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(54) **A DEVICE FOR DRILLING IN EARTH-LAYERS AND ROCK**

VORRICHTUNG ZUM BOHREN IN ERDSCHICHTEN UND GESTEIN

DISPOSITIF POUR FORER DANS DES COUCHES TERRESTRES ET DE LA ROCHE

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(56) References cited:
WO-A1-03/004824 WO-A1-2005/098194
WO-A1-2006/025713 US-A- 4 706 764
US-A- 5 009 271 US-A- 5 284 216
US-A- 5 699 867 US-A- 5 803 192
US-B1- 6 502 650

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Description

[0001] The present invention refers to a device for performing of a drilling in earth-layers and rocks at the same time as a casing pipe is forced downwards into the ground, so that strokes from a countersink hammer via a bore crown or a guide belonging to a bore crown is acting against a shoulder situated at the lower most portion of the casing pipe in driving downwards of the casing pipe into the bore hole made together with the bore crown used.

[0002] Bore devices of today are usually built up around a countersink hammer and is used for instance for drilling of a well, said drilling tool comprising a pilot crown having a reamer bit provided, so that it can be throw outwards eccentrically in relation to the pilot crown and make the bore being drilled larger. In this case the bore hole made can get the dimension enough in order to besides the bore crown in a swung in position has place for a casing pipe, which has been moved downwards into the bore hole at the same time as the hole is being made. The casing pipe is driven downwards into the hole together with the bore crown by that the strokes of a counter sink hammer via the bore crown or a guide is acting against a shoulder situated at the lower most portion of the casing pipe. The casing pipes usually consist of three meter's lengths of steel or plastic which are welded or screwed together as the casing pips are driven downwards into the bore hole. One drawback using this technique is that during the end of the drilling and the removing of the bore head out from the bore hole, valuable material must be left in the hole, which is anchored in different ways at the end portion of the casing pipe and which is necessary for carrying out the drilling and the driving downwards of the casing pipe into the bore hole.

[0003] WO 03/004824 discloses a drilling tool and a method for down-the-hole drilling. The drilling tool comprises a central pilot drill bit, a reamer and a guide body and being intended to drill a hole ahead of a following casing tube. The casing pipe has a welded-on casing shoe, which forms a circular collar in the inside of the casing tube, which is used to drive down the tube by the down-the-hole hammer.

[0004] One object of the present invention is to eliminate those drawbacks present of known bore devices of the type mentioned above by providing a new type of device for drilling in earth-layers and rocks. The characterizing features of the present invention are set forth in the claims enclosed.

[0005] Thanks to the invention a device has now been provided, which in an excellent way fulfils its purpose at the same time as it furthermore is both cheap and easy to manufacture. According to the invention the shoulder, which is situated at the lower portion of the casing pipe, formed by a wearing ring of steel or plastic resting against an edge portion within the inner mantle surface of the casing pipe, which directly or indirectly cooperates against a shoulder surface facing in a direction to the free

end portion of the casing pipe, said shoulder surface is located on the guide belonging to the casing pipe and also a boring string rotary connected to a boring machine. A shoulder provided protecting ring can further be used in the free end portion of the casing pipe in preventing of penetrating of gravel and sand between the bore crown and the casing pipe and the shoulders of which are located on the protecting ring so that the wearing ring indirectly cooperates against the shoulder surface of the bore crown or the guide.

[0006] The invention is described closer below with help of a preferred embodiment example with reference to the accompanying drawings, in which

15 Fig. 1 shows a schematic cross section view of a previously known embodiment form of a bore crown with belonging parts in connection with the lowermost free end portion of a casing pipe,

20 Fig. 2 shows a schematic cross section view like the one illustrated in Fig. 1 but formed according to the present invention,

25 Fig. 3 shows a cross section view of a wearing ring formed according to the present invention, and

30 Fig. 4 shows a cross section view of a protecting ring which can be used in preventing penetrating of gravel and sand between the bore crown and the casing pipe.

[0007] According to a preferred embodiment example of the invention the same consists of a device illustrated in Fig. 2 comprising a bore or pilot crown 1, a reamer crown 2 and a guide 3 of a counter sink hammer not illustrated in the drawing and a portion of a boring string 4. The crowns 1 and 2 and the guide 3 are rotated via the boring string 4 in a way known and are influenced axially by the counter sink hammer. A casing pipe 5 of preferably a plastic material as e.g. PEH-plastic, according to the invention, is provided with a shoulder 6 in its lower most portion 7, which is constituted by a wearing ring 10 of a steel or plastic material, resting against an edge portion 8 within the inner mantle surface 9 of the casing pipe 5. The guide 3 in this embodiment example has a downwardly directed shoulder surface 11 located on an expanded portion 12 and which transfers the strokes of the counter sink hammer against the wearing ring 10 and its shoulder 6 either directly via a protecting ring 13 illustrated in Fig. 2, which prevents penetrating of gravel and sand between the bore crown and casing pipe. The protecting ring 13 also has a first or second shoulder surface 14 and 15 for transferring strokes from the counter sink hammer indirectly against the wearing ring 10 from the shoulder surface 11 of the guide 3. The casing pipe 5 is drawn downwards by the strokes directed against the guide 3 and from this they are directly transferred to the shoulder 6 of the wearing ring 10 or indirect

via the shoulder surfaces 14 and 15 of the protecting ring 13.

[0008] In Fig. 1 an embodiment example of a known formation of the parts of a bore crown of an equipment for a simultaneous drilling and lining of a bore hole is illustrated in a cross section view, in said example a casing pipe 5' of steel is used, which in its lower most free end portion 7' has a sleeve formation 10' of steel, which is welded to the casing pipe 5' in order to constitute in the same time a shoulder 6' directed upwards for transferring of strokes driven downwards from a counter sink hammer via a shoulder surface 11' on the guide 3'.

[0009] In Fig. 3 a cross section view of the wearing ring 10 is illustrated; as it is formed according to the invention and in Fig. 4 a cross section view of the protecting ring 13 is illustrated, as it is formed according to the present invention.

Claims

1. A device for carrying out drilling in earth-layers and rocks during a simultaneous forcing downwards of a casing pipe (5) into the ground, the device comprising a bore crown (1) of a countersink hammer and a casing pipe (5) with a shoulder (6) situated at the lower most portion (7) of the casing pipe (5), a shoulder surface (11) situated on the bore crown (1) or on a guide (3) belonging to the bore crown (1) and which shoulder surface (11) is faced downwards in a direction to the free, lower most portion (7) of the casing pipe (5), whereby strokes from the countersink hammer via the bore crown (1) or the guide (3) belonging to the bore crown (1) is provided to cooperate against the shoulder (6) in driving downwards of the casing pipe (5) into the bore hole made together with the bore crown (1), **characterized in that** the shoulder (6) is formed by a wearing ring (10) placed into position against an edge portion (8) within the inner mantle surface (9) of the casing pipe (5) for a direct or indirect cooperation against the shoulder surface (11).
2. A device according to claim 1, **characterized in that** the wearing ring (10) is intended for an indirect cooperation with said guide (3) via a protecting ring (13) extending between the inner mantle surface (9) of the casing pipe (5) and the guide (3) and between the inner mantle surface (9) of the casing pipe (5) with the adjacent wearing ring (10) and the guide, said protecting ring (13) in turn has a first shoulder surface (14) directed downwards for cooperation against the wearing ring (10) and a second shoulder surface (15) directed upwards for cooperation with the downwardly directed shoulder surface (11), which is provided on the guide (3).

Patentansprüche

1. Vorrichtung zum Ausführen von Bohrungen in Erdschichten und Gestein während eines simultanen nach unten Drückens eines Mantelrohrs (5) in den Boden, die Vorrichtung umfassend eine Bohrkronen (1) eines Senkhammers und ein Mantelrohr (5) mit einer Schulter (6), welche auf dem untersten Abschnitt (7) des Mantelrohrs (5) angeordnet ist, eine Schulteroberfläche (11), welche auf der Bohrkronen (1) oder auf einer zur Bohrkronen (1) gehörenden Führung (3) angeordnet ist, wobei die Schulteroberfläche (11) in einer Richtung zum freien, untersten Abschnitt (7) des Mantelrohrs (5) nach unten gerichtet ist, wobei vorgesehen ist, dass Schläge des Senkhammers durch die Bohrkronen (1) oder die zur Bohrkronen (1) gehörende Führung (3) gegen die Schulter (6) beim Abwärtstreiben des Mantelrohrs (5) in das Bohrloch zusammenzuwirken, welches gemeinsam mit der Bohrkronen (1) geformt wird, **dadurch gekennzeichnet, dass** die Schulter (6) durch einen Verschleißring (10) gebildet wird, welcher gegen einen Randabschnitt (8) innerhalb der inneren Manteloberfläche (9) des Mantelrohrs (5) zum direkten oder indirekten Zusammenwirken gegen die Schulteroberfläche (11) in Position gehalten wird.
2. Vorrichtung gemäß Anspruch 1, **dadurch gekennzeichnet, dass** der Verschleißring (10) für ein indirektes Zusammenwirken mit der genannten Führung (3) durch einen Schutzring (13) vorgesehen ist, welcher sich zwischen der inneren Manteloberfläche (9) des Mantelrohrs (5) und der Führung (3) sowie zwischen der inneren Manteloberfläche (9) des Mantelrohrs (5) mit dem angrenzenden Verschleißring (10) und der Führung erstreckt, wobei der genannte Schutzring (13) hingegen eine erste Schulteroberfläche (14), welche zum Zusammenwirken gegen den Verschleißring (10) nach unten gerichtet ist, und eine zweite Schulteroberfläche (15), welche zum Zusammenwirken mit der auf der Führung (3) vorgesehenen, nach unten gerichteten Schulteroberfläche (11), nach oben gerichtet ist, aufweist.

Revendications

1. Dispositif pour effectuer des forages dans des couches terrestres et de la roche simultanément au cours d'un enfoncement d'un tubage (5) dans le sol, le dispositif comprenant une couronne de forage (1) d'un marteau de fraisage et un tubage (5) doté d'un épaulement (6) situé à la partie la plus basse (7) du tubage (5), une surface d'épaulement (11) située sur la couronne de forage (1) ou sur un guide (3) appartenant à la couronne de forage (1) et laquelle surface d'épaulement (11) est orientée vers le bas dans une direction jusqu'à la partie la plus basse (7), libre, du

tubage (5), grâce à quoi les courses du marteau de fraisage par le biais de la couronne de forage (1) ou du guide (3) appartenant à la couronne de forage (1) permettent de coopérer contre l'épaule (6) dans l'entraînement vers le bas du tubage (5) dans le trou de forage réalisé conjointement avec la couronne de forage (1), **caractérisé en ce que** l'épaule (6) est formé par un anneau d'usure (10) placé en position contre une partie de bord (8) au sein de la surface de manteau interne (9) du tubage (5) pour une coopération directe ou indirecte contre la surface d'épaule (11).

2. Dispositif selon la revendication 1, **caractérisé en ce que** l'anneau d'usure (10) est destiné à une coopération indirecte avec ledit guide (3) par le biais d'un anneau de protection (13) s'étendant entre la surface de manteau interne (9) du tubage (5) et le guide (3) et entre la surface de manteau interne (9) du tubage (5) avec l'anneau d'usure (10) adjacent et le guide, ledit anneau de protection (13), à son tour, comportant une première surface d'épaule (14) dirigée vers le bas pour coopération contre l'anneau d'usure (10) et une seconde surface d'épaule (15) dirigée vers le haut pour coopération avec la surface d'épaule (11) dirigée vers le bas, qui est située sur le guide (3).

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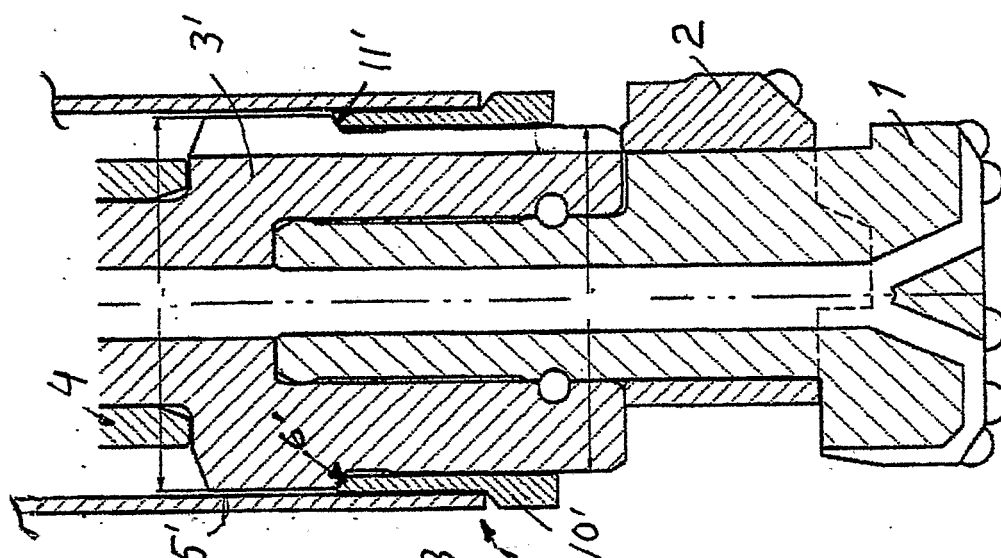


Fig. 1

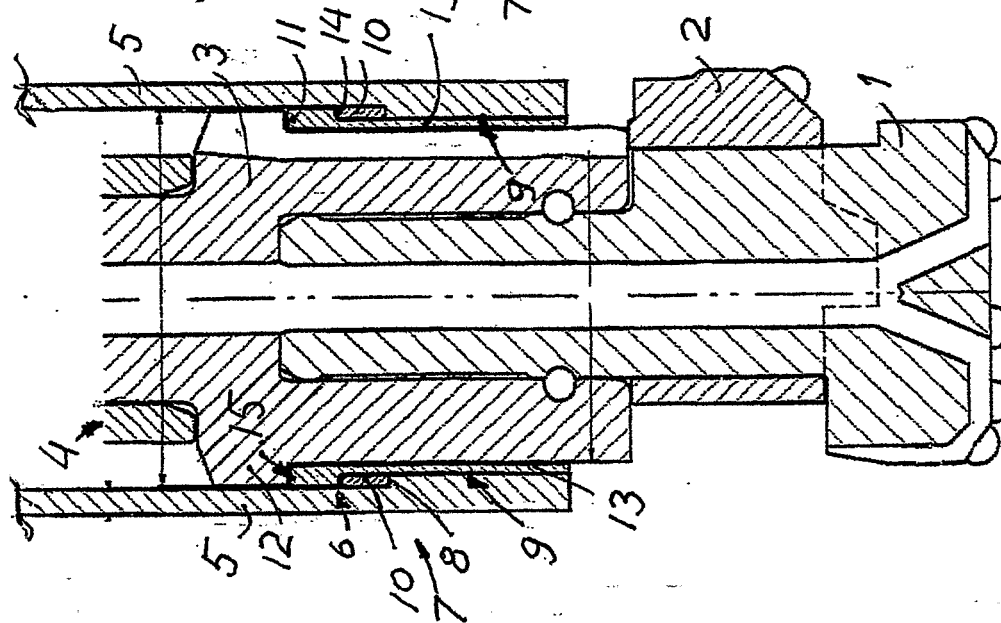


Fig. 2

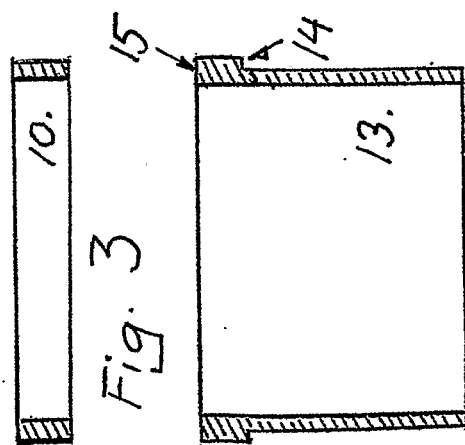


Fig. 3

Fig. 4

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- WO 03004824 A [0003]