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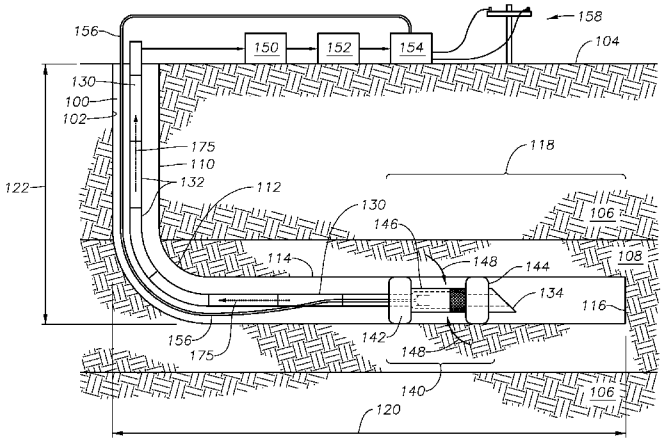


FIG. 1

(57) Abstract: A method of using an electrochemical gas lift, apparatus to induce artificial gas lift in a production fluid includes introducing the electrochemical gas lift apparatus into a well bore having a production zone, operating the electrochemical gas lift apparatus such that a combination of hydrocarbon fluid and formation water is introduced into the interior of the electrochemical gas lift apparatus, introducing electrical power to the electrochemical gas lift apparatus such that at least a portion of formation water in the interior of the electrochemical gas lift apparatus converts into product gases, operating the electrochemical gas lift apparatus such that the product gases form product gas bubbles in the interior of the electrochemical gas lift apparatus, and operating the electrochemical gas lift apparatus such that production fluid forms in the interior of the electrochemical gas lift apparatus. The production fluid comprises hydrocarbon fluid, unconverted formation water and product gas bubbles.

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B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
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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	US 2013/105174 A1 (NOUI-MEHIDI MOHAMED NABIL [SA]) 2 May 2013 (2013-05-02) paragraph [0030] - paragraph [0038]; figures 1,2	1-13
A	US 4 199 025 A (CARPENTER NEIL L [US]) 22 April 1980 (1980-04-22) abstract; figure 8	1-13
A	US 2013/118735 A1 (JAMAL AQIL [SA] ET AL) 16 May 2013 (2013-05-16) abstract; figure 1	1-13
A	US 3 724 543 A (BELL C ET AL) 3 April 1973 (1973-04-03) abstract; figure 5	1-13

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☒ See patent family annex.

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Information on patent family members

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2013105174 A1	02-05-2013	CN 103946479 A	23-07-2014
		EP 2773844 A2	10-09-2014
		US 2013105174 A1	02-05-2013
		WO 2013070501 A2	16-05-2013
US 4199025 A	22-04-1980	NONE	
US 2013118735 A1	16-05-2013	CN 104094461 A	08-10-2014
		EP 2780966 A2	24-09-2014
		JP 2015502639 A	22-01-2015
		KR 20140098135 A	07-08-2014
		US 2013118735 A1	16-05-2013
		WO 2013074875 A2	23-05-2013
US 3724543 A	03-04-1973	AR 211220 A1	15-11-1977
		CA 958640 A1	03-12-1974
		US 3724543 A	03-04-1973