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- (54) Title: METHOD AND DEVICE FOR PREVENTING A MUD RELIEF VALVE FROM INCORRECT OPENING

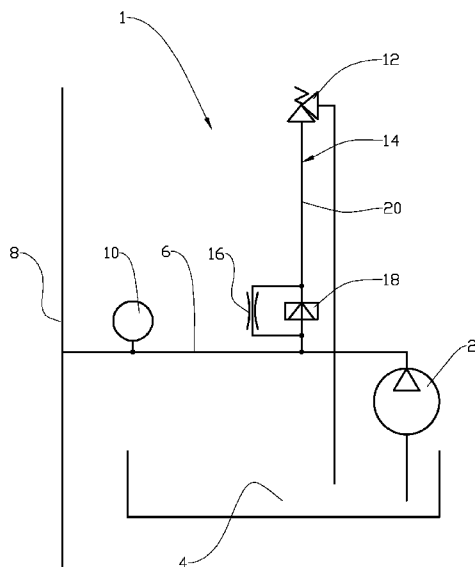


Fig. 1

- (57) Abstract: Method and device for preventing a primary relief valve (12) in a mud system (1) from opening at a pressure lower than a nominal opening pressure, and where the mud system (1) includes a mud pump (2), wherein the method includes: - installing a flow restrictor (16) between the mud pump (2) and the primary relief valve (12); and - providing a cavity (20) between the flow restrictor (16) and the primary relief valve (12).



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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	CN 201 184 291 Y (CHANGCHUN QIU [CN]) 21 January 2009 (2009-01-21) figure 2	1-3,5, 7-9
X	----- WO 2008/025936 A1 (VARCO INT [US]; LUCAS BRIAN [GB]; TETTLETON TAB S [US]; COX ERNEST FLO) 6 March 2008 (2008-03-06) abstract figure 1 page 14, line 29 - page 15, line 22	1,3,5, 7-9
X	----- US 3 964 556 A (GEARHART MARVIN ET AL) 22 June 1976 (1976-06-22) figure 1a column 3, line 12 - line 40 column 5, line 41 - line 60 ----- -/--	1,3,5, 7-9



Further documents are listed in the continuation of Box C.



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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,P	EP 2 378 056 A2 (WEATHERFORD LAMB [US]) 19 October 2011 (2011-10-19) abstract figure 3 paragraph [0069] - paragraph [0072] -----	1-9
A	US 5 975 129 A (WILLIAMS RICHARD D [US]) 2 November 1999 (1999-11-02) abstract figure 1 column 3, line 8 - line 30 column 6, line 26 - line 41 -----	1-9
A	WO 2010/115834 A2 (MANAGED PRESSURE OPERATIONS LL [US]; LEUCHTENBERG CHRISTIAN [BE] MANAG) 14 October 2010 (2010-10-14) abstract figure 1 page 11, line 7 - line 13 -----	1-9

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No PCT/N02012/050052
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Patent document cited in search report	Y	Publication date	Patent family member(s)	Publication date
CN 201184291	Y	21-01-2009	NONE	
-----				
WO 2008025936	A1	06-03-2008	US 2008078586 A1	03-04-2008
			WO 2008025936 A1	06-03-2008
-----				
US 3964556	A	22-06-1976	CA 1021451 A1	22-11-1977
			US 3964556 A	22-06-1976
-----				
EP 2378056	A2	19-10-2011	AU 2011201664 A1	03-11-2011
			BR PI1101694 A2	21-08-2012
			CA 2737172 A1	16-10-2011
			EP 2378056 A2	19-10-2011
			US 2011253445 A1	20-10-2011
-----				
US 5975129	A	02-11-1999	NONE	
-----				
WO 2010115834	A2	14-10-2010	AU 2010233847 A1	27-10-2011
			CA 2757403 A1	14-10-2010
			CN 102405328 A	04-04-2012
			EP 2414619 A2	08-02-2012
			SG 174604 A1	28-11-2011
			US 2012090893 A1	19-04-2012
			WO 2010115834 A2	14-10-2010
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