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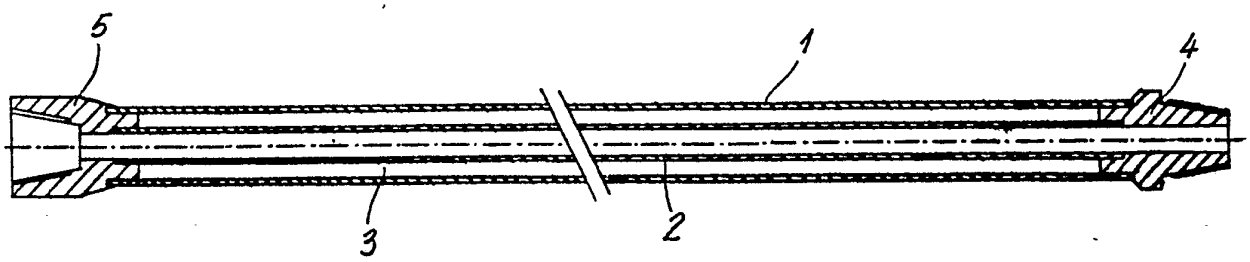
(54) Title: DRILLING PIPE FOR MAKING A DRILL STRING



(57) Abstract

Drilling pipe for making of a drill string, in particular for deviation drilling, comprising an outer tube (1) and an inner tube (2) connected to heads (4, 5) on each end, in such a manner that the inner tube communicates with apertures through each head, and in such a manner that a closed cavity is constituted between the tubes (1, 2), said cavity contributing to give the drilling pipe and the drill string a buoyancy in the bore hole.

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Drilling pipe for making a drill string.

The present invention relates to drilling pipes for making a drill string, in particular adapted to deviation drilling, i.e. drilling performed in such a manner that the drilling direction at the beginning is substantially vertical, while the direction is later changed towards one side, so that the direction of drilling finally is under a larger or smaller angle with the vertical direction, up to 90°.

Such drilling allows drilling into several mutually separate sources from one point , and is used for offshore drilling.

Deviation drilling causes, however, and in particular when the deviation angle from the vertical direction is large, problems with respect to transporting of the cuttings. Moreover, the friction against the bore hole becomes large, and the weight on the drill bit may be insufficient. Generally the weight of a conventional drill string will be a problem when the more or less horizontal portion of the bore hole has a large length.

The problem of transporting the cuttings will increase with the deviation angle and the length of the hole. A large deviation angle means that the cuttings have a short way to "fall" until they reach the "bottom" of the hole.

The weight of the drill string will generally be proportional to the frictional forces and frictional torques which occur between the drill string and the wall of the hole. In long holes having a large deviation angle said forces and torques will be of importance, and they will determine the possible length of drilling until the friction becomes too large.

The object of the present invention is to provide a drilling pipe which makes it possible to reduce the frictional forces and the frictional torques and which simultaneously keeps the pressure losses and the operational and handling conditions within acceptable limits.

In accordance with the invention the above has been achieved with a drilling pipe as specified in the accompanying claims.

With a drilling pipe according to the invention is achieved a buoyancy, which causes that the pressure of the drill string against the under side of a more or less horizontal portion of a hole is reduced.

According to an embodiment the drilling pipe is made of an inner and an outer tube, and the inner tube has ribs which maintain the distance from the outer tube and contribute to prevent that the outer tube is squeezed together by the outer pressure.

According to another embodiment at least the outer tube is helical.This brings about a reduction of the contact surface of the drill pipe against the wall of the hole and reduced problems related to friction between the drill string and the wall of the hole.

It is to be noted that the entire drill string does not have to comprise drilling pipes according to the invention,because these may be combined with drilling pipes without cavities for buoyancy. Conventional drilling pipes may for instance be used during the first phase of the drilling, when the transporting of cuttings and the frictional forces are small problems, and drilling pipes according to the invention may be used in the area where the major deviation takes place.

The buoyance chamber or channels may be permanemtly closed, and the cross section of the chamber or the channels is of course adapted to the desired buoyancy, taking into account the weight of the drilling mud which determines the buoyancy per unit of volume.

In the following the invention will be explained closer, with reference to the accompanying drawings.

Fig. 1 shows a longitudinal section through an originally straight drilling pipe according to the invention.

Fig.2 shows a cross section through a drilling pipe according to the invention.

Fig. 3 shows a longitudinal section through a drilling pipe according to the invention, in which the outer tube is of helical shape, while the inner tube primarily is straight.

The shown drilling pipes are sections which are adapted to form a drill string by being joined, and they may, as mentioned, provide a combination together with sections which have no cavities for buoyancy.

The drilling pipe shown in Fig.1 consists of an outer tube 1 and an inner tube 2, and said tubes are concentrical and are spaced radially by means of ribs 3. On each end of the drilling pipe is a head 4,5, which may have outer and inner threads, respectively, for screwing together of drilling pipes to form a string.

The tubes 1 and 2 may have cross sections as shown in Fig. 2, where the tube 1 has smooth walls while the tube 2 has outer ribs 3.

Fig.3 shows an embodiment where the outer tube 1 is of helical shape, while the inner tube 2 is straight. The drilling pipe shown in Fig.3 has heads 4 and 5, in the same manner as the drilling pipe shown in Fig.1, and ribs 3 maintain the distance between the tubes 1 and 2.In this case, however, the ribs 3 have a height which varies with the distance between the tubes 1 and 2.

A not shown modification is a drilling pipe of which both the outer tube 1 and the inner tube 2 have helical shape.

The heads 4 and 5 may be of conventional type, and are not closer described.

The tubes 1 and 2 may be made of aluminium. It is theoretically possible to extrude the tubes 1 and 2 and the ribs 3 together, but because of the compression loading to which the tubes

are subjected it is considered necessary to use heavily extrudable alloys , which makes it necessary to manufacture the tubes 1 and 2 separately, whereupon the tubes are joined.The joining may be performed in different ways, of which are mentioned:
Stretching of the tube 1 until it comes into pressure contact with the ribs 3.
Pulling of a plunger through the tube 2, in order to bring the ribs 3 into pressure contact with the tube 1.

The use of a temperature difference between the tubes 1 and 2 and moving the tubes 1 and 2 together, followed by the above mentioned stretching or pulling of a plunger.

Explosive technology, for instance placing of a detonating fuse around the tube 1, whereby the detonation will press the ribs 3 into the wall of the tube 1.

The manufacture, however, does not constitute any limitation with respect to the scope of the invention, and is merely mentioned as examples of possibilities.

The above processes may also be used when the outer tube is of helical shape, as shown in Fig.2. If both the tubes are of helical shape the inner tube must be screwed into the outer one after giving both the tubes their shape. Thereupon one of the above mentioned processes may be used. Alternatively the two tubes may be moved together in straight condition, whereupon they are given a helical shape.

A drilling pipe according to the invention contains a closed chamber or a plurality of channels which are closed against the exterior. There is no hindrance of providing mutually communicating channels, but grounds of manufacture make it most appropriate that the channels are separate.

The cavity or the channels for buoyanca may as mentioned contain air, but also other media can be used, such as a liquid or a more or less solid mass. Also another gas than air may be used.

The invention makes it possible, in particular when the mud weight is relatively high, to achieve a "positive" buoyancy.Compared with conventional drilling pipes of aluminium the invention makes it possible to achieve a substantial weight reduction, for instance by a factor in the range of 3, and relatively to conventional drilling pipes of steel there may be achieved a weight reduction by a factor in the range of 7 (I.e. approximately 1/3 and 1/7 , respectively, of the weight of conventional drilling pipes).

It will be appreciated that the joining of the tubes 1 and 2 and the heads 4 and 5 may be performed in any suitable manner. As examples are mentioned threaded connections and welding. The inner tube, which is adapted to convey mud, of course communicates with apertures in the heads 4 and 5, in such a manner that a plurality of joined drilling pipes constitute a string having a continuous inner channel.

In addition to the fact that the tubes 1 and 2 must be designed for the prevailing pressures, they must also be designed to withstand the bending which necessarily occurs during deviated drilling, and the tubes must furthermore be designed to withstand the axial forces and the torque to which they are subjected.

Claims.

1. Drilling pipe for making a drill string, in particular for deviation drilling, characterized in that it comprises an outer tube (1) and an inner tube (2) which are connected to heads (4,5) on each end, in such a manner that the inner tube (2) communicates with apertures through each head, and such that a closed cavity is constituted between the tubes (1,2).

2. Drilling pipe according to claim 1, characterized in that ribs (3) are provided in said cavity, in order to maintain the radial distance between the tubes.

3. Drilling pipe according to claim 2, characterized in that the ribs (3) are made integrally with one of the tubes (1,2).

4. Drilling pipe according to claim 3, characterized in that the ribs (3) are exterior ribs on the inner tube (2).

5. Drilling pipe according to claims 1 to 4, characterized in in that at least the outer tube (1) is of helical shape.

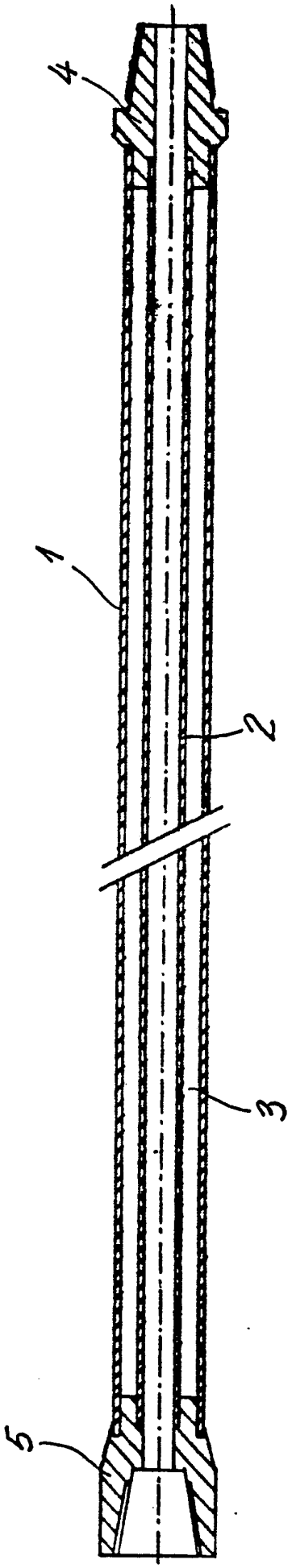

Fig. 1

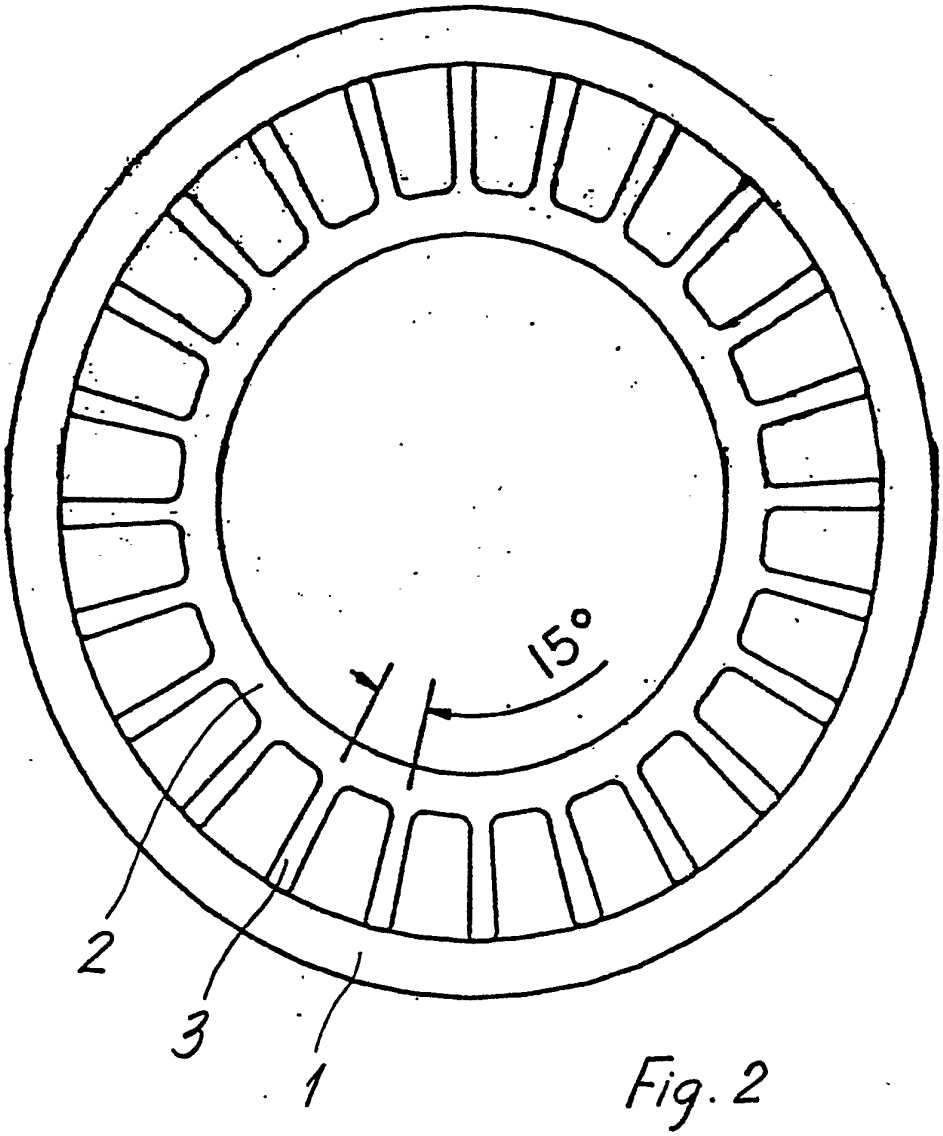

Fig. 2

INTERNATIONAL SEARCH REPORT

International Application No PCT/NO86/00019

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [6]

According to International Patent Classification (IPC) or to both National Classification and IPC 4

E 21 B 17/00

II. FIELDS SEARCHED

Minimum Documentation Searched [7]

Classification System	Classification Symbols
IPC 4	E 21 B 17/00, /18, /20, /22, 7/00, /08; E 21 C 15/00
US Cl	175: 320, 323; 285: 133

Documentation Searched other than Minimum Documentation to the Extent that such Documents are included in the Fields Searched [8]

SE, NO, DK, FI classes as above

III. DOCUMENTS CONSIDERED TO BE RELEVANT [9]

Category *	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No. [13]
X,Y	US, A, 1 024 310 (R H CANFIELD) 23 APril 1912	1, 2, 3, 4
X	DE, A1, 3 239 342 (SCHMIDT, KRANZ & CO GMBH) 26 April 1984	1, 5
Y	DE, C, 816 464 (H KÄSTNER) 11 October 1951	2, 3, 4
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IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
1986-05-13	1986 -05- 14
International Searching Authority	**Signature of Authorized Officer**
Swedish Patent Office	Christer Bäcknert

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