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(54) **A device for removing debris from a helical drilling tool**

Vorrichtung zum Entfernen von Bohrklein aus einem schraubenförmigen Bohrwerkzeug

Dispositif pour enlever des débris d'un outil hélicoidal de forage

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DescriptionField of the invention

[0001] The present invention pertains to the field of continuous flight auger drilling by means of a helical tool. More particularly, the invention refers to a device for cleaning the helical drilling tool of debris.

Background of the invention

[0002] In straight-ahead drilling methods the soil brought up to surface by the helical drilling tool has to be removed to prevent it from falling down a considerable height when lifted up high on the helix.

[0003] At present there are known several kinds of debris removing devices. Generally, these devices are motor-driven; FR-A-2 624 197 discloses an auger cleaning device in accordance with the preamble of claim 1.

[0004] The most complete type consists of a slide slidably mounted on the drilling mast and secured to a guiding ring that surrounds a length of the helical tool in order to keep it at the right distance from the drilling mast. The active part of the auger cleaning device is comprised of a rotating portion mounted to said ring. Such rotating portion comprises a scraping blade inserted between the scrolls of the helical tool and rotated by a motor through a toothed gearing assembly.

[0005] In operation, the auger cleaning device rotates the scraping blade down the scrolls forcing the debris to fall, regardless of whether the helical tool is stationary or rotating. If the device is not activated, it tends to ascend the helical tool when this rotates in the drilling direction.

[0006] A first inconvenience with this kind of auger cleaning device is concerned with vertical movement along the helical tool. The auger cleaning device must be stopped from running up the helical tool and interfering with the driving unit fitted at the top of the helical drilling tool. Also, the auger cleaning device must be prevented from descending too far, as it could get stuck in the ground. Therefore, the auger cleaning device motion has to be controlled by an operator or a special automatic control unit.

[0007] Another prior art drawback concerns the maximum transversal size of the helical tool. Generally, the maximum diameter of the tool is limited by the near drilling mast. When an auger cleaning device of this kind is provided, the mast and such device must be spaced apart to fit a rolling bearing, a toothed gearing and a motor housing. It follows that the maximum diameter of helix that can be cleared is considerably less than the maximum diameter of helix that could be fitted in the absence of an auger cleaning device.

[0008] Finally, the provision of a motor and toothed gearing besides involving implementation expenses, causes practical complications due to the presence of cumbersome and hindering electric cables or hydraulic

lines.

Summary of the invention

[0009] An object of the present invention is to provide a device allowing the expensive driving means of conventional auger cleaning devices to be dispensed with and which is free of the above discussed inconveniences.

[0010] A further object of the invention is to provide a device capable of relieving the operator of the task of continuously having to pay attention to the position of the auger cleaning device, without incurring further expenses for a separate special control system.

[0011] These and further objects which will be more apparent hereinafter are attained according to the present invention by the provision of a device for cleaning debris from a helically-shaped drilling tool, comprising a slide capable of translating freely in a direction parallel to the axis of the tool, said slide being secured in said translating motion to a scraping member engaging the helical tool. The scraping member is oriented substantially radially on the helical tool and rests upon on the scrolls of the helical tool through a roller means. The device is characterised in that said scraping member is free to rotate about the axis of the tool and run along the scrolls of the helical tool, thereby causing the debris deposited on the helical tool during drilling to fall off.

[0012] For a better understanding of the present invention, reference is made to the following detailed description of a preferred but not limiting embodiment considered in combination with the accompanying drawing, which depicts schematically a debris auger cleaning device arranged in accordance with the present invention.

Description of an exemplary embodiment

[0013] With reference to the drawing, numeral 1 schematically designates the position of a pair of vertical guides fixed to the drilling mast (not shown) which exploits a conventional helical drilling tool 4.

[0014] In brief, the device for removing debris is composed of a first, non-rotating portion vertically slidable along the guides and the helical tool, and a second rotatable portion mounted to the first portion but free to rotate about the central drilling axis x of the tool.

[0015] The non-rotating part of the auger cleaning device comprises a slide 2 slidably mounted on guides 1 and a cylindrical member 3 for guiding the helical drilling tool 4. Cylindrical member 3 is inserted on the helical tool and rigidly fixed to slide 2.

[0016] Cylindrical member 3 is fitted with a coaxial bearing the rotating race 5 of which is secured to a scraping member 6, preferably in form of a blade. As shown, scraping member 6 provides a surface disposed substantially radially on helical tool 4 and adapted to make the debris 8 which has deposited on the scrolls of the tool during drilling move and fall off.

[0017] The outer portion 6a of scraping member 6 is secured to the rotating part of the bearing 5. The base 6b of the blade member skims the surface of the helical tool. The radially inner end portion of the blade base rests on the helical tool by means of a roller means 7.

[0018] In operation, as the helical tool is screwed into the ground, the rotating portion of the auger cleaning device rotates freely following rotation of the helical tool through scraping member 6. At the end of the screwing step, the debris clearing device is located up at top of the helical tool, just above the drilling surface. The drilling tool is then raised up, thereby tearing the ground comprised between it scrolls and creating a bore (not shown) in the ground.

[0019] During the raising step, debris resting on the helical tool exerts a contrasting action against the scraping member 6 which tends to urge the auger cleaning device upwardly sliding along vertical guides 1. Simultaneously, the auger cleaning device descends for gravity along the helical tool which is withdrawn up and out of the bore full of debris 8.

[0020] In this phase, the scraping member 6 is free to rotate along the scrolls of the helical tool in the direction of the lower end of the helix. In doing so, scraping member 6 causes the fall out of the debris which remained on the helical tool at the end of the drilling step. The non-rotating portion of the auger cleaning device rests on the rotating portion, which in turn rests on the helical tool by means of roller 7. Roller 7 rolls on the inclined plane of the helix. Downward motion of the auger cleaning device along the helix is facilitated because of roller 7 resting on the steepest, radially innermost part of the helix.

Claims

1. A device for cleaning debris from a helically-shaped drilling tool (4), comprising a slide (2) capable of translating freely in a direction parallel to the axis (x) of said tool (4), said slide (2) being secured in said translating motion to a scraping member (6) engaging the helical tool (4), said scraping member (6) being oriented substantially radially on said helical tool (4) and resting upon on the scrolls of the helical tool through a roller means (7), characterised in that said scraping member (6) is free to rotate about the axis (x) of the tool (4) and run along the scrolls of the helical tool, thereby causing the debris (8) deposited on the helical tool during drilling to fall off.
2. A device as claimed in claim 1, characterised in that the roller means (7) rests on the scrolls proximate to the central core of the helical tool (4).
3. A device as claimed in claim 1, characterised in that the scraping member (6) is supported by the slide (2) in pivotal manner about said central axis (x) of

the helical tool (4).

4. A device as claimed in claim 3, characterised in that the scraping member (6) is pivotally mounted to a cylindrical member (3) for guiding the helical tool, said cylindrical member being rigidly fixed to the slide (2).

Patentansprüche

1. Vorrichtung zum Entfernen von Bohrklein aus einem schraubenförmigen Bohrwerkzeug (4), umfassend ein Gleitelement (2), welches in einer parallel zur Achse (x) des Werkzeugs (4) verlaufenden Richtung frei verschieblich ist und welches in dieser verschieblichen Bewegung an einem Schabelement (6) befestigt ist, das in das schraubenförmige Bohrwerkzeug (4) eingreift, wobei das Schabelement (6) im wesentlichen radial auf dem schraubenförmigen Werkzeug (4) ausgerichtet ist und auf den Spiralen des schraubenförmigen Werkzeugs durch ein Rollelement (7) aufliegt, dadurch gekennzeichnet, daß das Schabelement (6) frei um die Achse (x) des Werkzeugs (4) drehen und entlang den Spiralen des schraubenförmigen Werkzeugs laufen kann, wodurch bewirkt wird, daß das während des Bohrens auf dem schraubenförmigen Werkzeug sich absetzende Bohrklein (8) herunterfällt.
2. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß das Rollelement (7) nahe dem Mittelkern des schraubenförmigen Werkzeugs (4) auf den Spiralen aufliegt.
3. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß das Schabelement (6) von dem Gleitelement (2) drehbar um die Mittelachse (x) des schraubenförmigen Werkzeugs (4) gestützt wird.
4. Vorrichtung nach Anspruch 3, dadurch gekennzeichnet, daß das Schabelement (6) zum Führen des schraubenförmigen Werkzeugs drehbar auf einem zylindrischen Element (3) montiert ist, welches starr an dem Gleitelement (2) befestigt ist.

Revendications

1. Dispositif pour enlever des débris d'un outil hélicoïdal de forage (4), comprenant un chariot coulissant (2) capable d'effectuer librement un mouvement de translation dans une direction parallèle à l'axe (x) dudit outil (4), ledit chariot coulissant (2) étant fixé,

dans ledit mouvement de translation, à un organe de raclage (6) venant en prise avec l'outil hélicoïdal (4), ledit organe de raclage (6) étant orienté sensiblement radialement sur ledit outil hélicoïdal (4) et reposant sur les enroulements de l'outil hélicoïdal à l'aide de moyens de galets (7), caractérisé en ce que ledit organe de raclage (6) peut tourner librement autour de l'axe (x) de l'outil (4) et avancer le long des enroulements de l'outil hélicoïdal, entraînant ainsi la chute des débris (8) qui se sont déposés sur l'outil hélicoïdal au cours du forage.

2. Dispositif selon la revendication 1, caractérisé en ce que les moyens de galets (7) reposent sur les enroulements à proximité du coeur central de l'outil hélicoïdal (4).
3. Dispositif selon la revendication 1, caractérisé en ce que l'organe de raclage (6) est supporté par le chariot coulissant (2) de manière pivotante autour dudit axe central (x) de l'outil hélicoïdal (4).
4. Dispositif selon la revendication 3, caractérisé en ce que l'organe de raclage (6) est monté de manière pivotante sur un élément cylindrique (3) pour guider l'outil hélicoïdal, ledit élément cylindrique étant fixé de manière rigide au chariot coulissant (2).

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