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(71) Applicant *(for all designated States except US)*: **EASY WELL SOLUTIONS AS** [NO/NO]; Prof. Olav Hansens vei 11, N-4021 Stavanger (NO).

(72) Inventor; and

(75) Inventor/Applicant *(for US only)*: **FREYER, Rune** [NO/NO]; Vålandsgaten 12, N-4010 Stavanger (NO).

(74) Agent: **LANGAN, Hans**; Zacco Norway AS, P.O. Box 2003, Vika, N-0125 Oslo (NO).

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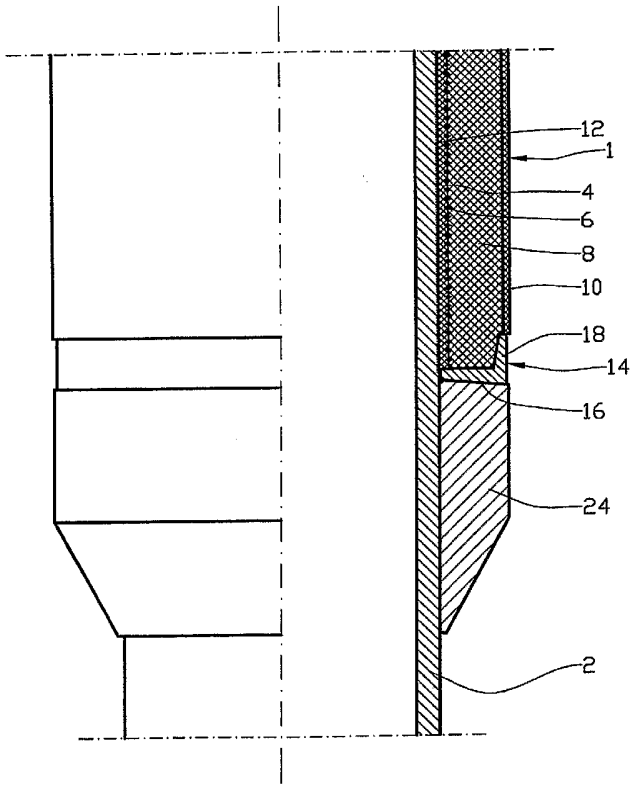
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(54) **Title:** PACKER-ANCHORING DEVICE

(57) **Abstract:** A packer-anchoring device between an annular packer (1) and a body (2), wherein the annular packer (1) is provided, at least at one of its end portions, with an expandable end ring (14).



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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

PACKER-ANCHORING DEVICE

This invention relates to a packer-anchoring. More particularly it concerns the anchoring of an expandable annular packer to a normally tubular object by means of a reinforcement and an expandable end ring, in particular for use in a borehole in connection with the recovery of petroleum

It is known for expandable annular packers to be arranged round a production pipe or an injection pipe before the pipe is run into a borehole. The aim is typically to isolate part of the borehole from the rest of the borehole. The annular packer may be swellable and designed to swell in contact with a fluid present in the borehole, or it may be expanded by means of diffusion.

It has turned out that known methods of chemical bonding between an annular packer and a pipe, such as gluing or vulcanisation, do not exhibit sufficient strength when the packer is subjected to a relatively high temperature of use, for example during the recovery of petroleum.

The invention has as its object to remedy or reduce at least one of the drawbacks of the prior art.

The object is realized according to the invention through the features specified in the description below and in the following Claims.

An annular packer in accordance with the invention is provided, at least at one of its end portions, with an expandable end ring which encircles a body, to which the annular packer is connected. Between its inner mantle and its outer mantle the annular packer is preferably provided with a reinforcement encircling the body.

Typically, the expandable end ring is radially slit, alternately from its inside and from its outside. In a cross-sectional view, the end ring has an angular shape, one leg of the angle forming a disc-shaped part projecting inwards, and a second leg of the angle forming a sleeve part, the sleeve part extending in an encircling manner over the end portion of the annular packer.

The expandable end ring is preferably made of a synthetic material, for example PTFE. The reinforcement which is located in the packer material, is preferably of a helical shape and arranged to clamp the annular packer material to the body. The reinforcement may, with advantage, be metallic.

The use of an anchoring according to the invention essentially overcomes the drawbacks connected with the prior art anchoring of swellable packers. The invention reduces, to a considerable degree, the risk currently present of separation of the annular packer from the body.

In what follows there is described a non-limiting example of a preferred embodiment which is visualized in the accompanying drawings, in which:

Figure 1 shows a relatively elongate swellable annular plug encircling a pipe;
Figure 2 shows, on a larger scale, a section of Figure 1; and
Figure 3 shows in perspective an expandable end ring.

In the drawings the reference numeral 1 identifies a relatively elongate swellable annular packer encircling a body 2 in the form of a pipe.

The annular packer 1 is built up from a number of layers placed on top of each other, an inner layer 4 encircling the pipe 2 and being clamped against the pipe 2 by a helical reinforcement 6. The reinforcement 6 is typically formed by stainless wire.

Encircling the inner layer 4 and the reinforcement 6, there is arranged an intermediate layer 8, whereas an outer layer 10 encircles the intermediate layer 8. It is advantageous for the layers 4, 8 and 10 to be bonded together, for example by means of vulcanisation.

The layers 4, 8, 10 may be provided with fibres and have equal or different swelling. The pipe 2 may, with advantage, be provided with a thread-like groove 12 in the area of the annular packer 1.

At its end portions the annular packer 1 is provided with an expandable end ring 14 encircling the pipe 2 and having a cross-section in the shape of an angle. A first leg of the angle forms a disc 16 projecting radially inwards, whereas a second leg of the angle forms a sleeve 18 extending axially.

The end ring 14 is slit, see Figure 3, by a number of first radial slits 20 extending from the inside, and a number of alternate second radial slits 22 extending from the outside. The end ring 14 is thereby sufficiently weakened to expand radially.

The disc 16 bears on the end portion of the annular packer 1, whereas the sleeve 18 encloses and extends somewhat over the same end portion.

The end ring 14 is supported by a supporting sleeve 24 which is connected to and encircles the pipe 2.

When the annular packer 1 has been run into a borehole, not shown, where it is swellingly influenced by a fluid, the volume of the annular packer 1 and thereby the external diameter are increased. During the expansion the reinforcement 6 is tensioned as there is an attempt to increase the diameter at which the reinforcement 6 is located. This helps the annular packer 1 to be further clamped to the pipe 2.

The diameter of the expandable end ring 14 increases with the external diameter of the annular packer 1, thereby preventing packer material from the annular packer 1 from entering an annular space, not shown, which encircles the supporting sleeve 24.

Patent Claims.

1. A packer-anchoring device between an annular packer (1) and a body (2), c h a r a c t e r i z e d i n that the annular packer (1) is provided, at least at one of its end portions, with an expandable end ring (14).

2. A device in accordance with claim 1, c h a r a c t e r i z e d i n that between its inner jacket and its outer jacket the annular packer (1) is provided with a reinforcement (6) encircling the body (2).

3. A device in accordance with claim 1, c h a r a c t e r i z e d i n that the expandable end ring (14) is radially slit, alternately from its inside and from its outside.

4. A device in accordance with claim 1, c h a r a c t e r i z e d i n that, in a cross-sectional view, the expandable end ring (14) has an angular shape, a first leg of the angle forming a disc-shaped part (16) projecting inwards, and a second leg of the angle forming a sleeve part (18), the sleeve part (18) extending in an encircling manner over the end portion of the annular portion (1).

5. A device in accordance with claim 1, c h a r a c t e r i z e d i n that the expandable end ring (14) is made of a synthetic material.

6. A device in accordance with claim 2, c h a r a c t e r i z e d i n that reinforcement (6) is of a helical shape.

7. A device in accordance with claim 6, c h a r a c t e r i z e d i n that the reinforcement (6) is metallic.

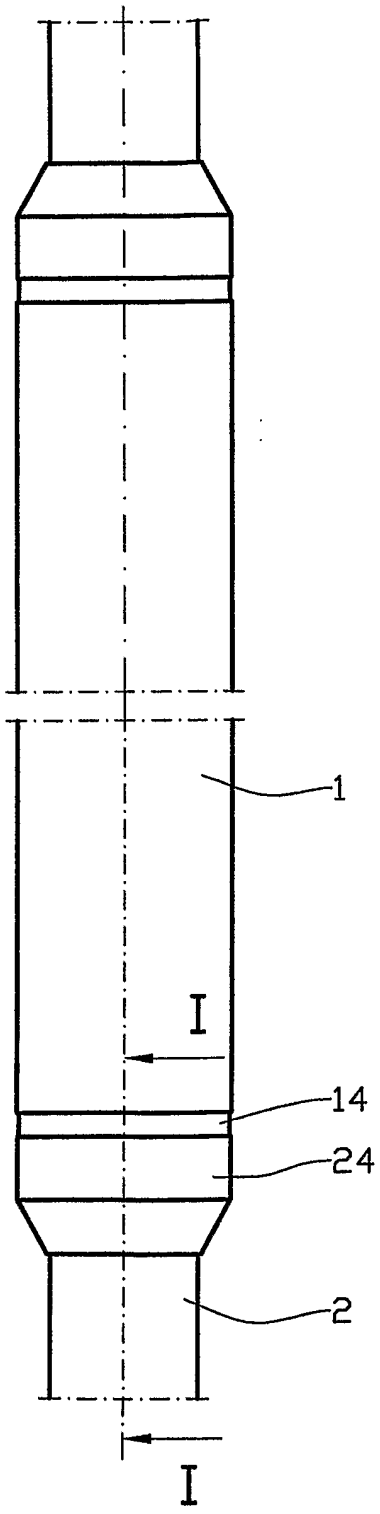


Fig. 1

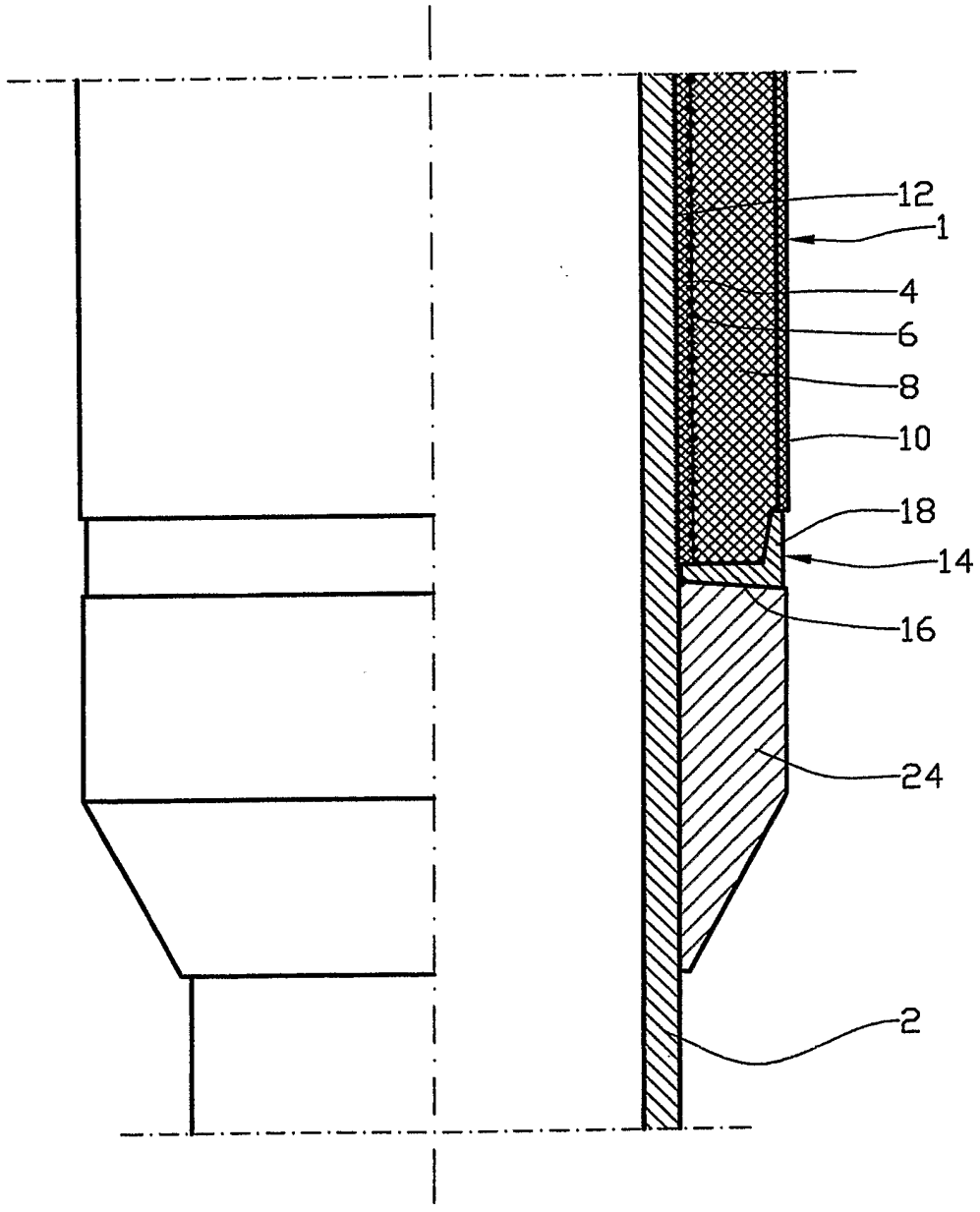


Fig. 2

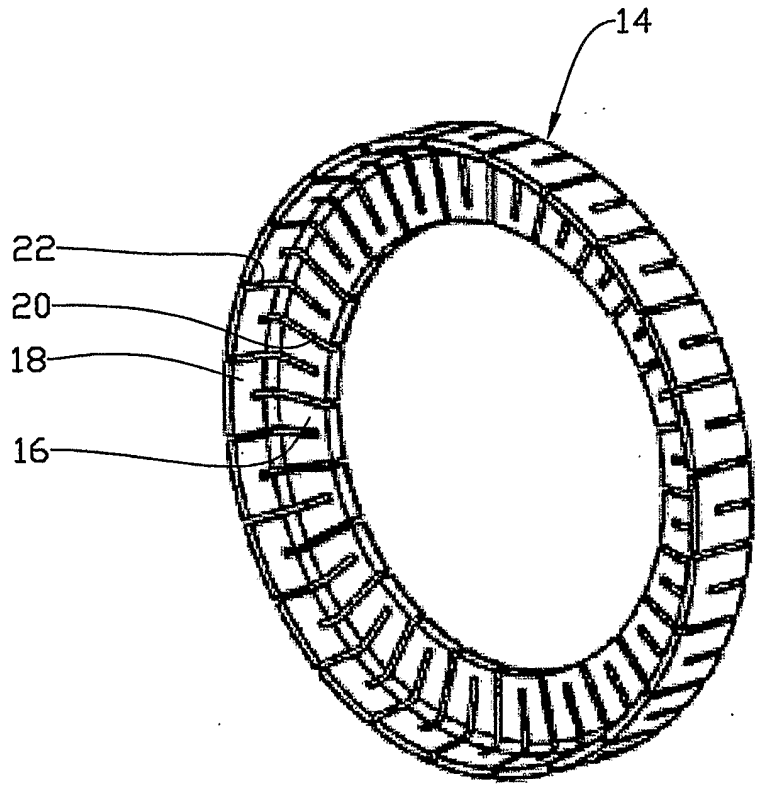


Fig. 3

INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER

IPC: see extra sheet
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)

IPC: E21B

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)

EPO-INTERNAL, WPI DATA, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3385679 A (J.H. CURRENT), 28 May 1968 (28.05.1968), whole document --	1,2,4-7
A	US 4349204 A (B.C. MALONE), 14 Sept 1982 (14.09.1982) --	1-7
X	US 4765404 A (T.F. BAILEY ET AL), 23 August 1988 (23.08.1988), whole document --	1,4
X	US 2885009 A (R.C. BAKER), 5 May 1959 (05.05.1959), whole document --	1,4

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
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Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Christer Bäcknert / MRo Telephone No. +46 8 782 25 00

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3381969 A (M.L. CROW ET AL), 7 May 1968 (07.05.1968), whole docuement ---	1,4
X	US 2726722 A (R.C.BAKER), 13 December 1955 (13.12.1955), whole document ---	1,4
X	US 3358766 A (J.H. CURRENT), 19 December 1967 (19.12.1967), whole document ---	1,4
X	US 3343607 A (J.H. CURRENT), 26 Sept 1967 (26.09.1967), whole document --- --------	1,4

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Paper copies can be ordered at a cost of 50 SEK per copy from PRV InterPat (telephone number 08-782 28 85).

Cited literature, if any, will be enclosed in paper form.

US	3385679	A	28/05/1968	US	3298440	A	17/01/1967
				US	3343607	A	26/09/1967
				US	3358766	A	19/12/1967
US	4349204	A	14/09/1982	CA	1176976	A	30/10/1984
				GB	2097451	A,B	03/11/1982
				MX	155365	A	23/02/1988
US	4765404	A	23/08/1988	BR	8801744	A	16/11/1988
				CA	1280362	A,C	19/02/1991
				CN	1014334	B	16/10/1991
				CN	88102073	A	26/10/1988
				DE	3812269	A	03/11/1988
				FR	2613766	A,B	14/10/1988
				GB	2203469	A,B	19/10/1988
				GB	8806708	D	00/00/0000
				JP	1820367	C	27/01/1994
				JP	5029756	B	06/05/1993
				JP	64001892	A	06/01/1989
				NO	881569	A	14/10/1988
US	2885009	A	05/05/1959	NONE			
US	3381969	A	07/05/1968	NONE			
US	2726722	A	13/12/1955	NONE			
US	3358766	A	19/12/1967	US	3298440	A	17/01/1967
				US	3343607	A	26/09/1967
				US	3385679	A	28/05/1968
US	3343607	A	26/09/1967	US	3298440	A	17/01/1967
				US	3358766	A	19/12/1967
				US	3385679	A	28/05/1968