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[Continued on next page]

- (54) **Title:** DOWNHOLE PRESSURE RELIEF APPARATUS

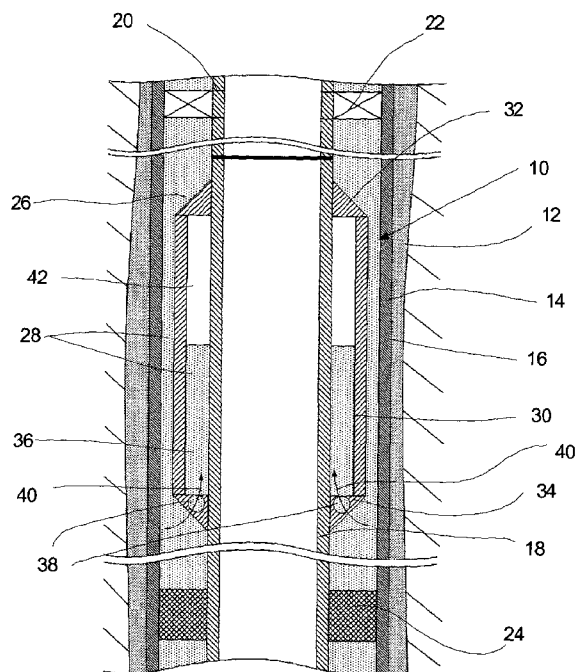


FIGURE 2

- (57) **Abstract:** A downhole pressure relief apparatus (10) comprises a tubular member (18) configured to be located within a wellbore (12) to at least partially define a wellbore annulus (26), wherein the annulus (26) is subject to varying fluid pressure, and a chamber (36) associated with the tubular member (18). A valve arrangement (38) associated with the chamber (36) is provided and is configurable from a closed state to an open state in response to a pressure event, wherein, in use, in the closed state the chamber (36) is isolated from the wellbore annulus (26), and in the open state fluid (28) is permitted to flow into the chamber (36) from the wellbore annulus (26) to relieve pressure within said annulus.



LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK,  
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## A. CLASSIFICATION OF SUBJECT MATTER

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ADD.

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)  
E21B

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

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

EPO-Internal, WPI Data

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages                                                  | Relevant to claim No.                         |
|-----------|-------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|
| X         | WO 00/17483 A1 (SCHLUMBERGER TECHNOLOGY CORP [US]) 30 March 2000 (2000-03-30)                                                       | 1-8,10,<br>14,16,<br>18-20,<br>22-25<br>17,21 |
| Y         | page 3, line 1 - line 23<br>page 4, line 20 - line 32<br>page 6, line 1 - page 7, line 27; claim 1;<br>figures 2-4<br>-----<br>-/-- |                                               |

☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

\* Special categories of cited documents :

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|
| X         | US 2010/122811 A1 (MASKOS KRYSTIAN K [US]<br>ET AL) 20 May 2010 (2010-05-20)<br><br>paragraph [0021]<br>paragraph [0028]<br>paragraph [0030]<br>paragraph [0033]<br>paragraph [0037]; figures 1-4<br>----- | 1-8,<br>10-14,<br>16,<br>18-20,<br>22-26 |
| X         | US 2005/189107 A1 (MCVAY CHESTER S [US] ET<br>AL) 1 September 2005 (2005-09-01)<br><br>paragraph [0001]<br>paragraph [0010]<br>paragraph [0040] - paragraph [0041];<br>figures 1-3,6<br>-----              | 1-11,15,<br>16,<br>18-20,<br>22-25       |
| X         | WO 2006/114607 A2 (HALLIBURTON ENERGY SERV<br>INC [US]; CURTIS PHILIP ANTHONY [GB]; FAUL<br>RON) 2 November 2006 (2006-11-02)<br><br>page 3, line 7 - page 4, line 2; figure 4<br>-----                    | 1-8,10,<br>16,<br>18-20,<br>22-25        |
| Y         | WO 01/57360 A1 (FMC CORP [US])<br>9 August 2001 (2001-08-09)<br>claims 1,6,7<br>-----                                                                                                                      | 17,21                                    |

# INTERNATIONAL SEARCH REPORT

Information on patent family members

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| Patent document<br>cited in search report | Publication<br>date | Patent family<br>member(s)  | Publication<br>date         |
|-------------------------------------------|---------------------|-----------------------------|-----------------------------|
| WO 0017483                                | A1                  | 30-03-2000                  | AU 6255499 A 10-04-2000     |
|                                           |                     | GB 2358656 A 01-08-2001     |                             |
|                                           |                     | NO 20011414 A 18-05-2001    |                             |
|                                           |                     | US 6293346 B1 25-09-2001    |                             |
|                                           |                     | WO 0017483 A1 30-03-2000    |                             |
| US 2010122811                             | A1                  | 20-05-2010                  | AU 2009316726 A1 27-05-2010 |
|                                           |                     | CA 2743164 A1 27-05-2010    |                             |
|                                           |                     | CN 102216557 A 12-10-2011   |                             |
|                                           |                     | EA 201170704 A1 30-01-2012  |                             |
|                                           |                     | GB 2477670 A 10-08-2011     |                             |
|                                           |                     | US 2010122811 A1 20-05-2010 |                             |
|                                           |                     | WO 2010059638 A2 27-05-2010 |                             |
| US 2005189107                             | A1                  | 01-09-2005                  | AR 049867 A1 13-09-2006     |
|                                           |                     | EP 1718841 A1 08-11-2006    |                             |
|                                           |                     | NO 331859 B1 23-04-2012     |                             |
|                                           |                     | US 2005189107 A1 01-09-2005 |                             |
|                                           |                     | WO 2005085588 A1 15-09-2005 |                             |
| WO 2006114607                             | A2                  | 02-11-2006                  | EP 1880079 A2 23-01-2008    |
|                                           |                     | US 2006243435 A1 02-11-2006 |                             |
|                                           |                     | WO 2006114607 A2 02-11-2006 |                             |
| WO 0157360                                | A1                  | 09-08-2001                  | AT 329134 T 15-06-2006      |
|                                           |                     | AU 3476401 A 14-08-2001     |                             |
|                                           |                     | BR 0108291 A 05-03-2003     |                             |
|                                           |                     | CA 2399079 A1 09-08-2001    |                             |
|                                           |                     | EP 1255912 A1 13-11-2002    |                             |
|                                           |                     | MX PA02007502 A 23-08-2004  |                             |
|                                           |                     | NO 20023657 A 27-09-2002    |                             |
|                                           |                     | US 2001027865 A1 11-10-2001 |                             |
|                                           |                     | WO 0157360 A1 09-08-2001    |                             |