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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : E21B 7/20, 17/14

A1

(11) International Publication Number: **WO 97/06337**

(43) International Publication Date: 20 February 1997 (20.02.97)

(21) International Application Number: PCT/SE95/00904

(22) International Filing Date: 3 August 1995 (03.08.95)

(71) Applicant *(for all designated States except US)*: SVENSKA BORR AB [SE/SE]; Högalidsvägen 30, S-135 50 Tyresö (SE).

(72) Inventor; and

(75) Inventor/Applicant *(for US only)*: EDMAN, Östen [SE/SE]; Högalidsvägen 30, S-135 50 Tyresö (SE).

(74) Agent: GRUNDFELT, Gunnar; Atlas Copco Rock Drills AB, Patents, S-105 23 Stockholm (SE).

(81) Designated States: AM, AT, AU, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LT, LU, LV, MD, MG, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TT, UA, UG, US, UZ, VN, ARIPO patent (KE, MW, SD, SZ, UG), European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).

Published

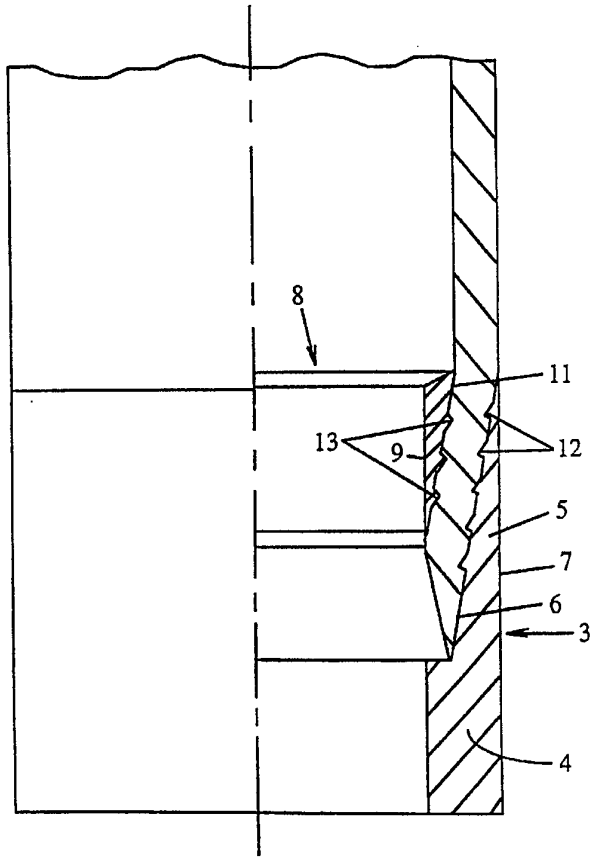
With international search report.

In English translation (filed in Swedish).

(54) Title: DRILLING METHOD AND CASING SHOE

(57) Abstract

At drilling in earth layers and simultaneous forcing in of casing tubes it is desirable to use casing tubes of plastic material, such as PEH plastic. This is made possible through a special forming of a casing shoe which gives a firm connection between the casing shoe and the casing tube. The casing shoe comprises an outer annular part (3) and an inner annular part (8) with against each other corresponding conical sections (6, 11) between which the casing tube can be clamped.



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Drilling method and casing shoe

The present invention relates to a method of performing drilling in earth layers with simultaneous forcing in of casing tubes of plastic or similar material, and a casing shoe for bringing the casing tube with it.

When performing drilling in earth layers one uses a pilot drill bit with a reamer drill bit arranged such that it can be thrown out eccentrically relative to the pilot drill bit and enlarge the hole drilled thereby. Through this the drilled hole can get sufficient dimension to give place, in addition to the drill bit with retracted reamer, for a casing tube entered into the borehole at the same time as the hole is drilled. The casing tube is thereby driven down by a casing shoe welded to the end of the casing tube and acted on by a down-the-hole hammer. The casing tubes normally consist of three meter long steel tubes which are welded to each other when drilling and the tube has been driven down to a suitable level.

One problem with the handling of the casing tubes is their weight. Another is the possibility of corrosion which in certain cases results in exchange of them to e.g. plastic tubes after finished drilling, a complicated and time-consuming procedure.

One object with the present invention is to eliminate the exchange of casing tubes and a further object is to simplify the handling of casing tubes during the drilling. These and other objects are fullfilled through the use of casing tubes of plastic material already from the beginning, which according to the invention is made possible through a special shape of the casing shoe which gives a strong anchoring in the plastic material. Additional advantageous details appear in the claims and the detailed description.

Through the Swedish patent application 9200563-6 and the corresponding international application WO 93/17215 a casing shoe specially formed for strong anchoring in casing tubes of plastic material is known. This requires joining of plastic material through holes in the casing shoe, which can be difficult to perform with good result at the site for the drilling, why it is best suited for being prefabricated and transported joined to one length of tube to the drilling site. With a casing shoe acording to the present

invention no joining of plastic material through holes in the casing shoe is needed. The joining of the casing shoe with the casing tube can be performed at the drilling site partly with aid of the drill hammer.

The invention will now be described more in detail with reference to the accompanying drawings in which fig 1 shows, partly in section, the shape of a casing shoe according to the invention, and fig 2 shows an alternative shape of the casing shoe.

Fig 1 shows a casing shoe according to the invention, partly in section. This is intended to be used for lining with casing tubes of plastic material or other material which cannot be welded to a conventional casing shoe. It can be used with down-the-hole hammers of e.g. the type described in Swedish lay-open print 411139 but can also be used with equipment provided with other types of drill hammers. The casing shoe comprises two separate annular parts with conical sections, between which the casing tube is clamped. The outer ring 3 of the casing shoe is thus formed with a lower strong part 4 connected with an upper part 5 with a conical inner surface 6 which has a diameter which is larger than that of the lower part 4 and slowly increases until the diameter of the outer surface 7 is reached. The outer surface 7 of the outer ring 3 of the casing shoe has a substantially constant diameter along the entire length of the outer ring and it is substantially the same as the outer diameter of the casing tube. The inner ring 8 of the casing tube has in a corresponding way an inner surface 9 with substantially constant diameter adapted to the outer diameter of the drill hammer. The inner ring 8 has a substantially triangular cross-section with an impact surface and a conical outer surface 11 and with an outer diameter which decreases from the impact surface, the outer surface 11 being intended for cooperation with the conical inner surface 6 of the outer ring so that the casing tube is clamped.

The angles for the conical surfaces 6 and 11 relative to the longitudinal axes of the rings are substantially equal. The surfaces 6 and 11 are preferably provided with projections 12 and 13 respectively which can be distributed both axially and radially. They can be annular or formed in spiral as threads. The projections can furthermore have a first surface with a small angular deviation from the main surface and a second surface with a large angular deviation from the main surface directed such that they get

barbed function against drawing apart of the inner ring and the outer ring from the casing tube. Since the projections preferably are placed such that they with connected casing shoe have passed each other the locking action against separation increases. Alternatively only one of the oblique surfaces 6 and 11 is provided with projections whereas the other has depressions lying opposite to the projections when the rings have been pressed together about the casing tube (not shown).

The pointed ends of the outer ring 3 and the inner ring 8 can be rounded in a suitable way. The surface toward the casing tube can thus be rounded to simplify the connection with the casing tube. Furthermore the outer diameter of the outer ring can be slightly decreasing and the inner diameter of the inner ring slightly increasing the last part toward respective pointed end to compensate for the deformation of these thin parts of the material which may occur because of the joining.

In the embodiment according to fig 2 the outer ring and the inner ring are modified such that they at the mounting on the casing tube completely surround the end part of the tube. This is achieved because the conical parts 6 and 11 change to cylindrical parts 14 and 15 respectively between which the end part of the casing tube can be pressed in. Thus no part of the casing tube is pressed inside the inner diameter of the casing shoe and the inner ring is adapted to reach the outer ring when mounted. As a further modification (not shown) it is possible to eliminate the middle part with the cylindrical sections 14 and 15 and thus obtain a casing shoe similar to the one in fig 1 but where the conical inner ring 8 reaches the lower part 4 of the outer ring when the casing shoe is mounted on the casing tube.

The casing shoe according to the invention can be applied at the end of the casing tube in the following way. An inner ring is placed in the tube with the pointed part toward the tube end but extra far into the tube. Then an outer ring is pressed or hammered onto the tube end until the casing tube has reached the lower part 4. With the aid of the drill hammer the inner ring now can be hammered into position. That part of the casing tube which comes in the way of the drill bit or the drill hammer will normally be worked away by channels in the drill or down-the-hole hammer when these rotate. Alternatively they can be worked away before the inner ring is moved into position with the drill

the drill hammer.

Claims:

1. Method of performing drilling in earth layers with simultaneous forcing in of casing tubes in which a drill hammer is arranged to act on a casing shoe joined with the casing tube at its the lower end and tubes of plastic or similar material are used as casing tubes, c h a r a c t e r i z e d in that as casing shoe is used an inner ring and an outer ring with conical sections between which the casing tube is clamped.

2. Method according to claim 1, c h a r a c t e r i z e d in that the casing shoe is clamped to the casing tube through entering the inner ring into the casing tube, that the outer ring at least with its conical part is pressed or hammered onto the end of the tube and that the inner ring after that is hammered fast with the drill hammer.

3. Casing shoe for casing tubes to be used with drill hammers, c h a r a c t e r i z e d in that it comprises an outer annular part (3) and an inner annular part (8) with against each other corresponding conical sections (6,11) between which the casing tube can be clamped.

4. Casing shoe according to claim 3, c h a r a c t e r i z e d in that the outer annular part (3) has an outer diameter substantially corresponding to the outer diameter of the casing tube (2) and that its conical section has a decreasing inner diameter from the outer diameter at one of the ends of the outer annular part and that the inner annular part (8) from a part against which the drill hammer acts has a decreasing outer diameter forming its conical section.

5. Casing shoe according to claim 3 or 4, c h a r a c t e r i z e d in that it furthermore shows an annular part between outer ring and inner ring which is a continuation of the space between the conical parts and allows further clamping of the casing tube.

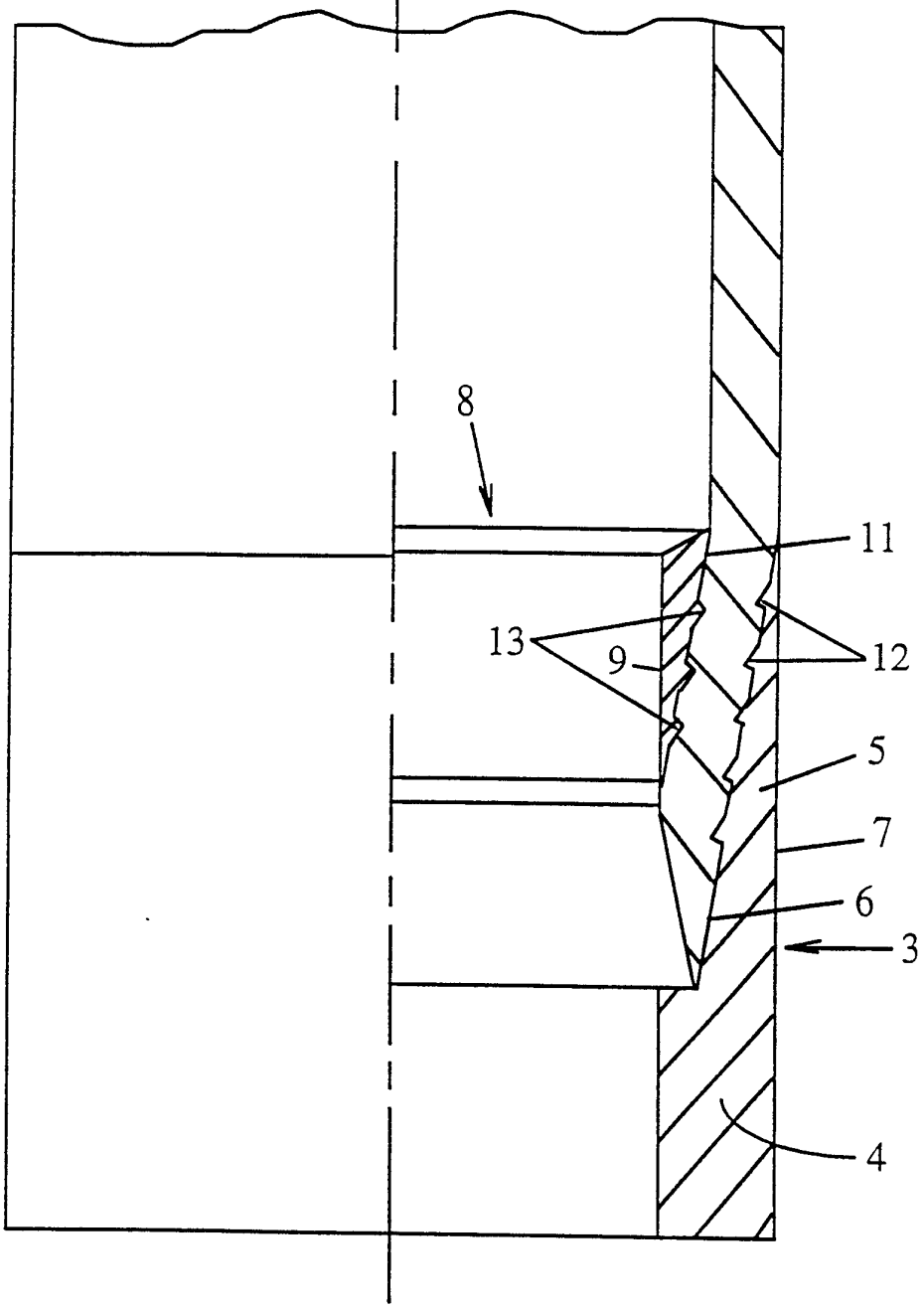


Fig. 1

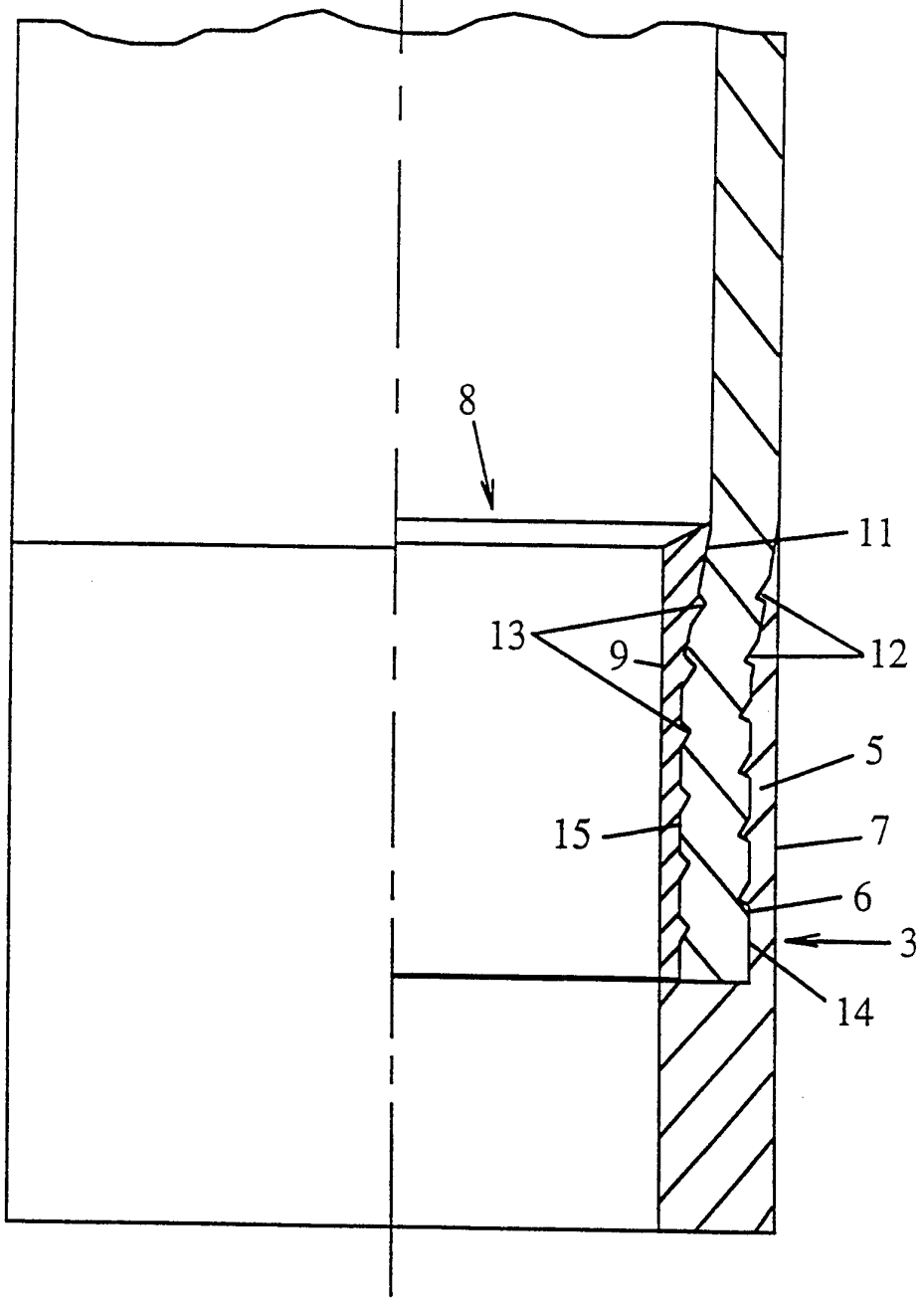


Fig. 2

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 95/00904

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: E21B 7/20, E21B 17/14
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: E21B, F16L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPODOC; PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 9317215 A1 (EDMAN KNUT ÖSTEN), 2 Sept 1993 (02.09.93), abstract -- --------	1,3

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

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26 March 1996	29 -03- 1996
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INTERNATIONAL SEARCH REPORT

Information on patent family members

05/02/96

International application No.
PCT/SE 95/00904

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO-A1- 9317215	02/09/93	AU-A- 3653793	13/09/93
		CA-A- 2130818	02/09/93
		EP-A- 0627040	07/12/94
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		JP-T- 6509757	02/11/94
		JP-T- 7509546	19/10/95
		NO-A,D- 943131	24/08/94
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