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(54) Continuous feeding and torqueing device for a drill stem.

(57) A drill head comprises two chucks (38, 40) which alternately grip, rotate and advance downwards a drill string (32) before releasing the drill string and being retracted, each chuck regripping the drill string before the other releases the drill string so that the torsional wind up of the drill string is maintained.

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DIAMOND DRILLING

TITLE MODIFIED
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BACKGROUND TO THE INVENTION

This invention relates to rotary drilling.

In conventional rotary diamond drilling practice rotation and feed are transmitted from a head to the drill string through a hollow chuck to which the string is chucked. The feed travel is usually less than a metre. After the string has been fed for that distance, the chuck is loosened, run back and retightened for another length of feed.

Especially as a hole gets deeper, the drill string gets wound up to a certain extent under the action of the rotating head. If the chuck is loosened, the drill string unwinds. This unwinding puts unnecessary stress on the drill string and bit. Further more, before effective drilling can commence, the drill string has to be wound up to the same extent before the chuck was loosened. This leads to a waste of energy.

An object of this invention is to alleviate these problems.

SUMMARY OF THE INVENTION

The invention provides a drill head for rotary drilling operations in which a drill string is chucked to a hollow chuck carried by the drill head which travels in the direction of drilling and reverses its travel after the drill string has been unchucked, characterised in that the drill head is provided with two spaced apart chucks, rotated at the same speed, the chucks being adapted to be fed in tandem so that while the one is being fed in the drilling direction the other is being reversed, that chuck which is being reversed for the time being having first been unchucked.

Preferably each chuck is fed forward and moved back by hydraulic cylinders to which it is attached by a yoke, each chuck is arranged normally to grip the drill string and to be hydraulically unchucked from the drill string, the chucks and jacks being hydraulically integrated so that each chuck is unchucked from the drill string after, and only after, the other chuck has gripped the drill string.

In one embodiment the drill head includes a frame, two spaced apart yokes arranged for guided movement by the frame in a forward, drilling direction and a reverse, non-drilling direction, double acting hydraulic jacks supporting the yokes on the frame and actuable to move the yokes in the forward and reverse directions, a chuck carried by each yoke which includes jaws biased to grip a drill string served by the drill head and actuable hydraulically to unchuck the chuck from the drill string, the chucks and jacks being integrated hydraulically for operation in such a way that the yokes and chucks move towards one another and then apart from one another with each

chuck gripping the drill string when it reaches the rearward extent of its reverse travel and being unchucked from the drill string when it is at the furthest extent of its forward travel but only after the other chuck has gripped the drill string.

DESCRIPTION OF THE DRAWING

The sole Figure shows a schematic view of a drill head embodying the principles of this invention.

DESCRIPTION OF AN EMBODIMENT

Referring to the drawing, the drill head 10 has a frame which includes four spaced guide columns 12 which are shown partially in ghosted outline for clarity. Only two guide columns are visible in the drawing. The frame also includes brackets 14 on either side through which the columns 12 pass, and outwardly directed brackets 16 and 18 at about mid-height and at the bottom of the frame respectively.

Mounted between brackets 20 and 22 at the upper and lower ends respectively of the frame are upper and lower gearboxes 24 and 26 from which extend upper and lower drive tubes 28 and 30 respectively. A drill string 32 passes through the aligned drive tubes 28 and 30.

Yokes 34 and 36, which are basically rectangular in plan view, are mounted for up-and-down movement on the guide columns 12 and are holed centrally to take the drive tubes and drill string. Carried rigidly by each yoke is a chuck 38, 40 which surrounds the drill string 32. The chucks can be of conventional type, having jaws which are spring-loaded to grip the drill string and which can be forced apart hydraulically against their spring loading to release the drill string.

The yokes are supported for their up-and-down sliding movement on the columns 12 by means of double-acting hydraulic jacks 42, 44. The cylinders 46, 48 of the jacks are secured rigidly to the yokes by means of locking collars 50, 52 and the ends of the piston rods 54, 56 of the jacks are secured to the outwardly extending brackets 16 and 18 respectively. Extension and retraction of the jacks thus results in upward and downward movement of the yokes.

A single motor serves both gearboxes 24 and 26, the outputs of which are transferred to the chucks by means of the drive tubes 28 and 30. Since a single motor is used, the outputs of the two gearboxes are therefore synchronised.

Each chuck 38, 40 can be basically of a conventional type in which the jaws of the chuck are spring loaded to grip the drill string to rotate it and which can be forced apart hydraulically to release the drill string. The actual hydraulic componentry, which is generally conventional, has been omitted from the drawing for clarity.

In the situation depicted in full line in the drawing, the piston rods 54 are fully retracted and the yoke 34 is at its lowest elevation. The piston rods 56 are fully extended and the yoke 36 is accordingly at its highest elevation. Starting from this situation, the drill head operates in the following way, assuming that the chuck 40 has just closed on the drill string:

The chuck 38 is hydraulically actuated to release the drill string, and the jacks 44 are retracted to lower the chuck 40 and hence the drill string which it grips, at the same time, the jacks 42 are extended to raise the chuck 38 past the descending drill string. When the jacks 44 are fully retracted and the jacks 42 are fully extended, the situation depicted in chain-dot outline is attained. The chuck 40 is now hydraulically actuated to release the drill string under the influence of the springs loading the jaws of that chuck.

The jacks 42 are again retracted, while the jacks 44 are again extended to feed the drill string further in the downward direction until the full line situation is again reached, when the cycle is repeated. It will thus be seen that the chucks move continuously towards one another and then away from one another as the cycle is repeated with each chuck closing on the drill string at the top of its path of movement, and releasing it again at the bottom of its path of movement. Of course, the drill must be held by at least one chuck at any given time, so the arrangement is such that the lowered chuck does not release the drill string until the raised chuck has closed on it.

Because the drill string is always held in torsion by at least one of the chucks, there is no unwinding of the drill string at each feed.

CLAIMS:

1.

A drill head for rotary drilling operations in which a drill string is chucked to a hollow chuck carried by the drill head which travels in the direction of drilling and reverses its travel after the drill string has been unchucked, characterised in that the drill head is provided with two spaced apart chucks, rotated at the same speed, the chucks being adapted to be fed in tandem so that while the one is being fed in the drilling direction the other is being reversed, that chuck which is being reversed for the time being having first been unchucked.

2.

A drill head according to claim 1, in which each chuck is fed forward and moved back by hydraulic cylinders to which it is attached by a yoke, each chuck has jaws biased to grip the drill string and to be hydraulically unchucked from the drill string, the chucks and the jacks being hydraulically integrated so that each chuck is unchucked from the drill string after, and only after, the other chuck has gripped the drill string.

3.

A drill head for rotary drilling operations which includes a frame, two spaced apart yokes arranged for guided movement by the frame in a forward, drilling direction and a reverse, non-drilling direction, double acting hydraulic jacks supporting the yokes on the frame and actuable to move the yokes in the forward and reverse directions, a chuck carried by each yoke which includes jaws biased to grip a drill string served by the drill head to unchuck the chuck from the drill string, the chucks and jacks being integrated hydraulically and actuable hydraulically for operation in such a way that the yokes and chucks moved towards the drill string when it reaches the rearward extend of its reverse travel and being unchucked from the drill string when it is at the furthest extent of its forward travel but only after the other chuck has gripped the drill string.

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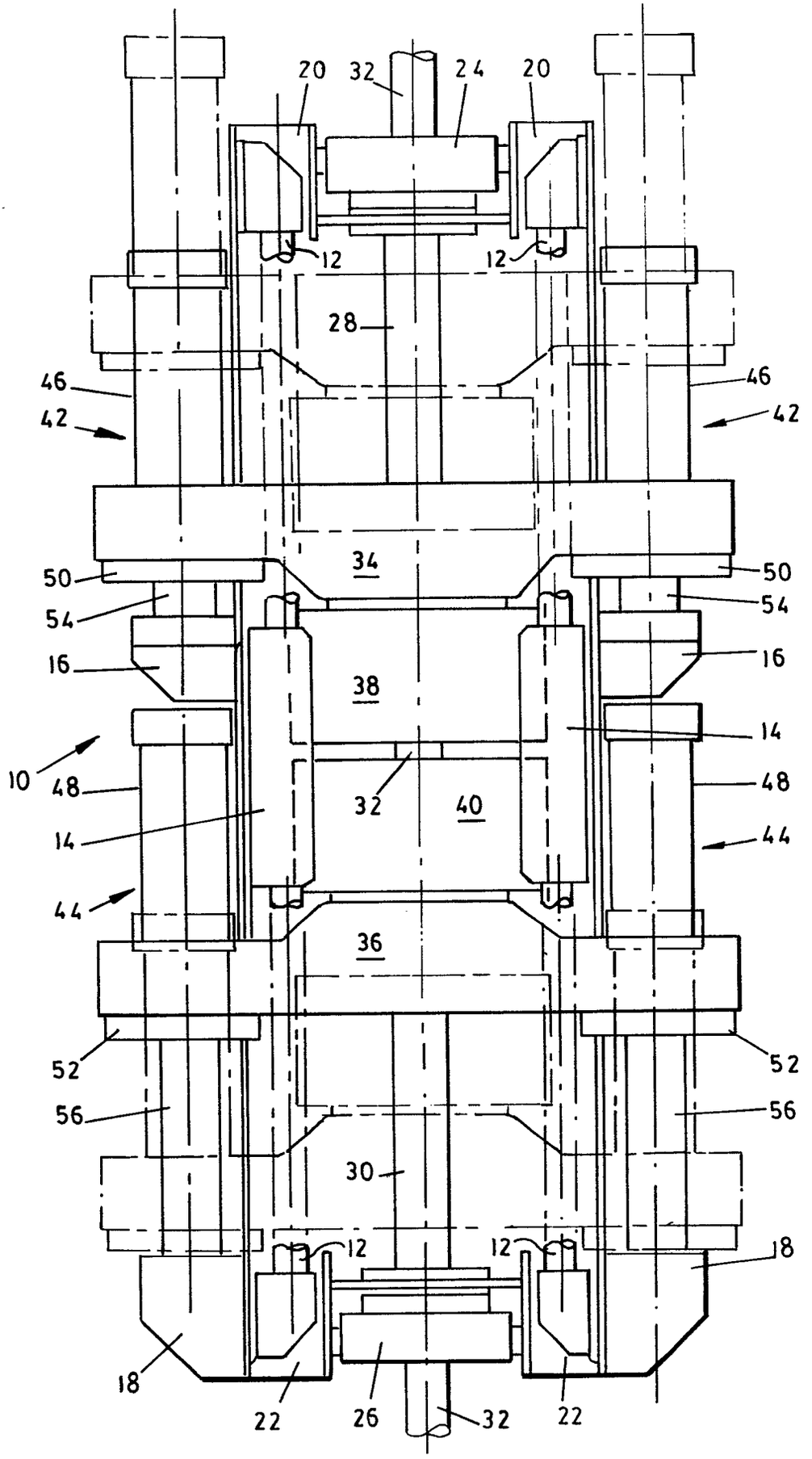
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EUROPEAN SEARCH REPORT

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Application number

EP 84 30 5926

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.4)
Y	CA-A- 41 490 (IKEDA)(1968) * Whole document * ---	1-3	E 21 B 3/02 E 21 B 19/00
Y	US-A-3 096 075 (BROWN) * Whole document * -----	1-3	

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

E 21 B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	18-12-1984	BENZE W.E.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
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T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
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