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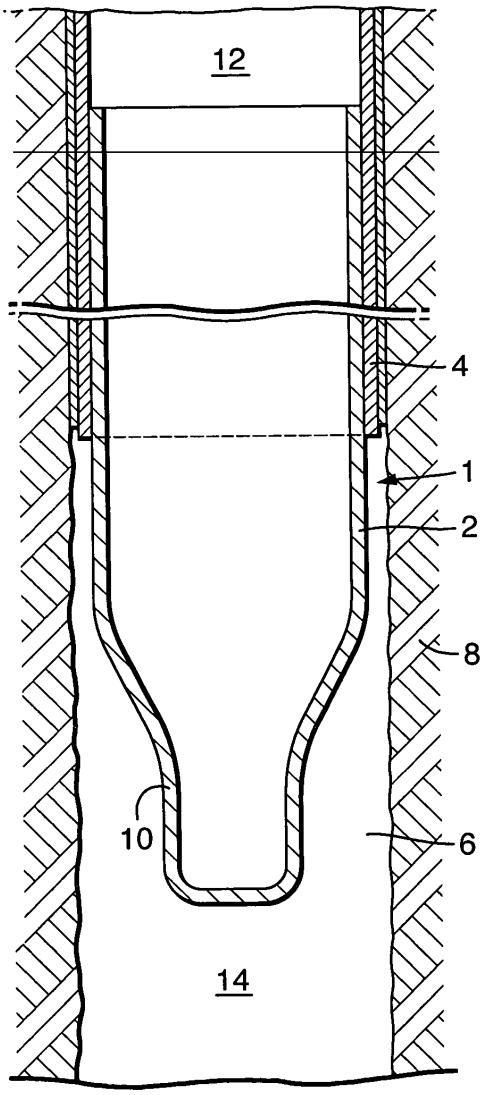
(54) Device for controlling fluid communication in a wellbore

(57) A device is provided for controlling fluid communication between first and second portions of the interior space of a tubular conduit extending into a wellbore formed in an earth formation. The device comprises a control member adapted to control fluid communication between said portions of the interior space of a tubular element, and an expandable tubular member adapted to be radially expanded against the inner surface of the tubular conduit in sealing relationship therewith. The control member and the expandable tubular member are sealingly connected to each other.

Fig.1.



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Description

[0001] The present invention relates to a device for controlling fluid communication between first and second portions of the interior space of a tubular conduit extending into a wellbore formed in an earth formation. In wellbore operations, such as for the production of hydrocarbon fluid from the earth formation, it is common practice to install one or more control devices in the wellbore for controlling fluid communication between different portions of the interior space of the wellbore. For example, a safety valve can be installed in a lower portion of the wellbore in order to allow controlled shut-in of the wellbore if dictated by circumstances. Also it is know to abandon a wellbore by installing a plug in the wellbore casing, for example by anchoring a packer in the casing and filling an upper portion of the wellbore space with a body of cement.

[0002] Although adequate results have been achieved with such conventional packers and control devices, there is a need for a more reliable and simple device for controlling fluid communication between first and second portions of the interior space of a tubular conduit extending into a wellbore.

[0003] In accordance with the invention there is provided a device for controlling fluid communication between first and second portions of the interior space of a wellbore formed in an earth formation, whereby a tubular conduit extends into the wellbore, the device comprising a control member adapted to control fluid communication between said portions of the interior space of the wellbore, and an expandable tubular member adapted to be radially expanded against the inner surface of the tubular conduit in sealing relationship therewith, the control member and the expandable tubular member being sealingly connected to each other.

[0004] By radially expanding the tubular member against the inner surface of the tubular conduit, the device can be sealingly anchored in the wellbore in a simple and reliable manner.

[0005] Suitably, the expandable tubular member and the control member are integrally formed.

[0006] Enhanced sealing and/or gripping functionality of the device can be achieved by providing the outer surface of the expandable tubular member with means for sealing and/or gripping of the device to the inner surface of the tubular conduit.

[0007] In a suitable embodiment of the device, the control member is provided with a tool for selectively controlling fluid communication between said first and second portions of the interior space of the tubular conduit. The tool can, for example, be received in a receptacle provided at the control member. Suitably, the tool is selected from a seal plug, a cementing float shoe, a shear disk, and a ball seat.

[0008] The invention will be further described by way of example in more detail, with reference to the accompanying drawings in which:

Fig. 1 schematically shows an embodiment of a device according to the invention; and

Fig. 2 schematically shows an alternative embodiment of a device according to the invention.

[0009] In the detailed description and drawings, like reference numerals relate to like components.

[0010] Referring to Fig. 1 there is shown a device 1 including a steel tubular member 2 radially expanded against the inner surface of a wellbore casing 4 arranged in a wellbore 6 formed in an earth formation 8. The device 1 further includes a steel blank closure member 10 integrally formed with the tubular member 2. The device 1 isolates an upper space 12 in the wellbore 6 from a lower space 14 in the wellbore 6.

[0011] Referring to Fig. 2 there is shown an alternative device 16 largely similar to the device 1 of Fig. 1, except that the blank closure member 10 is replaced by a steel control member 18 having a receptacle 20 in which a tool 22 is received. The tool 22 is adapted to selectively control fluid communication between the upper wellbore space 12 and the lower wellbore space 14.

[0012] During normal operation of the device 1 shown in Fig. 1, the device 1 is lowered into the casing 4 whereby the tubular member 2 is in unexpanded state. Upon arrival of the device 1 at the lower end of the casing 4, the tubular member 2 is radially expanded against the inner surface of the casing 4 such that a gripping force and a metal-to-metal seal exists between the tubular member 2 and the casing 4. The device 1 thereby forms a plug isolating the upper wellbore space 12 from the lower wellbore space 14.

[0013] During normal operation of the alternative device 16 shown in Fig. 2, the device 16 is lowered into the casing 4 whereby the tubular member 2 is in unexpanded state. Upon arrival at a selected location in the wellbore casing 4, the tubular member 2 is radially expanded against the inner surface of the casing 4 such that a gripping force and a metal-to-metal seal exists between the tubular member 2 and the casing 4. The tool 22 is then operated to selectively control fluid communication between the upper wellbore space 12 and the lower wellbore space 14. The tool 22 can be operated from surface, for example, by means of electric or hydraulic control means (not shown) extending from surface into the wellbore 6, or by wireless control means arranged at surface.

[0014] Optionally the steel tubular member can be provided with an annular seal member around its outer surface. A suitable material for such annular seal member is an elastomer which swells upon contact with oil or water present in the earth formation or in the wellbore.

Claims

1. A device for controlling fluid communication between first and second portions of the interior space of a wellbore formed in an earth formation, whereby a

tubular conduit extends into the wellbore, the device comprising a control member adapted to control fluid communication between said portions of the interior space of the wellbore, and an expandable tubular member adapted to be radially expanded against the inner surface of the tubular conduit in sealing relationship therewith, the control member and the expandable tubular member being sealingly connected to each other.

2. The device of claim 1, wherein the expandable tubular member and the control member are integrally formed.

3. The device of claim 1 or 2, wherein the outer surface of the expandable tubular member is provided with means for sealing and/or gripping of the device to the inner surface of the tubular conduit.

4. The device of any one of claims 1-3, wherein the control member is arranged to isolate said first and second portions of the interior space of the tubular conduit from each other.

5. The device of any one of claims 1-4, wherein the control member is provided with a tool for selectively controlling fluid communication between said first and second portions of the interior space of the tubular conduit.

6. The device of claim 5, wherein said tool is received in a receptacle of the control member.

7. The device of claim 6, wherein said tool is selected from a seal plug, a cementing float shoe, a shear disk, and a ball seat.

8. The device of any one of claims 1-7, wherein the device is arranged in the tubular conduit, the expandable tubular member being expanded against the inner surface of the tubular conduit in sealing relationship therewith.

9. The device substantially as described hereinbefore with reference to the accompanying drawings.

Fig.1.

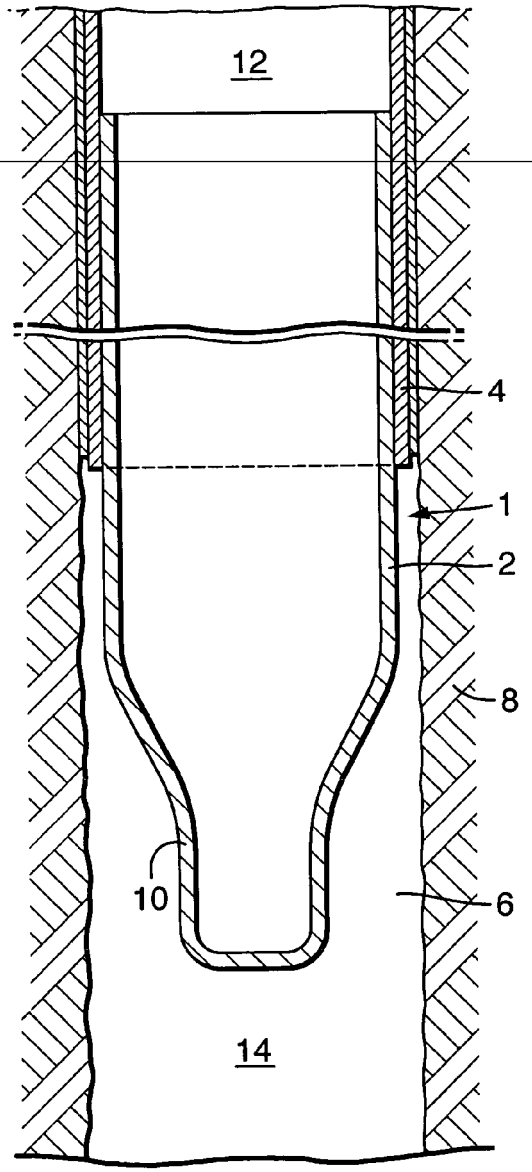
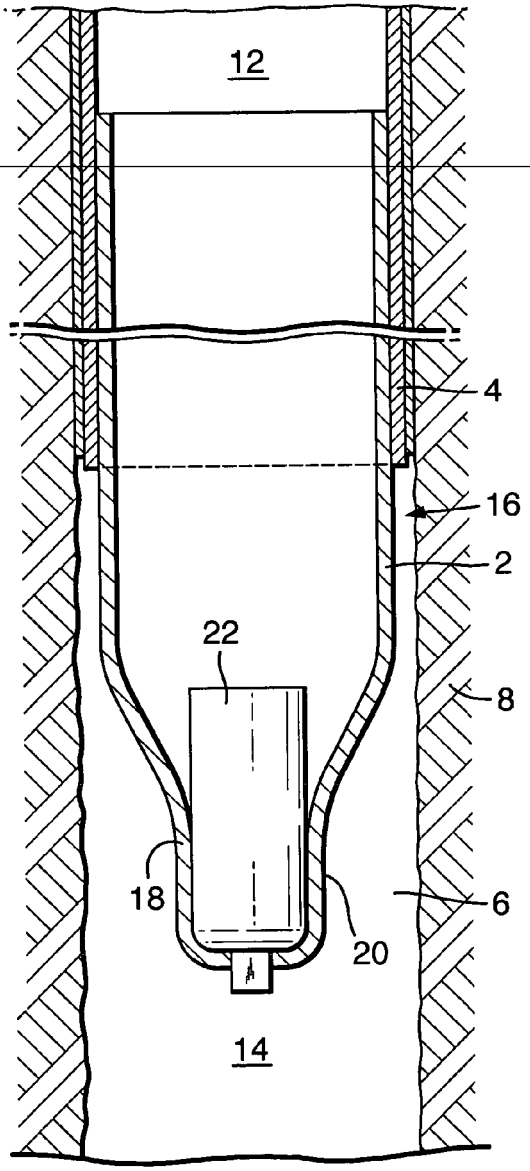


Fig.2.



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PARTIAL EUROPEAN SEARCH REPORT

which under Rule 45 of the European Patent Convention shall be considered, for the purposes of subsequent proceedings, as the European search report

Application Number EP 04 25 7717

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	US 6 823 937 B1 (COOK ROBERT LANCE ET AL) 30 November 2004 (2004-11-30) * column 10, lines 4-57 * * figure 4 * -----	1-8	E21B43/10 E21B33/134 E21B34/06
A	US 6 336 507 B1 (COLLINS GARY J) 8 January 2002 (2002-01-08) * column 7, lines 59-62 * * column 8, lines 36-42 * * figures 13-18 * -----	1	

TECHNICAL FIELDS SEARCHED (Int.Cl.7)

E21B

INCOMPLETE SEARCH

The Search Division considers that the present application, or one or more of its claims, does/do not comply with the EPC to such an extent that a meaningful search into the state of the art cannot be carried out, or can only be carried out partially, for these claims.

Claims searched completely :

Claims searched incompletely :

Claims not searched :

Reason for the limitation of the search:

see sheet C

Place of search	Date of completion of the search	Examiner
The Hague	21 March 2005	Schouten, A

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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INCOMPLETE SEARCH SHEET C

Application Number
EP 04 25 7717

Claim(s) searched completely:
1-8

Claim(s) not searched:
9

Reason for the limitation of the search:

Claim 9 contains a reference to the drawings. According to Rule 29(6) EPC, claims should not contain such references except where absolutely necessary, which is not the case here.

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 04 25 7717

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