounted, independent of one another, on a mast 9.

[0009] Set alongside the mast 9 is a loader 3 for rods 7 and casings 8. As may be noted, the loader 3 is located underneath the rotaries 1 and 2 when these are at their top end of travel.

[0010] At the bottom, applied on the mast 9 are three ? vices 4, 5, and 6, which are necessary, as will be seen, for unscrewing the rods 7 and the casings 8.

[0011] We shall first consider the step of loading of the rods/casings for carrying out drilling into the earth down to the depth required. Reference will be made for this first step to Figures 2 to 5. It may first of all be noted in Figure 2 that the top rotary 1 and the bottom rotary 2 are in the position at the top of the mast 9, and the loader 3 is brought onto the drilling axis of the rod 8.

[0012] In Figure 3, the two rotaries 1 and 2 are lowered onto the loader 3 and made to rotate so as to screw a rod to the top rotary 1 and the casing to the bottom rotary 2, the rod and casing being ready in the loader 3.

[0013] In Figure 4, the loader 3 is moved away, the rod 7 and the casing 8 being left on the drilling axis suspended from the respective rotaries.

[0014] In Figure 5, the rotaries 1 and 2 set the battery constituted by the rod 7 and the corresponding casing 8, screwed on the underlying rod 7' and the corresponding casing 8', in rotation and cause it to advance, thus drilling into the earth.

[0015] As the battery sinks into the earth, it is necessary to add on top of it another rod 7 with the corresponding casing 8 so that, with the aid of the vices 4, 5, the rotaries 1 and 2 are unscrewed from the rod and the casing that project from the ground and can come up, whilst the vice 6 withholds the casing 8. The cycle starts again from the step illustrated in Figure 2 and is repeated until drilling is completed.

[0016] Once drilling is completed, it is necessary to extract the battery of rods, including the starting rod provided with the bit, and the casings that contain them, setting them resting in the loader. This operation is performed in two successive steps: a first step of extraction of the rods 7 and their arrangement in the loader and a second step of extraction of the casings 8 and their arrangement in the loader.

[0017] The first of the two steps is represented in Figures 6 to 9. In Figure 6, it may first of all be noted that the rotary 1 has come up together with the rotary 2, extracting a first rod 7 from the casing 8 and, with the aid

of the vices 4, 5, and 6, has disconnected it from the subsequent rods. The loader 3 sets itself back again on the drilling axis to receive the rod 7.

[0018] In Figure 7, the rotary 1 has disconnected from the rod, and the loader 3, which has received it, brings it into the resting position.

[0019] In Figure 8, the rotary 1 is lowered together with the rotary 2 and, setting itself in rotation, screws onto the next rod 7, which is held stationary by the vice 5.

[0020] The rotary 1 can now come up together with the rotary 2, whilst the unscrewing vice 4 loosens the next joint, and the sequence returns to the step represented in Figure 6, from which the cycle just described is repeated until all the rods, including the bit have been completely extracted.

[0021] In Figure 9, the casing 8 is filled with a reinforcement 10 and cement grout or whatever is envisaged in the project. The rotary 1 is held up high so as not to hamper access to the hole.

[0022] The rotary 2 is preferably held up high to reduce the encumbrance in the working area, facilitate the operation of unscrewing, and protect it from any accidental damage.

[0023] The operating sequence described in Figures 6 to 9 can, however, be performed also with the rotary 2 kept permanently in the bottom position. In this case, the sleeve for connection of the rotary 2 to the casing must be kept outside the vices 4 and 5.

[0024] Figures 10 to 13 once again show schematically the second phase of the operation of extraction of the rods and the corresponding casings, namely, the phase of extraction of just the casings 8.

[0025] In Figure 10, the rotary 1 is up and the rotary 2 is down, connected to the first casing 8. The rods 7 are all on the loader 3.

[0026] In Figure 11, the loader 3 has been brought up in alignment with the drilling rod, and the rotary 1 has picked up a rod 7 so that the loader 3 can return into the resting condition.

[0027] In Figure 12, the rotary 2 has moved up, so coating the rod 7 with a casing 8 that is disconnected from the subsequent casing 8', which is withheld by the vice 6.

[0028] In Figure 13, the loader 3 receives the rod 7 and the casing 8 in a coaxial position to set them in a resting condition.

[0029] The sequence returns to the step illustrated in Figure 10, and the cycle is repeated until all the rods 7 are in the loader 3 coated with the respective casings 8.

Claims

1. A method for simultaneous handling and loading of drilling rods and casings by means of a machine provided with two rotaries (1 and 2), slidably mounted, independent of one another, on the mast (9) of the machine; there being positionable alongside the mast (9) the loader (3) for loading rods (7) and casings (8), there being applied on the mast (9), at the bottom end, three vices (4, 5 and 6), designed for unscrewing/screwing of the rods (7) and of the casings (8); the method being **characterized by** the following operations carried out in succession:

a) operation of loading of the rods/casings to carry out drilling in the earth down to the desired depth, wherein the following steps are carried out in succession:

a1) the top rotary (1) and bottom rotary (2) are in the position at the top of the mast (9), and the loader (3) is brought onto the axis of drilling of the rod (7);
a2) the two rotaries (1 and 2) are lowered onto the loader (3) and made to turn so as to screw, respectively, a rod (7) to the top rotary (1) and the corresponding casing (8) to the bottom rotary (2), the rod and casing being ready in the loader (3) ;
a3) the loader (3) is moved away, leaving the rod (7) and the casing (8) on the drilling axis suspended from the respective rotaries (1 and 2);
a4) the rotaries (1 and 2) set the battery, constituted by the rod (7) and the corresponding casing (8), screwed on the underlying rod (7') and the corresponding casing (8'), in rotation and cause it to advance, thus drilling into the earth;
a5) a further rod (7) with the corresponding casing (8) is added on top with the aid of the two top vices (4, 5), by means of which the rotaries (1 and 2) are screwed off the rod and off the casing that project from the ground and can rise, whilst the bottom vice (6) withholds the casing (7');
a6) the cycle from step a2 to step a5 is repeated until completion of the drilling operation;

b) operation of extraction of the battery of rods, including the starting rod provided with the bit, and casings that contain them, setting them resting in the loader, this operation being carried out in the following steps, namely: the first step b1) of extraction and arrangement of the rods (7) in the loader, and the second step b2) of extraction and arrangement of the casings (8) in the loader; the step b1) of extraction and arrangement of the rods (7) in the loader consisting in succession of the following steps:

b1a) the top rotary (1) is made to come up together with the bottom rotary (2), extracting a first rod (7) from the casing (8), which, with the aid of the vices (4, 5 and 6) has

disconnected it from the subsequent rods;
the loader (3) goes back onto the drilling axis to receive the rod (7);
b1b) the top rotary (1) is disconnected from the rod (7), and the loader (3), which has received it, brings it into the resting position;
b1c) the top rotary (1) is lowered together with the bottom rotary (2) and, setting itself in rotation, screws onto the next rod (7), which is held stationary by the intermediate vice (5);
b1d) the top rotary (1) goes up, together with the bottom rotary (2), whilst the top unscrewing vice (4) loosens the next joint;
b1e) the cycle from step b1a to step bld is repeated until complete extraction of all the rods, including the bit;

the step b2) of extraction and arrangement of the casings (8) in the loader consisting in succession of the following steps:

b2a) the top rotary (1) is positioned at the top and the bottom rotary (2) at the bottom, connected to the first casing (8);
b2b) the loader (3) is brought into alignment with the drilling axis, and the rotary (1) picks up a rod (7) so that the loader (3) can go back into the resting position;
b2c) the bottom rotary (2) is raised, thus coating the rod (7) with a casing (8), disconnected from the next casing (8'), which is withheld by the bottom vice (6);
b2d) the loader (3) receives the rod (7) and the casing (8) in a coaxial position to bring them into a resting condition;
b2e) the cycle from step b2a to step b2d is repeated until all the rods (7) are in the loader (3), coated with the corresponding casings (8).

2. The method according to Claim 1, **characterized in that**, following upon step b1e), the casing (8), connected to the bottom rotary (2), is filled with a reinforcement (10) and cement grout or whatever is envisaged in the project.

3. The method according to Claim 1, **characterized in that** in steps b1a to b1e the rotary 2 is held permanently in a bottom position.

Fig. 1

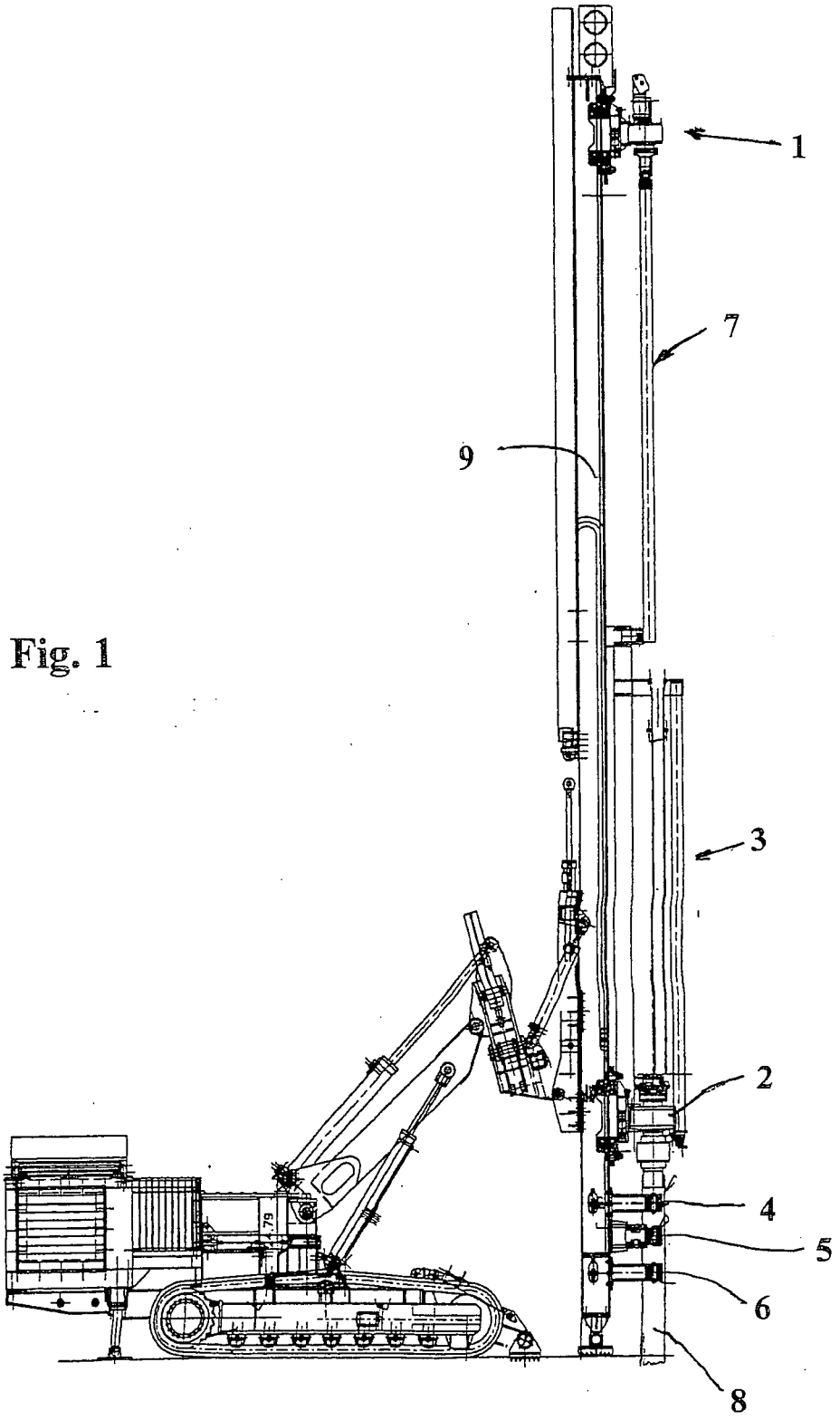


Fig. 2

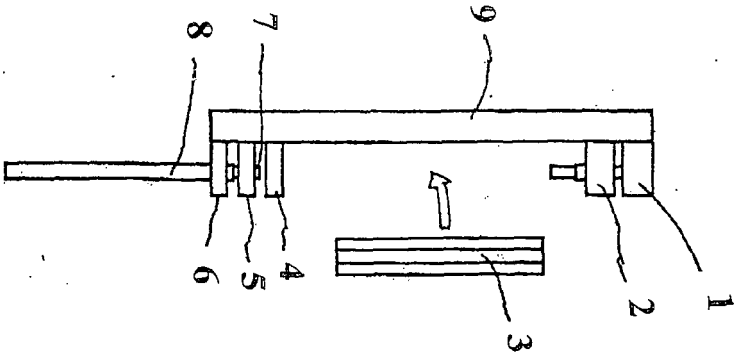


Fig. 3

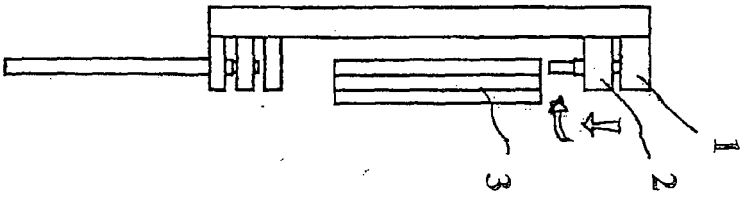


Fig. 4

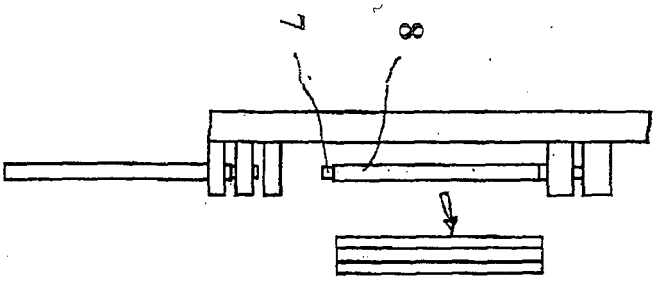


Fig. 5

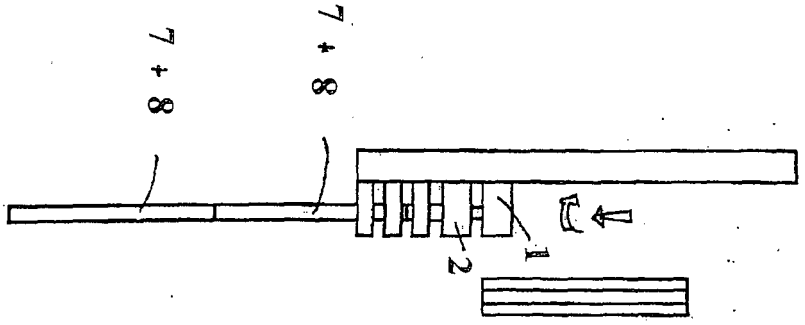


Fig. 6

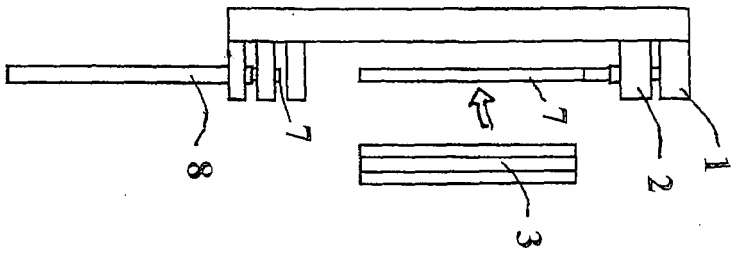


Fig. 7

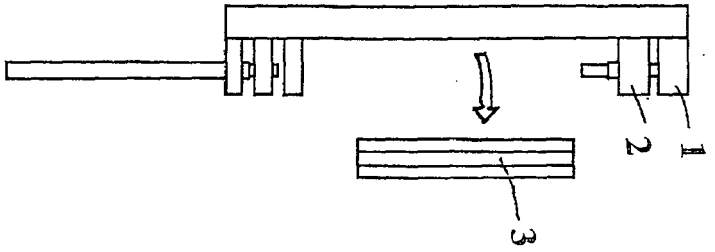


Fig. 8

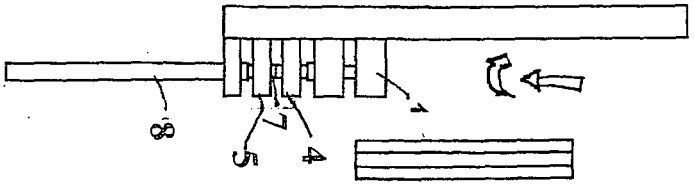


Fig. 9

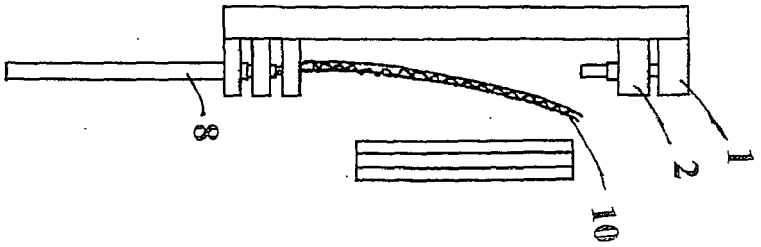


Fig. 10

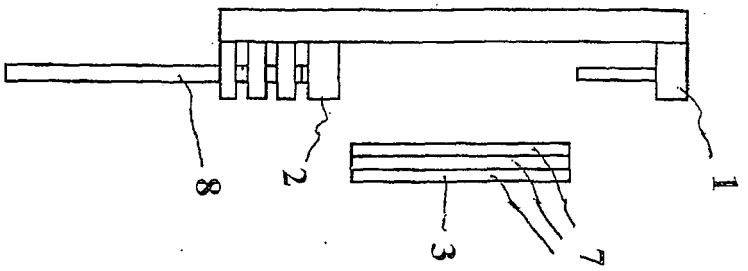


Fig. 11

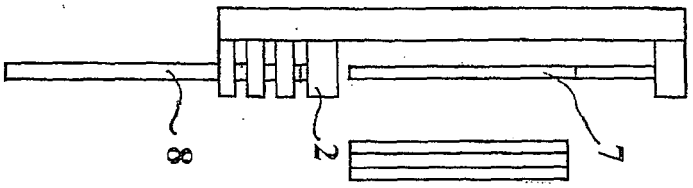


Fig. 12

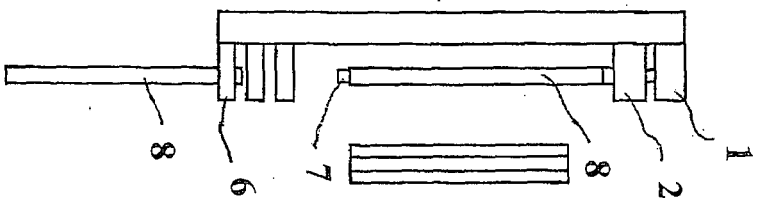
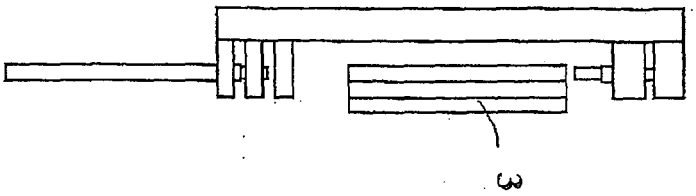


Fig. 13



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EUROPEAN SEARCH REPORT

Application Number
EP 08 00 6077

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	26 August 2008	van Berlo, André

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