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(54) **HOLDING WRENCH FOR ROCK DRILLING MACHINE AND ROCK DRILLING MACHINE
INCLUDING SUCH A HOLDING WRENCH**

HALTESCHLÜSSEL FÜR GESTEINSBOHRMASCHINE UND SOLCH EINEN HALTESCHLÜSSEL
ENTHALTENDE GESTEINSBOHRMASCHINE

CLE DE SUPPORT POUR MACHINE DE FORAGE DE ROCHES ET MACHINE DE FORAGE DE
ROCHES EQUIPEE D'UNE CLE DE SUPPORT DE CE TYPE

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Description

Field of the invention

[0001] The invention concerns a holding wrench according to the preamble of claim 1 and a rock drilling machine including such a holding wrench.

Background of the invention

[0002] In the process of rock drilling, a drill string having a reamer at its free end has to be assembled in accordance with the advancement of the reamer into the rock structure. Thus drill string components are accordingly joined so as to form the drill string at a proximal end thereof, generally by screwing a new drill string component onto the advanced drill string. After further advancement of the reamer, a new drill string component is added similarly to the proximal end of the thus advanced drill string and so on.

[0003] Disassembling of the drill string is carried out in the opposite way, i.e. the drill string is drawn into the drilling machine under successive loosening of the proximal drill string component from the rest of the drill string.

[0004] In order to control the drill string and to allow the most proximal drill string component to be joined and disjoined respectively, the drill string has to be fixed against rotational movement, which is accomplished by engagement of a holding wrench. There are different types of holding wrenches used for this purpose, for example fixed wrenches having gripping jaws positioned inside a U-shaped gripping head as disclosed in GB-A-2,139,129. It is also known to have gripping means being pivotally supported so as to be positioned into gripping position by means of actuators as disclosed in GA-A-2,440,176. In case of large dimensions there are corresponding high demands for powerful actuators so as to resist forces occurring during in particular in loosening of a drill string component during disassembling of the drill string.

Aim and most important features of the invention

[0005] It is an aim of the invention to provide an improved holding wrench of the kind indicated above which is capable of resisting important forces emanating during assembling and disassembling of a drill string and still be possible to be manufactured with relatively small dimensions.

[0006] This aim is obtained in accordance with a holding wrench with the features of claim 1.

[0007] Hereby it is ensured that the gripping means are not relocated during wrenching movement, since the closed rigid wrench structure guarantees that the gripping means remain into gripping contact with the wrenching surfaces of the drill string component also if they are subjected to important forces.

[0008] The invention also makes it possible to reduce

the dimensions on the gripping means as well as the positioning means. In particular the latter only have to be dimensioned for moving the gripping means and not for resisting any wrenching forces.

[0009] A holding wrench according to the invention is particularly useful for excavating drilling machines meaning that a relatively large diameter drill bit, or a reamer, is used and in particular where the frame opening is dimensioned such that the reamer can pass said frame opening under retraction of the entire drill string including the reamer. In this case there is a demand for the gripping means to be able to move between the active position where it is capable of gripping a drill string having a diameter of perhaps only about 1/5 - 1/3 of the free diameter of the frame opening.

[0010] It is preferred that the locking means are pivotally movable and in particular that they form hook parts that upon pivoting engagement pins or the like on an adjacent gripping means. It is preferred that the engagement means are actuated by linear hydraulic actuators but pneumatic and electric actuators can also be useful.

[0011] In an embodiment the locking means are rotatable and engage into a corresponding element by means of for example screw threads or bayonet coupling elements by means of a rotational actuator.

[0012] Further advantages of the invention result from other features and will be indicated in the following detailed description of an embodiment.

Brief description of drawings

[0013] The invention will now be described in more detail at the background of an embodiment and with reference to the drawings, wherein:

Fig. 1 shows a drilling machine making use of a holding wrench according to the invention,

Fig. 2 shows the drilling machine of Fig. 1 in a first perspective view,

Fig. 3 shows the drilling machine according to Fig. 1 in a second perspective view,

Fig. 4 shows a holding wrench according to the invention in an inactive position,

Fig. 5 shows the holding wrench of Fig. 4 in an active position gripping a drill string component,

Fig. 6 shows parts of the holding wrench of Fig. 4 and 5 in an enlarged perspective view, and

Fig. 7 shows the holding wrench according to Figs. 4-6 together with a guide bushing for a pilot bit.

Description of an embodiment

[0014] In Fig. 1 there is shown a rock drilling machine for excavating purposes, wherein a reamer 3, which is carried on a drill string 2, excavates a cylindrical part of rock formation. A pilot bit is indicated with 4 and a head frame of a holding wrench according to the invention is indicated with 5. The rock drilling machine 1 provides several additional details which are not part of this invention and therefore not described here.

[0015] In the perspective view in Fig. 2 the rock drilling machine 1 is shown having at its left end a compartment for storing drill string components 2' to be assembled into a drill string. A derrick 8 includes the head frame 5 of the holding wrench 6, wherein the free opening of the frame 5 viz. the frame opening 7 appears as having a diameter substantially exceeding the diameter of the drill string component 2'. The derrick is tiltable by power means which are not part of this invention and therefore not described here.

[0016] In the second perspective view of the rock drilling machine 1 in Fig. 3 the frame opening 7 is shown in connection with the comparatively large diameter reamer 3, which is intended to be drawn inside the rock drilling machine, that is through the frame opening 7, after the finishing of one bore hole and during transport to the next drilling position.

[0017] In Fig. 4 a holding wrench having only a slightly differently shaped head frame 5 from the one shown in Fig. 2 and 3 is shown. Fig. 4 shows the holding wrench in the inactive position of the gripping means 9, wherein free passage through the frame opening 7 is allowed since the gripping means are entirely positioned beside said opening 7. In Fig. 4 there is further shown two locking means 14, one positioned on each gripping means 9 and have the function which will be described in more detail below.

[0018] In Fig. 5 the gripping means 9 have been displaced to their active position such that they engage with wrenching surfaces (20 in Figs. 1 and 2) on a drill string component. In this position the gripping means are interlocked to each other by the locking means on one gripping means engaging an engagement means on an adjacent gripping means so as to form a closed rigid wrench structure which entirely encloses a drill string component 2'.

[0019] In Fig. 6 parts of the holding wrench are shown without the background of the head frame for clarity reasons. In Fig. 6 the gripping means are, like in Fig. 5, in the active position, that is with the gripping means being rigidly interconnected to each other by means of the locking means. These are in the form of pivotal engagement elements which are at least partly hook shaped, and wherein each respective hook portion catches an engagement means 15 in the form of a pin which is positioned at an adjacent area of an adjacent gripping means.

[0020] In Fig. 6 there is further shown a respective pivot axes 12, around which the gripping means are pivotally

movable by means of one respective positioning means 10 which in this case is a hydraulic cylinder. In more detail each gripping means provides a swing arm 11 for obtaining the sufficient distance when rotating between the active position and the inactive position. Each locking means is movable by means of one respective linear actuator 17, also in the form of a hydraulic cylinder.

[0021] Inside each gripping means there are a number, here 2, gripping surfaces 13 which in this case are positioned at right angle to each other, for engagement with the similarly shaped wrenching surfaces on the respective drill string components 2'.

[0022] The invention also provides for the possibility of having the holding wrench acting as a guide for a starter sub (detail 4' in Fig. 1) which carries the pilot bit 4, at the initial stage of a drilling operation. This is accomplished by having the holding wrench in its active, closed position, holding a guide bushing 18 having an inside opening allowing axial movement of the starter sub (4' in Fig. 1). This is done during only a short distance allowing the pilot bit to be fully established in its pilot hole in the rock. Thereafter the holding wrench is opened and the guide bushing, which preferably consists of two halves, is removed, whereafter the drilling procedure continues.

[0023] The invention may be modified within the scope of the invention. For example the gripping means may be actuated differently by for example pneumatic or electric actuators. The number of gripping means may be different, for example three or four. The position of the locking means may be altered and it is also within the scope of the invention to provide locking by other means than by pivotal hooking together two adjacent gripping means. An example of this is to have screw means and another example is bayonet coupling means between two adjacent gripping means. It should be understood that it is preferred that the movement of the gripping means as well as the movement of the locking means are controlled either automatically by a control system or distance controlled by an operator.

[0024] It is however not excluded that locking is made entirely manually although this is not preferred with respect to this invention.

[0025] The invention has been described mainly at the background of a particular rock drilling machine with excavating reamer but it is to be understood that the invention is applicable also in other types of rock drilling applications.

Claims

1. Holding wrench (6) for holding drill string components (2') for the purpose of assembling or disassembling a drill string (2) during a drilling process and including positioning means (10) for moving at least two gripping means (9) into engagement with wrenching surfaces (20) of the drill string components, wherein the gripping means are pivotally sup-

- ported on a head frame (5) so as to be pivotal in a plane perpendicular to a central axis of the drill string between an active, gripping position and an inactive, retracted position, and wherein the head frame (5) has a frame opening (7) for the passage of the drill string (2), **characterized in that** each gripping means (9) includes locking means (14) for interlocking engagement with engagement means (15) on an adjacent gripping means (9) in the active position so as to obtain a closed rigid wrench structure.
2. Wrench according to claim 1, **characterized in that** the frame opening (7) allows the passage of a reamer (3) for excavating rock in the inactive position of the gripping means.
 3. Wrench according to claim 1 or 2, **characterized in that** each locking means (14) includes a pivotal engagement element.
 4. Wrench according to claim 3, **characterized in that** each pivotal engagement element (14) is at least partly hook-shaped.
 5. Wrench according to any of the previous claims, **characterized in that** each engagement means (15) is pin-shaped.
 6. Wrench according to any of the claims 3 - 5, **characterized in that** the engagement element (14) is actuated by a linear actuator (17) of the group: hydraulic motor, pneumatic motor, electric motor.
 7. Wrench according to claim 1 or 2, **characterized in that** each locking means is rotatable and that interlocking engagement with the engagement means is obtained through a rotational movement.
 8. Wrench according to claim 7, **characterized in that** interlocking engagement is obtained through any of the group: screw treads, bayonet coupling elements.
 9. Wrench according to claim 7 or 8, **characterized in that** the locking means is actuated by a rotational actuator from the group: hydraulic motor, pneumatic motor, electric motor.
 10. Wrench according to any of the previous claims, **characterized in that** each gripping means (9) is pivotal in a plane which is parallel to the general plane of the head frame.
 11. Wrench according to any of the previous claims, **characterized in that** each positioning means (9) is an actuator from the group: hydraulic linear or rotatable motor, electric linear or rotatable motor, pneumatic linear or rotatable motor.
 12. Wrench according to any of the previous claims, **characterized in that** the number of gripping means (9) is two - four.
 13. Drilling machine (1) for extracting ore from an ore-bearing rock through excavation with a reamer (3) having its cutting surface directed from the machine during the process of drilling, and including a wrench (6) according to any of the claims 1 - 12 for holding drill string components for the purpose of assembling or disassembling a drill string (2), carrying the reamer (3), during the drilling process.
- ### 15 Patentansprüche
1. Halteschlüssel (6) zum Halten von BohrstrangkompONENTEN (2') zum Zweck des Zusammenbaus oder des Zerlegens eines Bohrstrangs (2) während eines Bohrprozesses und beinhalten Positionierungsmittel (10) zur Bewegung von zumindest zwei Greifmitteln (9) in den Eingriff mit Schlüsseloberflächen (20) der BohrstrangkompONENTEN, wobei die Greifmittel gelenkig auf einem Hauptrahmen (5) getragen sind, sodass sie in einer Ebene normal zu einer zentralen Achse des Bohrstranges zwischen einer aktiven Greifposition und einer inaktiven eingezogenen Position schwenkbar sind, und wobei der Hauptrahmen (5) eine Rahmenöffnung (7) für den Durchtritt des Bohrstranges (2) hat, **dadurch gekennzeichnet, dass** jedes Greifmittel (9), Schließmittel (14) zum verriegelnden Eingreifen mit Eingriffsmitteln (15) auf einem angrenzenden Greifmittel (9) in der aktiven Position beinhaltet, um eine geschlossene starre Schlüsselstruktur zu erhalten.
 2. Schlüssel nach Anspruch 1, **dadurch gekennzeichnet, dass** die Rahmenöffnung (7) das Durchtreten eines Räumers (3) zum Ausräumen von Gestein in der inaktiven Position des Greifmittels erlaubt.
 3. Schlüssel nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** jedes Schließmittel (14) ein drehbares Eingriffselement beinhaltet.
 4. Schlüssel nach Anspruch 3, **dadurch gekennzeichnet, dass** jedes drehbare Eingriffselement (14) zumindest teilweise hakenförmig ist.
 5. Schlüssel nach irgendeinem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** jedes Eingriffsmittel (15) stiftförmig ist.
 6. Schlüssel nach irgendeinem der Ansprüche 3 bis 5, **dadurch gekennzeichnet, dass** das Eingriffselement (14) durch einen linearen Antrieb (17) der Gruppe: hydraulischer Motor, pneumatischer Motor,

elektrischer Motor, betätigt wird.

7. Schlüssel nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** jedes Schließmittel drehbar ist, und dass der Verriegelungseingriff mit dem Eingriffsmittel durch eine Drehbewegung erhalten wird. 5
8. Schlüssel nach Anspruch 7, **dadurch gekennzeichnet, dass** der verriegelnde Eingriff erreicht wird durch irgendeines der Gruppe: Schraubengewinde, Bajonett-Kupplungselemente. 10
9. Schlüssel nach Anspruch 7 oder 8, **dadurch gekennzeichnet, dass** die Schließmittel durch einen Rotationsantrieb von der Gruppe: hydraulischer Motor, pneumatischer Motor, elektrischer Motor, betätigt werden. 15
10. Schlüssel nach irgendeinem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** jedes Greifmittel (9) zentral in einer Ebene drehbar ist, die parallel zu der allgemeinen Ebene des Hauptrahmens ist. 20
11. Schlüssel nach irgendeinem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** jedes Positionierungsmittel (9) ein Antrieb aus der Gruppe: hydraulischer linearer oder drehbarer Motor, elektrischer linearer oder drehbarer Motor, pneumatischer linearer oder drehbarer Motor, ist. 25 30
12. Schlüssel nach irgendeinem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Anzahl von Greifmitteln (9) zwei bis vier ist.
13. Bohrmaschine (1) zur Extraktion von Erzen aus einem erzhaltigen Gestein durch Aushub mit einem Räumer (3), der seine Schneidflächen während des Bohrprozesses von der Maschine gerichtet hat, und mit einem Schlüssel (6) nach irgendeinem der Ansprüche 1 bis 12 zum Halten von Bohrstrangkomponten zum Zweck des Zusammenbaus oder des Zerlegens eines Bohrstranges (2), der den Räumer (3) während des Bohrprozesses trägt. 40 45

Revendications

1. Clé (6) de maintien pour maintenir des composants (2') de train de tiges à des fins de montage, ou de démontage, d'un train de tiges (2) pendant un traitement de forage, et incluant un moyen (10) de positionnement permettant d'amener au moins deux moyens (9) de prise en engagement avec des surfaces (20) d'engagement de clé des composants de train de tiges, dans laquelle les moyens de prise sont supportés de manière pivotante sur un bâti (5) de tête de façon à pivoter dans un plan perpendiculaire 50 55

à un axe central du train de tiges entre une position active de prise et une position inactive de retrait, et dans laquelle le bâti (5) de tête comporte une ouverture (7) de bâti permettant le passage du train de tiges (2), **caractérisée en ce que** chaque moyen (9) de prise inclut un moyen (14) de verrouillage permettant un engagement de verrouillage mutuel avec un moyen (15) d'engagement situé sur un moyen (9) de prise adjacent dans la position active de façon à obtenir une structure de clé rigide fermée.

2. Clé selon la revendication 1, **caractérisée en ce que** l'ouverture (7) de bâti permet le passage d'un trépan (3) permettant une excavation rocheuse dans la position inactive des moyens de prise.
3. Clé selon la revendication 1 ou 2, **caractérisée en ce que** chaque moyen (14) de verrouillage inclut un élément pivotant d'engagement.
4. Clé selon la revendication 3, **caractérisée en ce que** chaque élément pivotant (14) d'engagement a au moins partiellement une forme de crochet.
5. Clé selon l'une quelconque des revendications précédentes, **caractérisée en ce que** chaque moyen (15) d'engagement a une forme de broche.
6. Clé selon l'une quelconque des revendications 3 à 5, **caractérisée en ce que** l'élément (14) d'engagement est actionné par un actionneur linéaire (17) du groupe : moteur hydraulique, moteur pneumatique, moteur électrique.
7. Clé selon la revendication 1 ou 2, **caractérisée en ce que** chaque moyen de verrouillage peut pivoter, et **en ce que** l'on obtient un engagement de verrouillage mutuel avec le moyen d'engagement par un mouvement de rotation.
8. Clé selon la revendication 7, **caractérisée en ce que** l'on obtient un engagement de verrouillage mutuel par l'un quelconque du groupe : éléments de couplage à vis, à baïonnette.
9. Clé selon la revendication 7 ou 8, **caractérisée en ce que** le moyen de verrouillage est actionné par un actionneur rotatif du groupe : moteur hydraulique, moteur pneumatique, moteur électrique.
10. Clé selon l'une quelconque des revendications précédentes, **caractérisée en ce que** chaque moyen (9) de prise est pivotant dans un plan qui est parallèle au plan général du bâti de tête.
11. Clé selon l'une quelconque des revendications précédentes, **caractérisée en ce que** chaque moyen (9) de positionnement est un actionneur du groupe :

moteur hydraulique linéaire ou rotatif, moteur électrique linéaire ou rotatif, moteur pneumatique linéaire ou rotatif.

12. Clé selon l'une quelconque des revendications précédentes, **caractérisée en ce que** le nombre de moyens (9) de prise est de deux à quatre. 5
13. Machine (1) de forage permettant l'extraction d'un minerai d'une roche métallifère par une excavation à l'aide d'un trépan (3) dont la surface de coupe est dirigée à partir de la machine pendant le traitement de forage, et incluant une clé (6) selon l'une quelconque des revendications 1 à 12, destinée à maintenir des composants de train de tiges à des fins de montage, ou de démontage, d'un train de tiges (2), pour supporter le trépan (3), pendant le traitement de forage. 10 15

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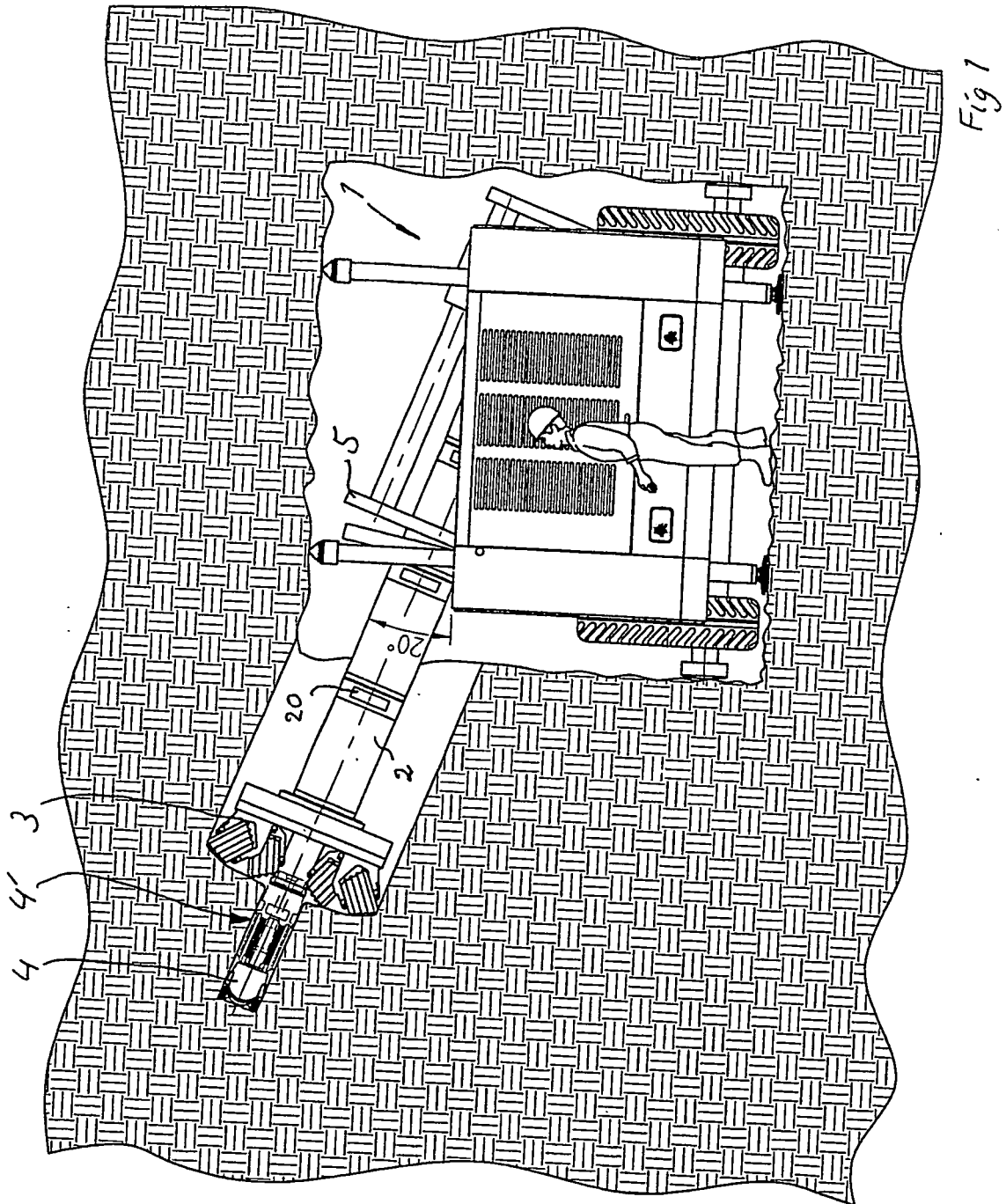
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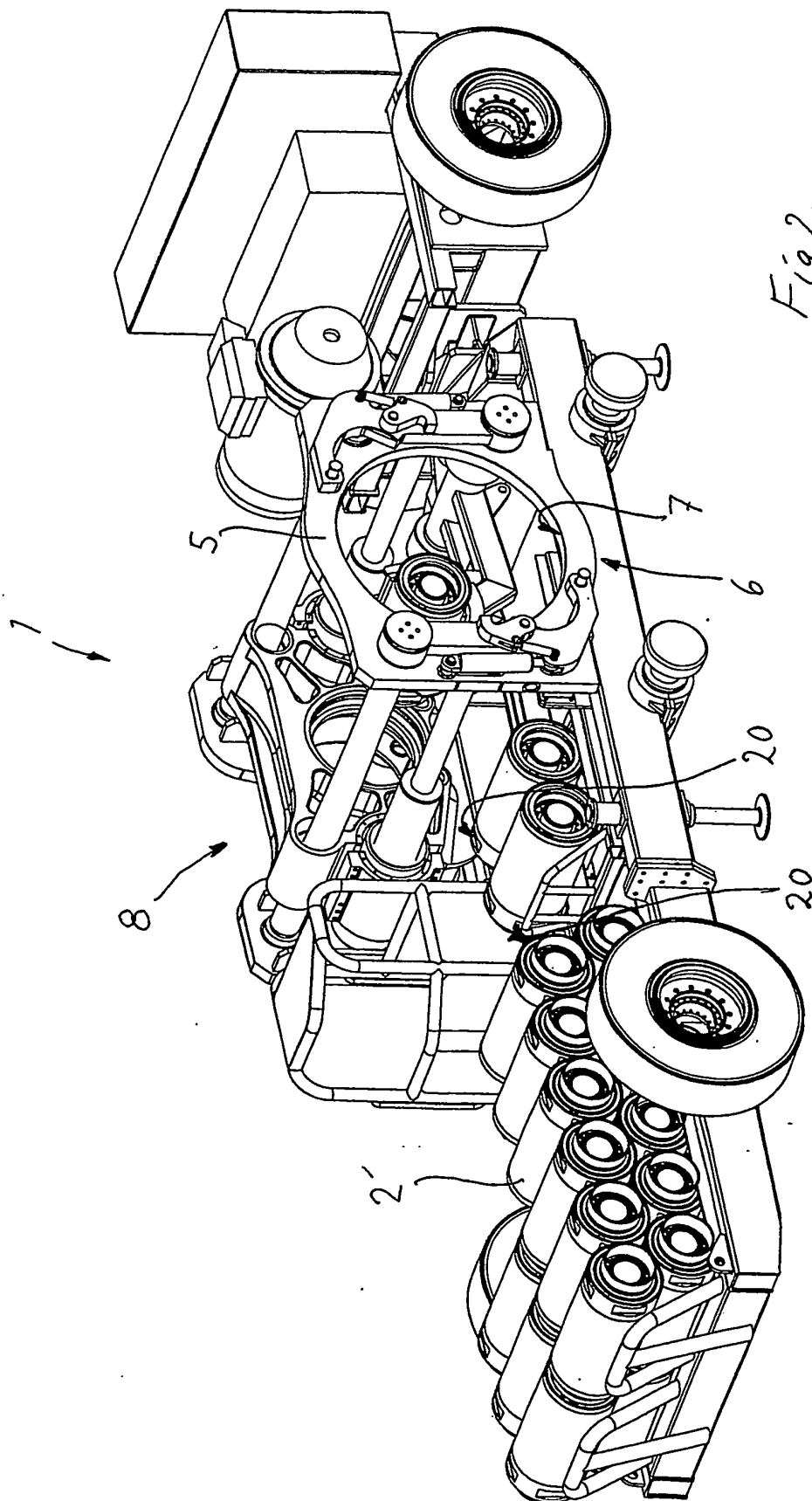
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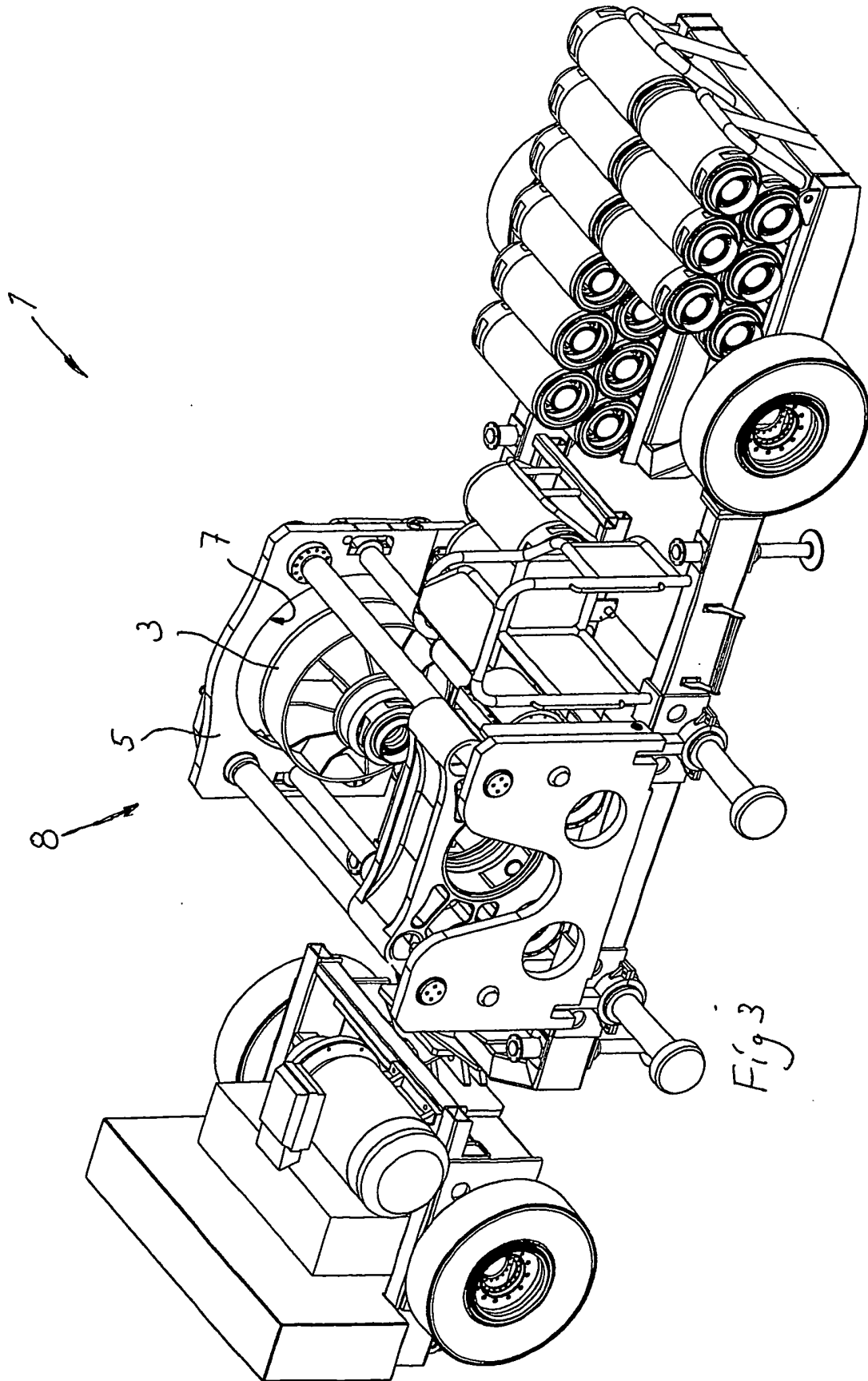
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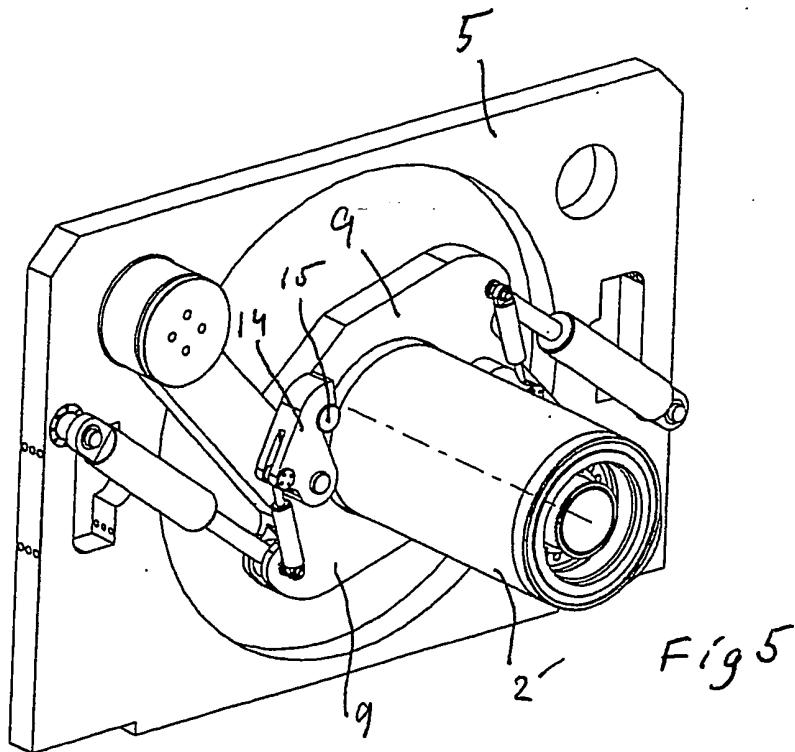
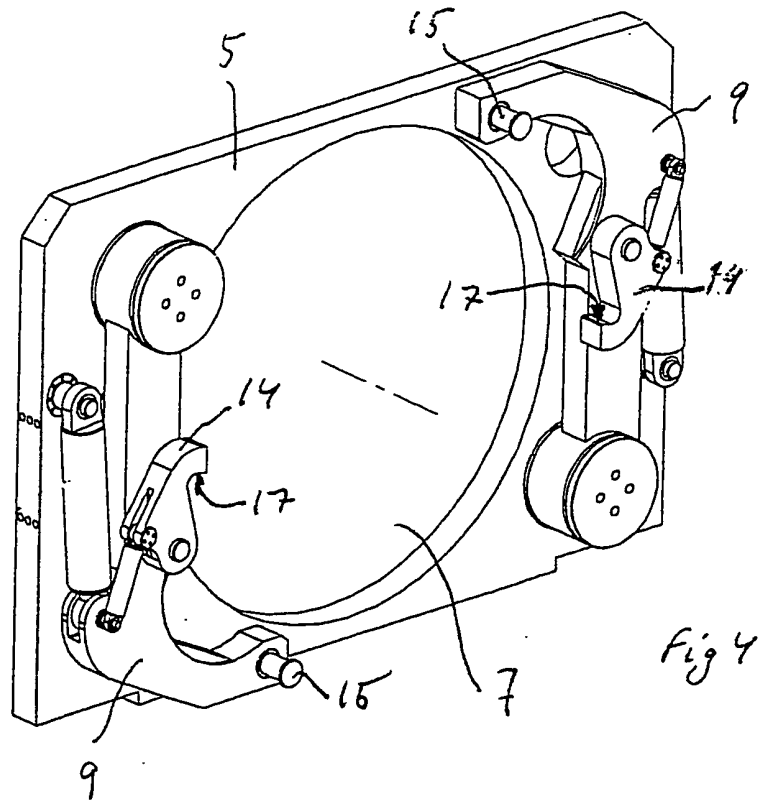
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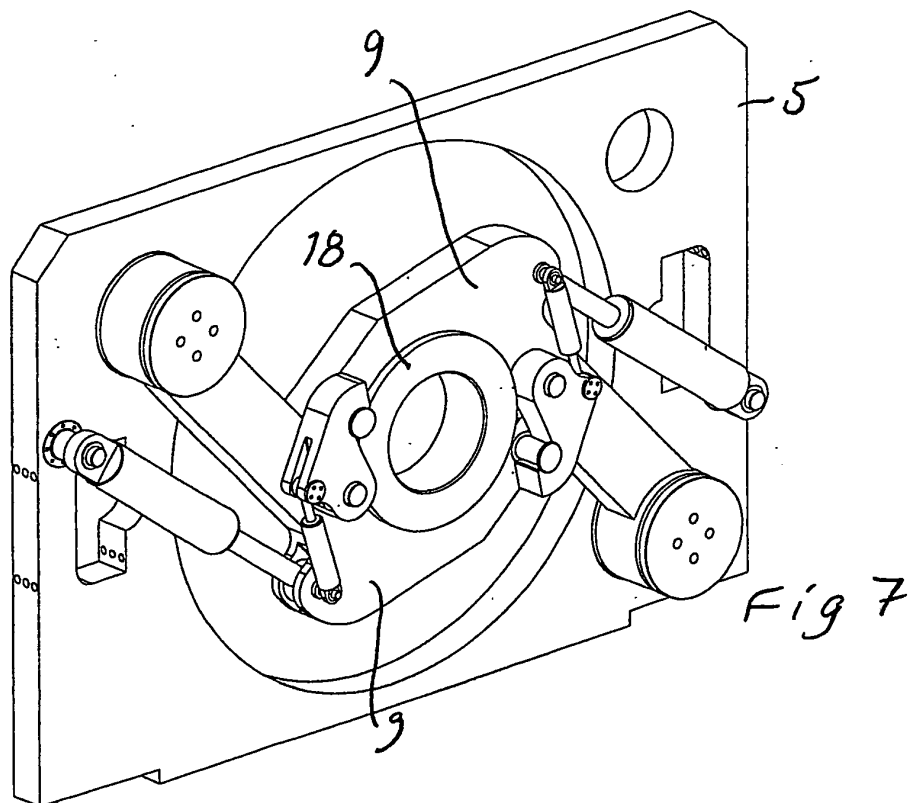
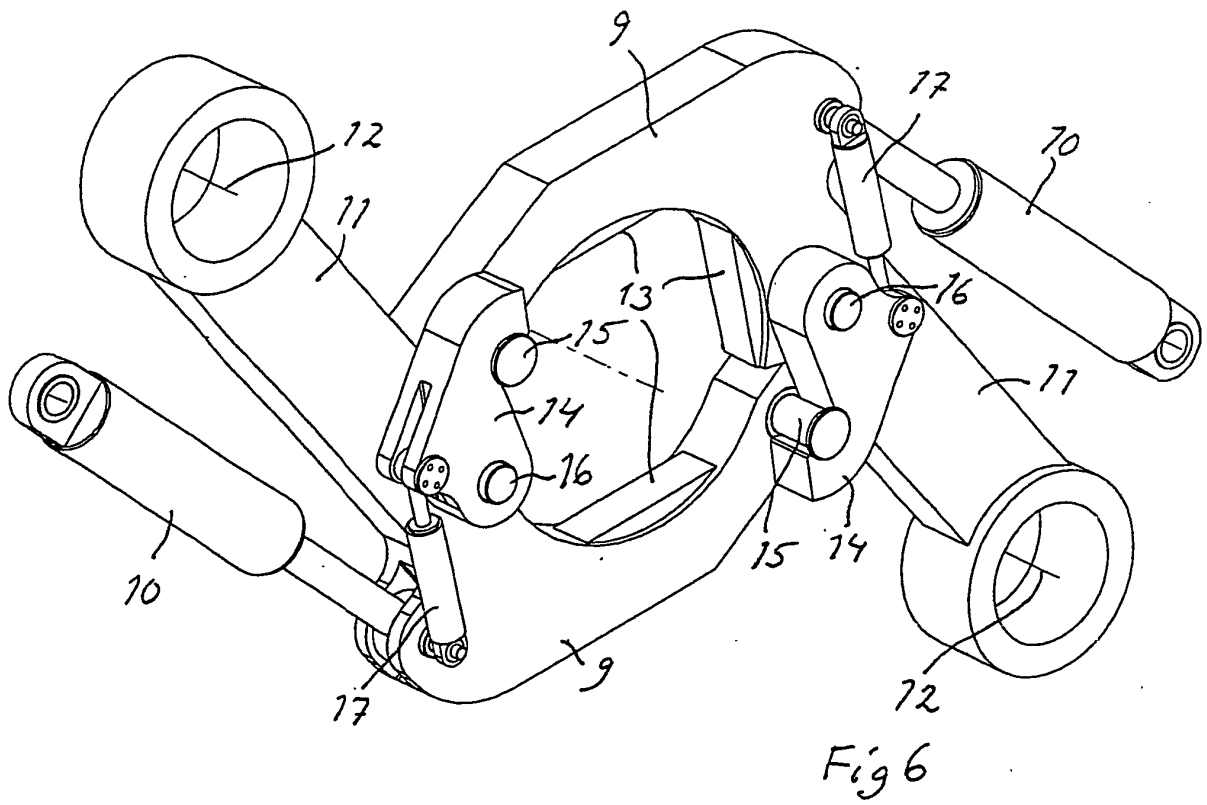
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REFERENCES CITED IN THE DESCRIPTION

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