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(54) GEAR REDUCER MECHANISM OF AN AUGER FOR SURFACE-DRILLING RIGS

UNTERSETZUNGSGETRIEBE FÜR EINEN BOHRER FÜR ÜBERTAGEBOHRGERÄTE

MÉCANISME RÉDUCTEUR D'ENGRENAGE D'UNE VIS SANS FIN POUR APPAREILS DE FORAGE DE SURFACE

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Description

[0001] The present invention relates to a gear reducer mechanism of an auger for surface-drilling rigs, commonly used in the construction of piles, which rotates an auger, via motorised means, to achieve said drilling of the surface on which the auger strikes.

Background of the invention

[0002] In construction activities it is usually necessary to drill land with drilling rigs to make piles or other types of drilling, taking into account that certain lands or surfaces may have layers to be drilled with the auger that have a hardness higher than the usual soil and gravel, and may include concrete or compact stone. A drilling rig of this kind is disclosed for example in WO2017056026.

[0003] In order to solve this, up until now the hammering system of the auger has been used, along with various auger tips to be able to drill the stone or concrete.

[0004] In this way, mechanisms in the drilling rigs' augers that incorporate a hydraulic or pneumatic system to hammer the auger into the layer of ground to be drilled are known and, therefore, are part of the state of the art, having a hammering effect.

[0005] These known systems have several drawbacks, such as the difficulty of applying the pneumatic/hydraulic hammer function to the auger, having to bring the air/water supply under pressure to the auger head, with the corresponding technical difficulty, or having the hammering movement and function in the upper part of the auger.

Description of the invention

[0006] The present invention relates to a gear reducer mechanism of an auger according to the features specified in claim 1. The gear reducer mechanism of an auger for surface-drilling rigs described in the present invention enables the mentioned inconveniences to be solved, presenting other advantages that will be described below.

[0007] The present invention is based on a gear reducer mechanism of an auger that is installed in the leader arm of a drilling rig, acting as a fixing element of the auger, as well as a driving medium that generates the rotation of said auger, with what could, in the present description, similarly be called a motor reducing mechanism. Advantageously, said gear reducer mechanism has a mechanical hammer system, which does not use a pneumatic or hydraulic system for the hammering movement of the auger.

[0008] The basic operation of the gear reducer mechanism is based on the fact that the rotation movement of the auger is generated by motorised means and taken to the auger by transmission means, usually by the gear of existing crowns/pinions, i.e. reducers, between said motorised means which generate the rotating movement of the auger and the auger itself, which is fixed to the

fixing hole of the auger in the reducer. In the present invention, this fixing hole has a relative longitudinal movement with respect to the element that transmits the rotation from the means of generating the rotating movement, i.e., the rest of the gear reducer mechanism that surrounds said fixing hole of the auger, without said motorised means having to be moved, wherein the fixing hole has said relative longitudinal displacement with the rest of the gear reducer mechanism maintaining the traction of rotation that said jacketing transmits to it.

[0009] To do this, it is preferable to include a jacketing of the auger's own fixing hole, so that said jacketing is fixed to the transmission means in solidarity and turns with them, and the jacketing piece transmits the rotary movement to the auger's fixing hole, allowing said transmission contact to be maintained even though it has a relative displacement between both: the jacketing piece that transmits the rotation to the fixing hole, and the fixing hole itself.

[0010] Alternatively, the action can be performed without a jacketed piece, by having the relative movement between the fixing hole, and directly the means of transmitting the turn.

[0011] The longitudinal relative displacement of the auger fixing hole is made by the increase in the hardness of the material to be drilled, in such a way that by pressing the gear reducer mechanism, when it is moved in the direction of drilling, towards the auger, which finds it more difficult to drill, this auger does not advance downwards in its drilling, the gear reducer mechanism descends more than the auger and, therefore, this relative displacement is automatically created between the gear reducer mechanism surrounding the auger fixing hole and the auger fixing hole, when the material to be drilled is of greater resistance than the downward force exerted by the reducer and the auger.

[0012] Said longitudinal displacement between the fixing hole and the gear reducer mechanism surrounding this fixing hole has a delimitation of the maximum longitudinal stroke that can be made, with an end-of-stroke piece on this fixing hole being included in the structure of the gear reducer mechanism that surrounds the fixing hole. On the other hand, the auger fixing hole has a stop that comes into contact with the end-of-stroke piece preventing its longitudinal displacement and turning said stop together with the auger fixing hole, with respect to the end-of-stroke piece.

[0013] In an advantageous way, the gear reducer mechanism incorporates in the two pieces that limit the longitudinal displacement, the end-of-stroke piece and the auger fixing hole stop, means of generating jumps between these two surfaces that are in contact due to the resistance involved in the drilling. Preferably, these means of generating jumps between the surface of the stop of the fixing hole against the surface of the end-of-stroke piece will be formed by irregularities, teeth, protuberances, etc., between these two surfaces, which form small sudden longitudinal relative displacements be-

tween the fixing hole and the auger itself, with which the auger exerts a hammering effect against the land to be drilled.

[0014] In order to avoid the transmission of the vibrations caused by this hammering effect on the auger and reducer assembly to the rest of the drilling machine, means of vibration absorption are available between the guide tower and said gear reducer mechanism.

[0015] Thus, the gear reducer mechanism of an auger for surface-drilling rigs has, advantageously, a configuration that includes at least one auger fixing hole with rotary movement transmitted from the motorised means and with longitudinal movement with respect to the rotary transmission part; an end-of-stroke piece of the maximum longitudinal displacement of the fixing hole that is located in the parts of the mechanism that surround the fixing hole of the auger; and a stop of the auger fixing hole that comes into contact with the end-of-stroke piece when the maximum relative longitudinal displacement is reached between the fixing hole and the rest of the structure of the gear reducer mechanism that surrounds it; wherein, when the material to be drilled shows a resistance to drilling greater than that of the drilling force exerted by the gear reducer mechanism with the auger, said auger does not advance towards the interior of the material and the gear reducer mechanism that surrounds it moves in the direction of the drilling, producing the relative displacement between the fixing hole and the rest of the gear reducer mechanism that surrounds it, moving relatively between them until its maximum displacement is reached, at the point of contact between the end-of-stroke piece and the stop piece of the auger fixing hole, and wherein the contact surface of the end-of-stroke piece and the stop piece of the auger fixing hole have protuberances, teeth or similar, which when rotating one against the other at said maximum displacement point, create jumps that cause the fixing hole of the auger to transmit to the auger itself a hammering movement against the ground to be drilled.

[0016] With all the above, a mechanical hammer system is achieved in the auger with a minimum modification of the gear reducer mechanism, and taking advantage of the weight of the auger leader arm itself, as well as doing away with complicated installations such as hammering by pneumatic or hydraulic systems, which are expensive to produce and maintain, requiring a greater reducing motor power, and without said hydraulic or pneumatic systems obtaining greater effectiveness than the mechanical system proposed in the present invention.

Brief description of the drawings

[0017] In order to better understand the description made, a set of drawings has been provided which, schematically and solely by way of non-limiting example, represents a practical storage case of embodiment.

Figure 1 is a perspective view of the gear reducer mechanism installed in the drill leader arm with the auger installed in the fixing hole.

Figure 2 is a cross-section view of the reducer with a jacket around the fixing hole.

Figure 3 is a cross-section view of the reducer without a jacket around the fixing hole.

Figure 4 is a cross-section view of detail "A" corresponding to the displacement stop and hammering surfaces.

15 Description of a preferred embodiment

[0018] In the present preferred embodiment of the invention, the gear reducer mechanism (10) to provide torque to a surface drilling auger (12) is installed in the guide tower (11) of a land drill rig and to which that drill auger (12) is fixed.

[0019] The gear reducer mechanism (10), as can be seen in Figures 1 to 3, has motorised means (13) for generating the rotary movement which are transmitted by means of pinions (14) up until the part which surrounds, as a jacket (15), the fixing hole (16) of the auger (12). This jacket (15) fits with the rotating movement transmission pinions (14), transmitting in turn said movement to the fixing hole (16) that it surrounds, but having some holes (17) that allow the relative longitudinal displacement between the fixing hole (16) and the jacket (15) that is connected in solidarity with the rest of the gear reducer mechanism (10).

[0020] This relative longitudinal displacement between the fixing hole (16) and the jacket (15) which is connected with the rest of the gear reducer mechanism (10), is produced by the increase in the resistance of the ground being drilled, in such a way that the force exerted by the gear reducer mechanism (10) with the auger (12) on the ground is not sufficient to advance in the direction of drilling and then the gear reducer mechanism (10) moves in said direction while the auger (12) cannot.

[0021] This longitudinal displacement has a maximum, limited by a piece of maximum displacement (18) in solidarity with the reducing mechanism (10), which interposes itself in the way of a stop (19) located in solidarity with the fixing hole (16) of the auger (12), colliding in order to limit said longitudinal displacement. As mentioned above, the stop (19) of the fixing hole (16) is connected to it, thus maintaining the same rotation as the fixing hole (16) and the auger (12) that is fixed. Both parts, the stop (19) of the fixing hole (16) and the maximum moving part (18) can form part of the elements to which they are attached or, as in this preferred embodiment, be parts that are interchangeable for reasons of maintenance or modification.

[0022] The surface (20) of the maximum longitudinal displacement part (18) that comes into contact with the

surface (21) of the stop (19) of the fixing hole (16) of the auger (12), as well as this surface (21) of the fixing hole (16) stop, has inclinations, holes, protrusions, teeth, etc., wherein when it comes into contact by turning one surface (20) with respect to the other (21), it produces an effect of sudden jumps during the turn, making the fixing hole (16) have small sudden, longitudinal movements and creating an effect of hammering against the ground, which occurs automatically when a greater resistance is created in the ground to be drilled.

[0023] Alternatively, as can be seen in Figure 3, the fixing hole (16) directly contacts the pinion (14) of the motorised means (13) generating the rotary motion, said pinions having a longer length by which the transmission contact piece of the rotary motion of the fixing hole moves longitudinally, through said pinion of the rotary motion transmission means, until it is limited, as is done in the preferred embodiment described above.

[0024] Between the guide tower (11) and said gear reducer mechanism (10) there are vibration absorption elements, not shown in the figures, to avoid the transmission to the rest of the drilling machine of the vibrations caused by this hammering effect in the auger (12) and reducer (10) assembly.

[0025] Although reference has been made to a specific embodiment of the invention, it is clear to a person skilled in the art that the gear reducer mechanism of an auger for surface-drilling rigs described is susceptible to numerous variations and modifications, and that all the details mentioned can be substituted by other technical features, without departing from the scope of protection defined by the attached claims.

Claims

1. Gear reducer mechanism of an auger for surface-drilling rigs which makes the auger (12) that is connected with said mechanism (10) turn by motorised means (13) that transmit the rotary movement to this auger (12), **characterised in that** the gear reducer mechanism (10) is formed, at least, by:
 - an auger fixing hole (16), which in addition to the rotary motion transmitted from the motorised means (13), has relative longitudinal motion with respect to the element transmitting the rotation (14), without affecting the position of the rotary transmission element (14) that does not move longitudinally;
 - an end-of-stroke piece (18) of the maximum longitudinal displacement of the fixing hole (16), which is located in the parts of the mechanism that surrounds the fixing hole (16) of the auger (12);
 - a stop (19) located at the fixing hole (16) of the auger (12) that turns together with the auger fixing hole, which comes into contact with the end-

of-stroke piece (18), when the maximum relative longitudinal displacement is reached between the fixing hole (16) and the rest of the gear reducer mechanism (10) that surrounds it;

wherein, the gear reducer mechanism (10), that surrounds the auger (12) fixed in the auger fixing hole (16), is able to move longitudinally in a relative manner to this auger fixing hole (16), wherein this longitudinal movement has a maximum displacement point that is the point of contact between the end-of-stroke piece (18) and the stop piece (19) of the auger fixing hole (16), and wherein the contact surface (20) of the end-of-stroke piece (18) and the stop piece (19,21) of the auger fixing hole (16) have protuberances, teeth or similar, which at said maximum displacement point the contact surface (20) rotates against the stop piece (21), this creates longitudinal displacements, by way of sudden jumps between these surfaces (20,21), wherein the auger fixing hole (16) transmits to the auger (12) itself a hammering movement against the ground to be drilled, during the turn.

2. Gear reducer mechanism of an auger for surface-drilling rigs according to claim 1, wherein between the transmission element (14) of the rotary movement of the motorised means (13) to the auger fixing hole (16), there is a jacket/sleeve (15) for the fixing hole (16) which transmits the rotary movement of the crown or pinion (14) to the fixing hole (16) without having longitudinal displacement, and allowing in its interior the longitudinal displacement of the auger fixing hole (16).
3. Gear reducer mechanism of an auger for surface-drilling rigs according to claim 1, wherein the transmission element (14) of the rotary motion of the motorised means (13) directly transmits the rotary motion to the auger fixing hole (16), also allowing the longitudinal displacement of the auger fixing hole (16) by said movement transmission system (14) when the contact piece of the rotary motion transmission of the fixing hole moves, by the crown or pinion (14) of the transmission means (13) of the rotary motion.
4. Gear reducer mechanism of an auger for surface-drilling rigs according to claim 1, wherein the stop (19) of the fixing hole (16) is connected and forms part of the fixing hole (16) itself by coming into contact with the maximum longitudinal displacement piece (18) which is connected and forms part of the structure of the gear reducer mechanism (10).
5. Gear reducer mechanism of an auger for surface-drilling rigs according to claim 1, wherein the stop (19) of the fixing hole (16) is connected and consists

of an interchangeable piece coming into contact with the maximum longitudinal displacement piece (18) that is connected with the structure of the gear reducer mechanism (10), also being interchangeable.

6. Gear reducer mechanism of an auger for surface-drilling rigs according to claim 1, wherein between the guide tower (11) and said gear reducer mechanism (10) are arranged elements to absorb the vibration of the hammering effect in the auger (12) and reducer assembly.

Patentansprüche

1. Untersetzungsgetriebemechanismus eines Bohrers für Übertagebohranlagen, der dafür sorgt, dass sich der Bohrer (12), der mit dem Mechanismus (10) verbunden ist, durch motorisierte Mittel (13), die die Drehbewegung auf diesen Bohrer (12) übertragen, dreht, **dadurch gekennzeichnet, dass** der Untersetzungsgetriebemechanismus (10) zumindest gebildet ist durch:

- ein Bohrerbefestigungsloch (16), das zusätzlich zu der von den motorisierten Mitteln (13) übertragenen Drehbewegung eine relative Längsbewegung in Bezug auf das Element, das die Drehung (14) überträgt, aufweist, ohne die Position des Drehübertragungselements (14), das sich nicht längs bewegt, zu beeinflussen;
- ein Hubendeteil (18) der maximalen Längsverschiebung des Befestigungsloches (16), das sich in den Teilen des Mechanismus, die das Befestigungsloch (16) des Bohrers (12) umgeben, befindet,
- einen Anschlag (19), der sich an dem Befestigungsloch (16) des Bohrers (12) befindet, der sich zusammen mit dem Bohrerbefestigungsloch dreht, der mit dem Hubendeteil (18) in Kontakt kommt, wenn die maximale relative Längsverschiebung zwischen dem Befestigungsloch (16) und dem Rest des Untersetzungsgetriebemechanismus (10), der es umgibt, erreicht ist;

wobei sich der Untersetzungsgetriebemechanismus (10), der den Bohrer (12), der in dem Bohrerbefestigungsloch (16) befestigt ist, umgibt, längs in einer relativen Weise zu diesem Bohrerbefestigungsloch (16) bewegen kann, wobei diese Längsbewegung einen maximalen Verschiebungspunkt besitzt, der der Kontaktpunkt zwischen dem Hubendeteil (18) und dem Anschlagteil (19) des Bohrerbefestigungsloches (16) ist, und wobei die Kontaktfläche (20) des Hubendeteils (18) und das Anschlagteil (19, 21) des Bohrerbefestigungsloches (16) Ausstülpungen, Zähne oder ähnliches, besitzen, die an dem maxi-

malen Verschiebungspunkt die Kontaktfläche (20) gegen das Anschlagteil (21) drehen, wobei dies Längsverschiebungen durch plötzliche Sprünge zwischen diesen Flächen (20, 21) erzeugt, wobei das Bohrerbefestigungsloch (16) während der Drehung auf den Bohrer (12) selbst eine Hämmerbewegung gegen den zu bohrenden Boden überträgt.

2. Untersetzungsgetriebemechanismus eines Bohrers für Übertagebohranlagen nach Anspruch 1, wobei es zwischen dem Übertragungselement (14) der Drehbewegung der motorisierten Mittel (13) auf das Bohrerbefestigungsloch (16) einen Mantel/eine Hülse (15) für das Befestigungsloch (16) gibt, das die Drehbewegung des Kranzes oder des Getrieberrads (14) auf das Befestigungsloch (16) überträgt, ohne eine Längsverschiebung zu besitzen und die in ihrem Inneren die Längsverschiebung des Bohrerbefestigungsloches (16) erlaubt.
3. Untersetzungsgetriebemechanismus für einen Bohrer für Übertagebohranlagen nach Anspruch 1, wobei das Übertragungselement (14) der Drehbewegung der motorisierten Mittel (13) die Drehbewegung unmittelbar auf das Bohrerbefestigungsloch (16) überträgt, wobei außerdem die Längsverschiebung des Bohrerbefestigungsloches (16) durch das Bewegungsübertragungssystem (14) durch den Kranz oder das Getrieberrad (14) der Übertragungsmittel (13) der Drehbewegung erlaubt wird, wenn sich das Kontaktteil der Drehbewegungsübertragung des Befestigungsloches bewegt.
4. Untersetzungsgetriebemechanismus eines Bohrers für Übertagebohranlagen nach Anspruch 1, wobei der Anschlag (19) des Befestigungsloches (16) verbunden ist und einen Teil des Befestigungsloches (16) dadurch, dass es mit dem maximalen Längsverschiebungsteil (18), das verbunden ist und einen Teil der Struktur des Untersetzungsgetriebemechanismus (10) bildet, in Kontakt kommt, selbst bildet.
5. Untersetzungsgetriebemechanismus eines Bohrers für Übertagebohranlagen nach Anspruch 1, wobei der Anschlag (19) des Befestigungsloches (16) verbunden ist und aus einem austauschbaren Teil besteht, das mit dem maximalen Längsverschiebungsteil (18) in Kontakt kommt, das mit der Struktur des Untersetzungsgetriebemechanismus (10), das auch austauschbar ist, verbunden ist.
6. Untersetzungsgetriebemechanismus für einen Bohrer für Übertagebohranlagen nach Anspruch 1, wobei zwischen dem Führungsturm (11) und dem Untersetzungsgetriebemechanismus (10) Elemente angeordnet sind, um die Schwingung des Hämmereffekts in dem Bohrer (12) und der Untersetzungs-

anordnung zu absorbieren.

Revendications

1. Un mécanisme réducteur de vis sans fin pour des engins de forage en surface qui fait tourner la vis sans fin (12) connectée à ce mécanisme (10) à l'aide de moyens motorisés (13) qui transmet le mouvement rotatif à cette vis sans fin (12), **caractérisé en ce que** le mécanisme réducteur (10) comprend au moins :

- un orifice de fixation de vis sans fin (16), qui outre le mouvement rotatif transmis par les moyens motorisés (13), présente un mouvement longitudinal par rapport à l'élément transmettant la rotation (14), sans affecter la position de l'élément de transmission rotatif (14) qui ne se déplace pas longitudinalement ;
- une pièce de fin de course (18) du déplacement longitudinal maximum de l'orifice de fixation (16), qui est située dans les parties du mécanisme qui entourent l'orifice de fixation (16) de la vis sans fin (12) ;
- une butée (19) située sur l'orifice de fixation (16) de la vis sans fin (12) qui tourne avec l'orifice de fixation de vis sans fin, qui entre en contact avec la pièce de fin de course (18), lorsque le déplacement longitudinal relatif maximum est atteint entre l'orifice de fixation (16) et le reste du mécanisme réducteur (10) qui l'entoure ;

dans lequel le mécanisme réducteur (10), qui entoure la vis sans fin (12) fixée sur l'orifice de fixation de vis sans fin (16), peut se déplacer de manière longitudinale de manière relative par rapport à cet orifice de fixation de vis sans fin (16), dans lequel ce mouvement longitudinal présente un point de déplacement maximum qui est le point de contact entre la pièce de fin de course (18) et la pièce de butée (19) de l'orifice de fixation de vis sans fin (16), et dans lequel la surface de contact (20) de la pièce de fin de course (18) et de la pièce de butée (19, 21) de l'orifice de fixation de vis sans fin (16) présente des protubérances, des dents ou autres, qui sur ce point de déplacement maximum la surface de contact (20) tourne contre la pièce de butée (21), ce qui crée des déplacements longitudinaux, sous forme de sursauts entre ces surfaces (20, 21), dans lequel l'orifice de fixation de vis sans fin (16) transmet à la vis sans fin (12) elle-même un mouvement de martèlement contre le sol à forer, pendant la rotation.

2. Un mécanisme réducteur de vis sans fin pour des engins de forage en surface selon la revendication 1, dans lequel entre l'élément de transmission (14) du mouvement rotatif des moyens motorisés (13) et

l'orifice de fixation de vis sans fin (16), se trouve une chemise/manchette (15) pour l'orifice de fixation (16) qui transmet le mouvement rotatif de la couronne ou du pignon (14) à l'orifice de fixation (16) sans déplacement longitudinal, et autorisant en son sein le déplacement longitudinal de l'orifice de fixation de vis sans fin (16).

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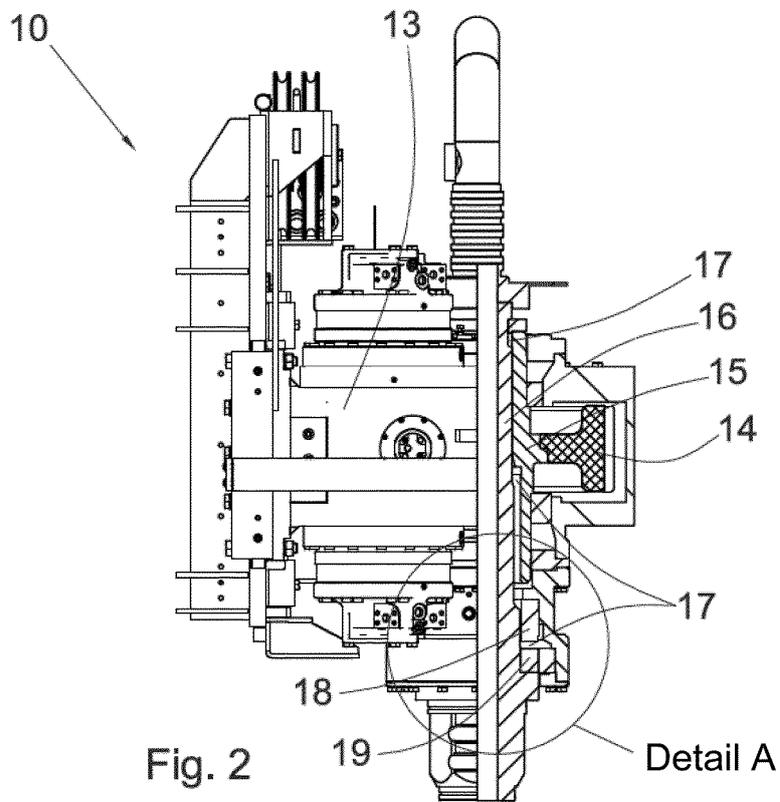
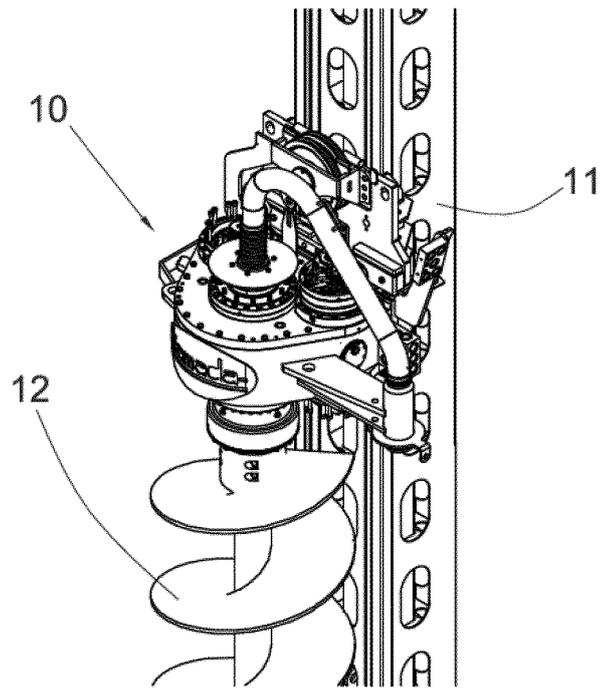
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3. Un mécanisme réducteur de vis sans fin pour des engins de forage en surface selon la revendication 1, dans lequel l'élément de transmission (14) du mouvement rotatif des moyens motorisés (13) transmet directement le mouvement rotatif à l'orifice de fixation de vis sans fin (16), autorisant également le déplacement longitudinal de l'orifice de fixation de vis sans fin (16) par ce système de transmission de mouvement (14) lorsque la pièce de contact de la transmission de mouvement rotatif de l'orifice de fixation se déplace, par la couronne ou le pignon (14) du mode de transmission (13) du mouvement rotatif.

4. Un mécanisme réducteur de vis sans fin pour des engins de forage en surface selon la revendication 1, dans lequel la butée (19) de l'orifice de fixation (16) est connectée et fait partie intégrante de l'orifice de fixation (16) en entrant en contact avec la pièce à déplacement longitudinal maximum (18) qui est connectée et fait partie intégrante de la structure du mécanisme réducteur (10).

5. Un mécanisme réducteur de vis sans fin pour des engins de forage en surface selon la revendication 1, dans lequel la butée (19) de l'orifice de fixation (16) est connectée et consiste en une pièce interchangeable entrant en contact avec la pièce à déplacement longitudinal maximum (18) qui est connectée à la structure du mécanisme réducteur (10), également interchangeable.

6. Un mécanisme réducteur de vis sans fin pour des engins de forage en surface selon la revendication 1, dans lequel entre la tour de guidage (11) et ce mécanisme réducteur (10) sont disposés des éléments pour absorber la vibration de l'effet de martèlement dans la vis sans fin (12) et l'ensemble de réducteur.



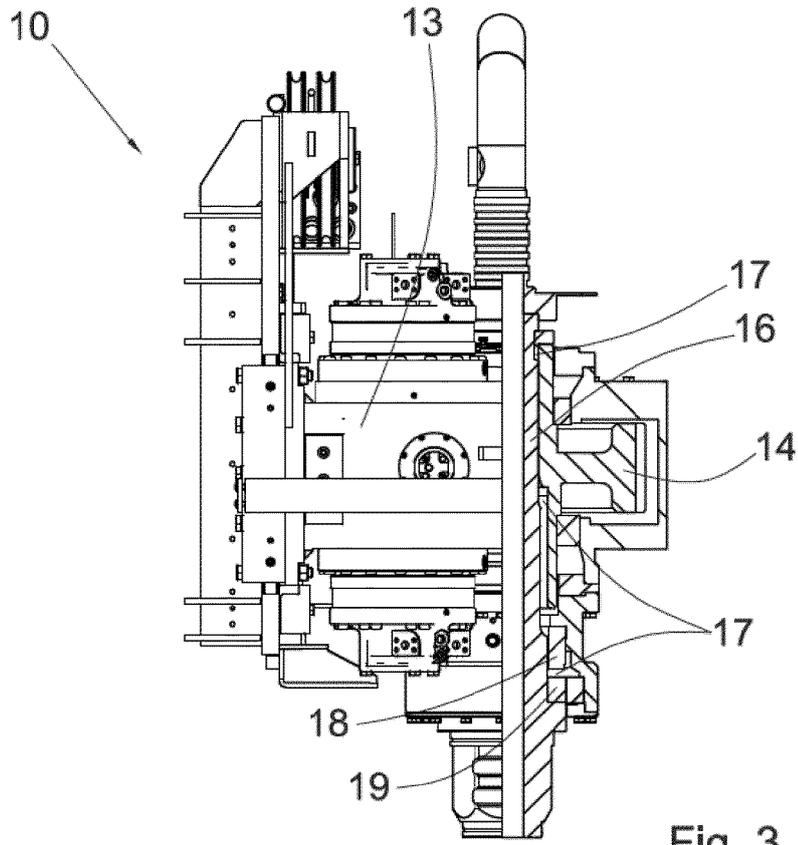


Fig. 3

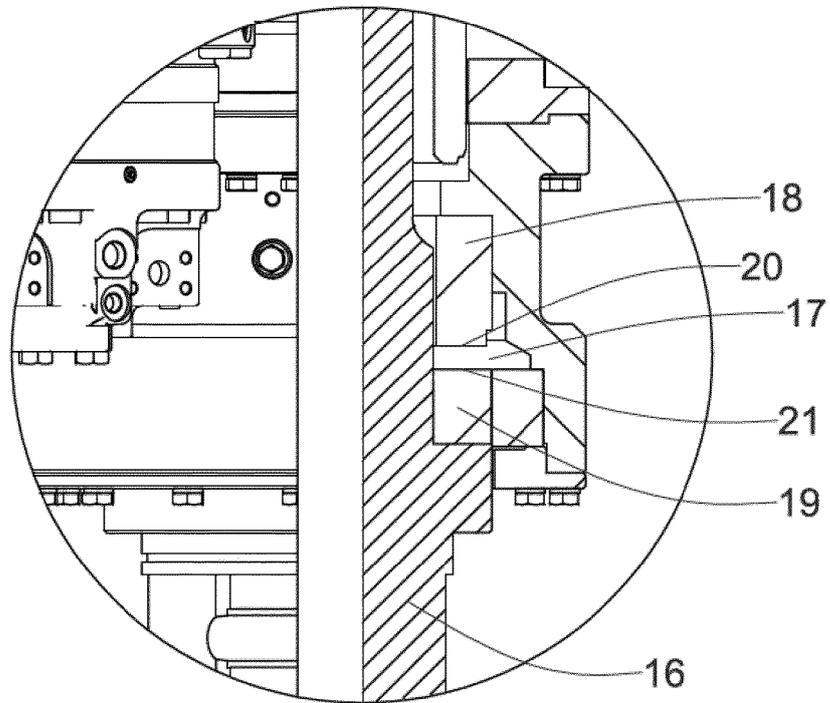


Fig. 4

REFERENCES CITED IN THE DESCRIPTION

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