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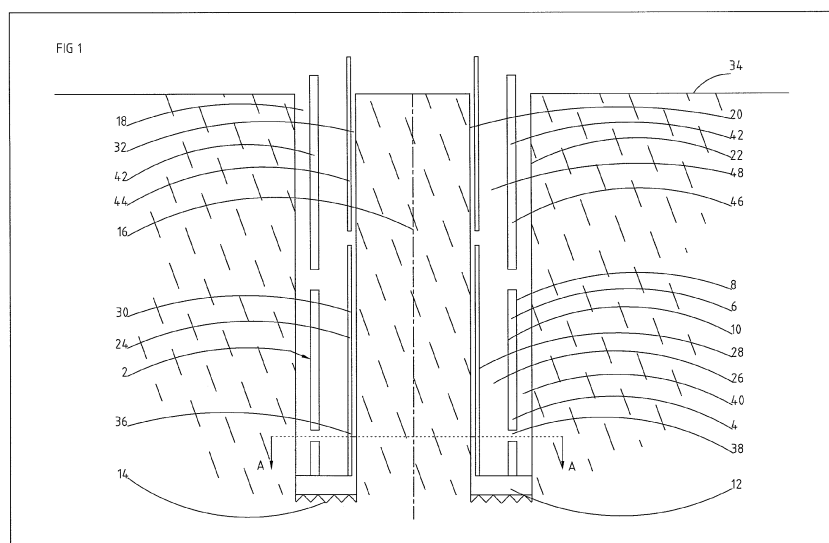
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(54) **Anchor device and drilling assembly incorporating such anchor member**

(57) An anchor device (4) adapted to be anchored in an annular cavity (18) is disclosed. The anchor device comprises a body portion (6) and a cutting portion (12) and is adapted to engage a body member (24) to form a drilling assembly (2). The drilling assembly is adapted to cause the cutting portion to form an annular cavity defining a second radially inner surface (20) spaced from a first radially inner surface (30) and a second radially outer

surface (22) spaced from a first radially outer surface (8). The drilling assembly defines at least one fluid delivery channel (26) for delivering fluid to a region adjacent the cutting portion to remove drill cuttings from the region via a space (40) between the first radially outer surface and the second radially outer surface. The anchor device is adapted to disengage the body member after formation of the annular cavity.



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Description

[0001] The present invention relates to anchor devices and relates particularly, but not exclusively, to anchor devices for onshore drilling applications. The invention also relates to drilling assemblies incorporating such anchor devices.

[0002] It is known to provide anchor devices in the form of cylindrical piles which are driven into the ground by means of drilling and anchor a structure to the ground by means of engagement of their external surfaces with the ground. However, this arrangement suffers from the drawback that excessive amounts of energy are consumed in removing a cylindrical volume of material to form a cylindrical cavity for receiving the pile, and the piles may need to be driven to significant depths to provide sufficient anchoring for their particular application. This in turn significantly increases the cost of installation of the piles.

[0003] Preferred embodiments of the present invention seek to overcome one or more of the above disadvantages of the prior art.

[0004] According to an aspect of the present invention, there is provided an anchor device adapted to be anchored in an annular cavity, the anchor device comprising:-

a body portion and a cutting portion arranged adjacent a first end of said body portion, wherein the anchor device is adapted to engage a body member to form a drilling assembly having a substantially annular body defining a first radially inner surface and a first radially outer surface, wherein the drilling assembly is adapted to cause said cutting portion to form an annular cavity by means of at least rotation of said cutting portion, such that said annular cavity defines a second radially inner surface spaced from said first radially inner surface and a second radially outer surface spaced from said first radially outer surface, and said drilling assembly defines at least one fluid delivery channel for delivering fluid to a region adjacent said cutting portion to remove drill cuttings from said region via a space between said first radially outer surface and said second radially outer surface and/or a space between said first radially inner surface and said second radially inner surface, and wherein said anchor device is adapted to disengage said body member after formation of said annular cavity.

[0005] By providing an arrangement in which an annular cavity is formed by means of at least rotation of the cutting portion, such that the annular cavity defines a second radially inner surface spaced from the first radially inner surface and a second radially outer surface spaced from the first radially outer surface, and the drilling assembly defines at least one fluid delivery channel for delivering fluid to a region adjacent the cutting portion to

remove drill cuttings from said region via a space between the first radially outer surface and the second radially outer surface and/or a space between said first radially inner surface and said second radially inner surface, and wherein the anchor device is adapted to disengage the body member after formation of the annular cavity, it is believed that this provides the advantage of enabling bonding of the anchor device at inner and outer surfaces of the body portion thereof, thereby requiring a shorter length of cavity for a given anchoring force, thereby reducing the cost of installation of the anchor device in certain formations.

[0006] Said body portion may define said first radially inner surface and said anchor device may be adapted to engage a body member such that said body portion at least partially surrounds said body member.

[0007] The anchor device may further comprise engaging means adapted to sealingly engage the body member.

[0008] This provides the advantage of enabling one or more of said fluid delivery channels to be defined between the anchor device and the body member, thereby simplifying construction and reducing the cost of the drilling assembly.

[0009] The anchor device may further comprise at least one mounting portion arranged adjacent a second end of said body portion.

[0010] This provides the advantage of simplifying attachment of further structures to the anchor device.

[0011] At least one said mounting portion may comprise a respective flange.

[0012] The anchor device may further comprise at least one fluid outlet communicating with at least one respective said fluid delivery channel to enable delivery of fluid to said region.

[0013] The body member may be adapted to rotate with said cutting portion during formation of said annular cavity.

[0014] The cutting portion may be adapted to rotate relative to said body member during formation of said annular cavity.

[0015] This provides the advantage of reducing the risk of causing the inner core of the annular cavity to disintegrate.

[0016] The anchor device may further comprise at least one extension device comprising a respective first member adapted to be mounted to an end portion of said body portion and a respective second member adapted to be mounted to an end portion of said body member.

[0017] This provides the advantage of enabling the device to be used in applications where limited headspace is available.

[0018] According to another aspect of the present invention, there is provided a drilling assembly comprising an anchor device as defined above, and a body member adapted to engage the anchor device to enable formation of an annular cavity by means of at least rotation of said drilling assembly.

[0019] According to a further aspect of the present invention, there is provided a method of locating an anchor member in an annular cavity, the method comprising:-

forming an annular cavity by at least rotation of a drilling assembly comprising an anchor device as defined above and a body member engaging the anchor device;

delivering fluid to a region adjacent said cutting portion to remove drill cuttings from said region via a space between said first radially outer surface and said second radially outer surface; and

introducing bonding material between said second radially inner surface and said drilling assembly and between said second radially outer surface and said drilling assembly.

[0020] The method may further comprise separating the body member from the anchor device to leave the anchor device in said cavity.

[0021] The step of introducing bonding material may comprise introducing bonding material into at least one said fluid delivery channel to cause at least some of said bonding material to pass from said fluid delivery channel to spaces between said second radially outer surface and said drilling assembly and between said second radially inner surface and said drilling assembly.

[0022] The body member may be separated from the anchor device subsequently to introduction of bonding material between said second radially inner surface and said drilling assembly and between said second radially outer surface and said drilling assembly.

[0023] A preferred embodiment of the invention will now be described, by way of example only and not in any limitative sense, with reference to the accompanying drawings, in which:

Figure 1 is a schematic cross sectional elevation view of a drilling apparatus embodying the present invention and located in an annular cavity in the ground; and

Figure 2 is a view along the line A-A in Figure 1.

[0024] Referring to Figures 1 and 2, a drilling assembly 2 embodying the present invention comprises an anchor device 4 having an elongate generally cylindrical body portion 6 defining a first radially outer surface 8 and a third surface 10. A cutting portion in the form of an annular widened portion 12 at a first end of the body portion 6 and carrying cutting elements 14 of hardened material such as tungsten carbide is attached such that rotation of the drilling assembly 2 about its longitudinal axis 16 causes the cutting elements 14 to form an annular cavity 18 having a second radially inner surface 20 and a second radially outer surface 22.

[0025] The drilling assembly 2 also includes a body member 24 for sealingly engaging an upper surface of the widened portion 12 and to be surrounded by the body portion 6 so that the anchor device 4 and body member 24 define an annular chamber 26 between the third surface 10 and a fourth surface 28 defined by the body member 24. The body member 24 defines a first radially inner surface 30 which is spaced from the second radially inner surface 20 to define a first gap 32. The annular chamber 26 enables delivery of fluid from the surface 34 of the cavity 18 to one or more fluid outlets 38 near the widened portion 12 communicating with a region around the cutting elements 14 to enable drill cuttings to be removed from the region around the cutting elements 14 via a second gap 40 between the second radially outer surface 22 of annular cavity 18 and the first radially outer surface 8 of the body portion 6.

[0026] One or more extension devices 42 (of which only one is shown in Figure 1) can be attached to an upper part of the drilling assembly 2 by suitable means (not shown) such as pins and which will be familiar to persons skilled in the art. Each extension device 42 has an inner member 44 for attachment to the body member 24 and an outer member 46 for attachment to the body portion 6 to define an annular chamber 48 forming an extension to the annular chamber 26.

[0027] The operation of the drilling assembly 2 shown in Figures 1 and 2 will now be described.

[0028] The anchor device 4 is sealingly mounted to the body member 24 to form the drilling assembly 2, which is then rotated about its longitudinal axis 16 by means of drive means (not shown) to cause the cutting elements 14 to form the annular cavity 18. Suitable apparatus may also be provided for urging the drilling assembly 2 downwardly to assist in formation of the annular cavity 18. At the same time, suitable fluid such as water is introduced from ground level to the fluid outlets 38 via the annular chamber 26 between the anchor device 4 and body member 24 and via the annular chamber 48 if one or more extension devices 42 are attached, to remove drill cuttings generated by the cutting elements 14 via the second gap 40.

[0029] When the desired depth of cavity 18 has been reached, rotation of the drilling assembly 2 is ceased, and suitable bonding material such as grout or cement is introduced via the annular chamber 26 to the fluid outlets 38, to remove drilling fluid from the second gap 40. The body member 24 is then removed, leaving the anchor device 4 in position in the cavity 18 and exposing the third surface 10, and the bonding material is then allowed to set or is cured. The first gap 32 now extends from the second radially inner surface 20 to the third surface 10 because of removal of the body member 24. By provision of suitable mounting attachments such as a flange (not shown), structures to be anchored in place can be more easily attached to the upper end of the anchor device, although it will be appreciated by persons skilled in the art that other methods for attaching structures to the an-

chored anchor device 4 can be used.

[0030] It will be appreciated by persons skilled in the art that the above embodiment has been described by way of example only, and not in any limitative sense, and this various alterations and modifications are possible without departure from the scope of the invention as defined by the appended claims. For example, although in the above embodiment the entire drilling assembly 2 is rotated to form the annular cavity 18, it will be appreciated by persons skilled in the art that the anchor device 4 may be rotated to form the annular cavity 18 and the body member 24 remain stationary. Also, in certain situations, for example when the second inner surface 20 is formed from unstable material, the body member 24 may be left in position in the cavity 18.

Claims

1. An anchor device adapted to be anchored in an annular cavity, the anchor device comprising:-
a body portion and a cutting portion arranged adjacent a first end of said body portion, wherein the anchor device is adapted to engage a body member to form a drilling assembly having a substantially annular body defining a first radially inner surface and a first radially outer surface, wherein the drilling assembly is adapted to cause said cutting portion to form an annular cavity by means of at least rotation of said drilling assembly, such that said annular cavity defines a second radially inner surface spaced from said first radially inner surface and a second radially outer surface spaced from said first radially outer surface, and said drilling assembly defines at least one fluid delivery channel for delivering fluid to a region adjacent said cutting portion to remove drill cuttings from said region via a space between said first radially outer surface and said second radially outer surface and/or a space between said first radially inner surface and said second radially inner surface, and wherein said anchor device is adapted to disengage said body member after formation of said annular cavity.
2. A device according to claim 1, wherein said body portion defines said first radially inner surface and said anchor device is adapted to engage a body member such that said body portion at least partially surrounds said body member.
3. A device according to claim 1 or 2, further comprising engaging means adapted to sealingly engage the body member.
4. A device according to any one of the preceding claims, further comprising at least one mounting portion arranged adjacent a second end of said body portion.
5. A device according to claim 4, wherein at least one said mounting portion comprises a respective flange.
6. A device according to any one of the preceding claims, further comprising at least one fluid outlet communicating with at least one respective said fluid delivery channel to enable delivery of fluid to said region.
7. A device according to any one of the preceding claims, wherein the body member is adapted to rotate with said cutting portion during formation of said annular cavity.
8. A device according to any one of the preceding claims, wherein the cutting portion is adapted to rotate relative to said body member during formation of said annular cavity.
9. A device according to any one of the preceding claims, further comprising at least one extension device comprising a respective first member adapted to be mounted to an end portion of said body portion and a respective second member adapted to be mounted to an end portion of said body member.
10. A drilling assembly comprising an anchor device according to any one of the preceding claims, and a body member adapted to engage the anchor device to enable formation of an annular cavity by means of at least rotation of said drilling assembly.
11. A method of locating an anchor member in an annular cavity, the method comprising:-
forming an annular cavity by at least rotation of a drilling assembly comprising an anchor device according to any one of claims 1 to 9 and a body member engaging the anchor device;
delivering fluid to a region adjacent said cutting portion to remove drill cuttings from said region via a space between said first radially outer surface and said second radially outer surface; and
introducing bonding material between said second radially inner surface and said drilling assembly and between said second radially outer surface and said drilling assembly.
12. A method according to claim 11, further comprising separating the body member from the anchor device to leave the anchor device in said cavity.
13. A method according to claim 12, wherein the body member is separated from the anchor device subsequently to introduction of bonding material between said second radially inner surface and said drilling assembly and between said second radially outer surface and said drilling assembly.

14. A method according to any one of claims 11 to 13, wherein the step of introducing bonding material comprises introducing bonding material into at least one said fluid delivery channel to cause at least some of said bonding material to pass from said fluid delivery channel to spaces between said second radially outer surface and said drilling assembly and between said second radially inner surface and said drilling assembly.

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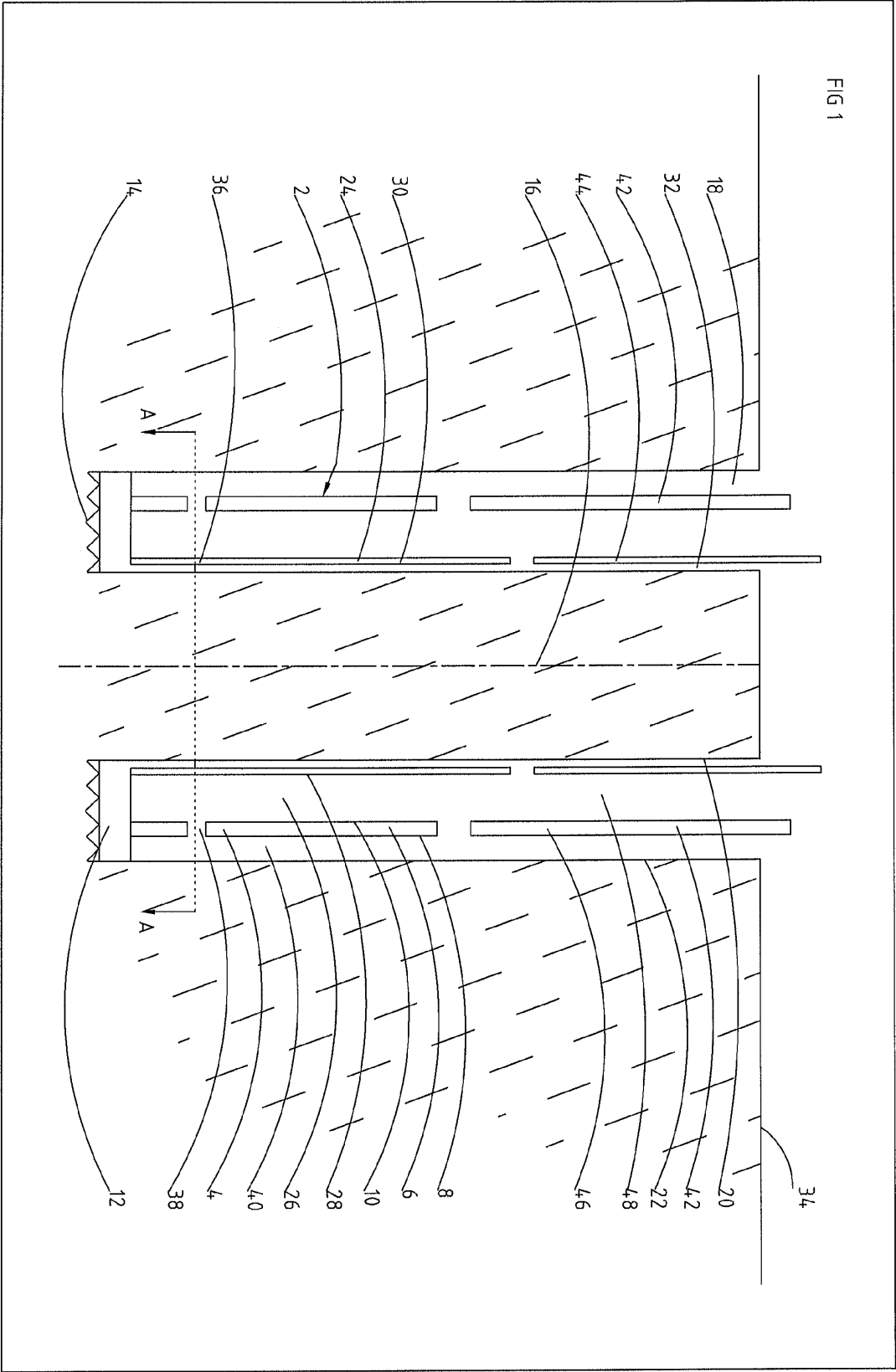
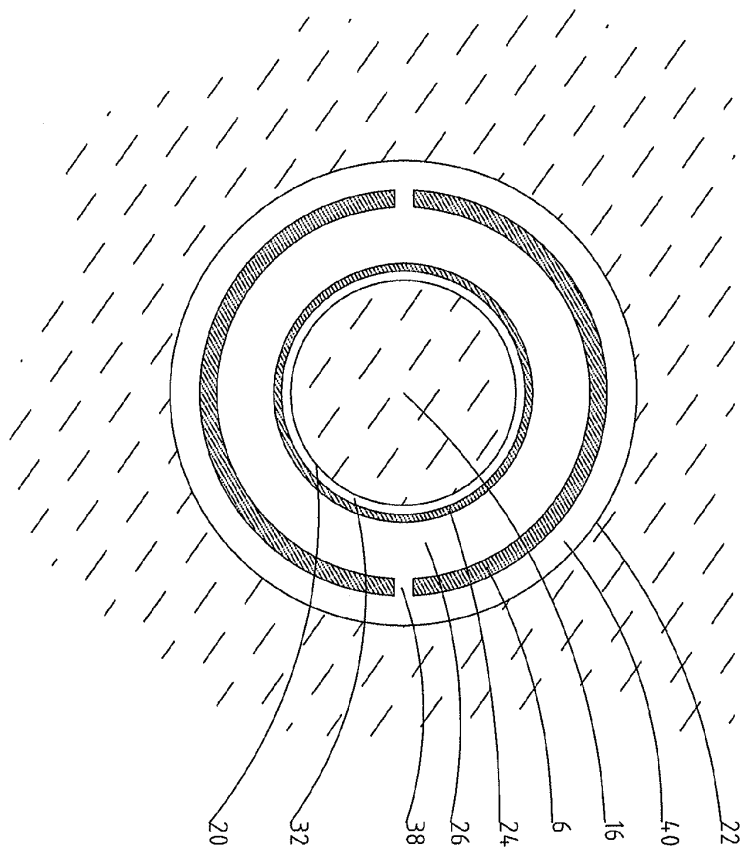


FIG 2
VIEW A-A





EUROPEAN SEARCH REPORT

Application Number
EP 13 17 1510

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	DE 10 2007 008966 A1 (ISCHEBECK FRIEDRICH GMBH [DE]) 6 September 2007 (2007-09-06) * paragraph [0003] - paragraph [00034]; figures 1,3 * -----	1-5,7, 10-13	INV. E02D5/80
			TECHNICAL FIELDS SEARCHED (IPC)
			E02D
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 23 January 2014	Examiner Geiger, Harald
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 O : non-written disclosure P : intermediate document 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 L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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23-01-2014

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 102007008966 A1	06-09-2007	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82