



(51) International Patent Classification:
E21B 31/107 (2006.01)

(21) International Application Number:
PCT/US2014/013754

(22) International Filing Date:
30 January 2014 (30.01.2014)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
61/758,707 30 January 2013 (30.01.2013) US

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(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM,

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(54) Title: JARRING TOOL

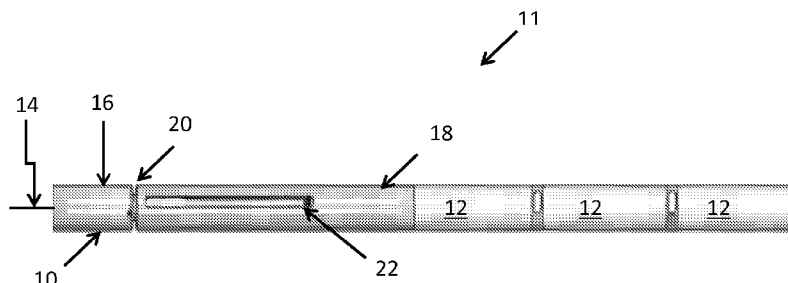


Figure 1

(57) Abstract: A jarring tool that includes a first portion and a second portion. An impact point is located between the first portion and the second portion. The jarring tool has an internal energy source that generates an internal force to move one of the portions or an inner mass to cause a jarring force.

WO 2014/120873 A1



TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, **Published:**
KM, ML, MR, NE, SN, TD, TG).

— *with international search report (Art. 21(3))*

JARRING TOOL

Background

[0001] The present disclosure is related in general to wellsite equipment such as oilfield surface equipment, downhole assemblies including, but not limited to, wireline conveyance accessories, wireline jarring tools, and the like.

[0002] Various operations can be performed in a well using tool strings that are run into the well on a conveyance or carrier structure such as a wireline, slickline, coiled tubing, jointed tubing, drill pipe, and so forth. In some cases, the tool strings can be stuck in the wellbore, with the well operator unable to apply sufficient tensile force through the carrier structure to free the stuck tool string.

[0003] To free a tool string that is stuck in a wellbore, a jarring tool is typically provided in the tool string. The jarring tool is able to apply an impact force that amplifies tension applied to the carrier structure. The amplified impact force is transmitted to other tools in the tool string to which the jarring tool is coupled so that the tool string can be freed.

[0004] It remains desirable to provide improvements in oilfield surface equipment and/or downhole assemblies.

Summary and Detailed Description

[0005] Referring now to Figure 1, in an embodiment, the present disclosure comprises a jarring tool 10 that is attached as a part of a tool string 11. The tool string 11 may comprises various tools or tool components 12 for performing formation evaluation services, pressure and sampling services, mechanical intervention services and the like for use in a wellbore (not shown) penetrating a subterranean formation of interest, as will be appreciated by those skilled in the art. The jarring tool 10 is attached to a conveyance 14 such as a wireline, a slickline, coiled tubing, or the like. While the jarring tool 10 is shown in Figure 1 as being disposed between the conveyance 14 and the tools 12 of the tool string 11, in other embodiments the jarring tool 10 may be disposed at an end of the tool string 11 or between various components of the tool string 11 such as between tools 12 or the like.

[0006] In an embodiment, the jarring tool 10 comprises a first portion 16 and a second portion 18 and defines between the portions 16 and 18 a jarring impact point 20, wherein the force generated by the jarring tool 10 is concentrated during operation. In an embodiment, a mass or the like is slidably disposed in either the the first portion 16 or the second portion 18 and is moved toward the impact point 20 by a suitable energy source, such as electrical, hydraulic, mechanical, or combinations thereof. In an embodiment, the first portion 16 or the second portion 18 is movable with respect to the other of the portions 16 and 18 and the impact point 20 is the interface between the portions 16 and 18. The jarring tool 10, therefore, is capable of producing an internally generated force or internal force that is repeatable. The internal force generated by the jarring tool 10 is augmented by providing a tension on the conveyance 14 such as a wireline cable or the like, wherein the cable tension increases the force generated by the jarring tool 10. At a given tension, the movement of the mass or the portions 16 or 18 to generate the jarring force may commence and the internal force may be enabled electrically, hydraulically, mechanically, or by combinations thereof, as will be appreciated by those skilled in the art. The internal force generated by the jarring tool 10 may be a fixed magnitude force as determined by the energy source within the jarring tool 10.

[0007] The second portion 18 may comprise a selector 22, which enables an operator to select a mode of operation for the jarring tool 10 prior to introduction into a wellbore, discussed in more detail below. The jarring tool 10 further comprises suitable electronics for sending and/or receiving communications, commands, and/or data during operation thereof. In an embodiment, the jarring tool 10 comprises three operational modes; a maximum force setting mode, a minimum force setting mode, and an intermediate force setting mode.

[0008] In the maximum mode, the impact force generated by the jarring tool 10 will be the internal force generated by the jarring tool 10 augmented by the highest possible activating tension in the cable 14, typically near the safe working load of the cable and according to the string 11 and profile of the wellbore. In an embodiment, the maximum mode is surface preset is active at all times and is

failsafe. The maximum mode provides low frequency, high impact jarring forces from the jarring tool 10 and may be useful when a tool string 11 has already been determined to have stuck in the wellbore. The maximum mode setting determines the highest cable tension at which the jarring tool 10 will activate.

[0009] In the minimum mode, the impact force generated by the jarring tool 10 will be the internal force generated by the jarring tool 10 augmented by a cable tension that is less than the safe working load such as about 1500 to about 2000 lbs above the normal tension in the cable 14. The minimum mode provides high frequency, lower impact (with respect to the maximum mode) jarring forces from the jarring tool and may be useful to enable when sticking of the tool string 11 is determined to have first occurred. The minimum mode setting determines the lowest cable tension needed to activate the jarring tool 10.

[0010] In operation of the jarring tool 10 and tool string 11, if low impact force is not needed or when stuck and low early impact is not enough to free the tool, then a command is sent from surface (such as by constant voltage, direct command, etc.), to disable the minimum mode operation (at which the jarring tool 11 is no longer able to activate at the lower setting of the minimum mode), after which the jarring tool 10 would automatically revert to the maximum mode or the high impact setting.

[0011] In an intermediate mode, if the operator of the jarring tool 10 and tool string 11 wishes to activate the jarring tool 10 at a lower setting than the maximum mode but higher than the minimum mode at a given cable tension, then a command is sent from the wellbore surface (such as by reversing the previous command sent to set disable minimum mode). This command re-enables the minimum mode, thereby activating the jarring tool 10 immediately at this intermediate setting. The impact force in the intermediate mode is determined by the internal force and the energy stored (the tension force) in the wireline cable and, therefore, may be advantageously commanded to create a jarring force at any cable tension between the maximum mode and the minimum mode.

[0012] Advantageously, the jarring tool of the present disclosure may be switched between the modes while in the wellbore, enabling an operator of the jarring tool 10 and tool string 11 various options for utilizing the jarring tool 10 to

either enable movement of the tool string 11 when sticking has been determined to have first occurred or from unsticking the tool string 11 when the tool string 11 has already been determined to have stuck in the wellbore.

[0013] The preceding description has been presented with reference to present embodiments. Persons skilled in the art and technology to which this disclosure pertains will appreciate that alterations and changes in the described structures and methods of operation can be practiced without meaningfully departing from the principle, and scope of this present disclosure. Accordingly, the foregoing description should not be read as pertaining only to the precise structures described and shown in the accompanying drawings, but rather should be read as consistent with and as support for the following claims, which are to have their fullest and fairest scope.

What is claimed is:

1. A method for operating a jarring tool in a wellbore, wherein the method comprises:
 - conveying a tool string and the jarring tool in the wellbore on a conveyance;
 - activating the jarring tool to generate an internal force; and
 - augmenting the internal force by applying tension to the conveyance.
2. The method of claim 1, wherein an operational mode of the jarring tool is set prior to conveying the tool string and the jarring tool.
3. The method of claim 2, wherein the jarring tool has three operation modes.
4. The method of claim 3, further comprising sending a signal from surface to the jarring tool to change the operation mode of the jarring tool.
5. A jarring tool comprising:
 - a first portion;
 - a second portion; and
 - an impact point located between the first portion and the second portion.
6. The jarring tool of claim 5, wherein one of the portions is configured to move relative to the other and engage the impact point to cause a jarring force.
7. The jarring tool of claim 5, further comprising a mass located within one of the portions, wherein the mass is configured to move and strike the impact point to generate the jarring force.
8. The jarring tool of claim 6, wherein an energy source is activated to cause the movement of one of the portions.

9. The jarring tool of claim 7, wherein an energy source is activated to cause the mass to move.

10. The jarring tool of claim 5, further comprising a selector in one of the portions for allowing selection of an operation mode of the jarring tool.

11. A selectable force jarring tool comprising:

- a first portion;
- a second portion;
- an impact point located between the first portion and the second portion;
- an energy source located within one of the portions;
- a selector in one of the portions; and
- communication equipment in communication with the selector,

wherein the communication equipment is configured to allow remote selection of an operation mode of the jarring tool.

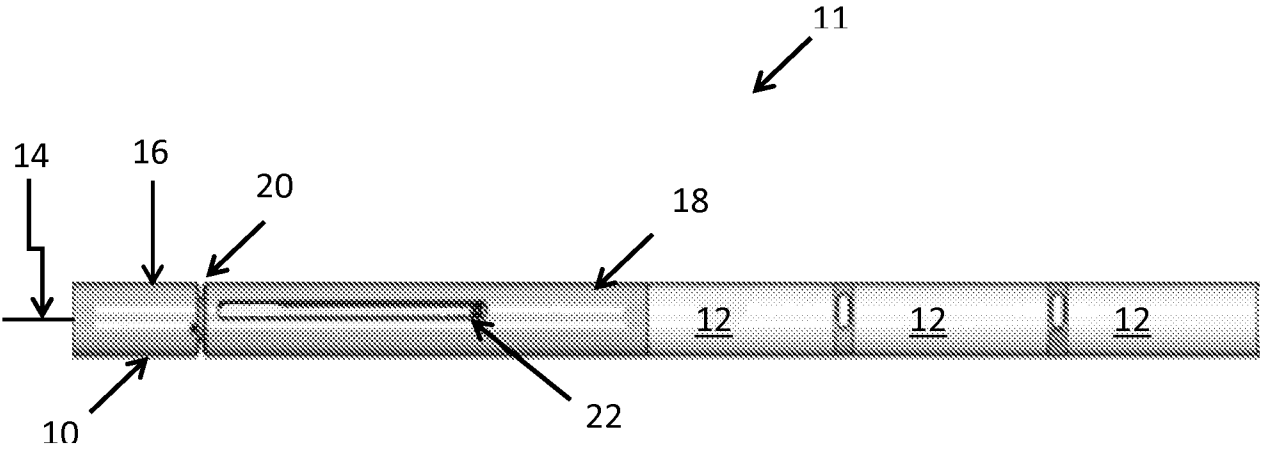


Figure 1

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2014/013754**A. CLASSIFICATION OF SUBJECT MATTER****E21B 31/107(2006.01)i**

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 31/107; E21B 31/113; E21B 31/00; E21B 23/00

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

Korean utility models and applications for utility models

Japanese utility models and applications for utility models

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

eKOMPASS(KIPO internal) & keywords: jarring tool, conveyance, mass, impact point, energy source, and selector

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2009-0095490 A1 (MORIARTY et al.) 16 April 2009 See abstract, paragraphs [0028]-[0032],[0034]-[0038], and figures 1-3.	1-11
A	US 2006-0054322 A1 (ROSE, LAWRENCE C.) 16 March 2006 See abstract, paragraphs [0027]-[0028],[0032], and figures 1-2.	1-11
A	US 5931242 A (OETTLI, MARK C.) 03 August 1999 See abstract, column 3, line 37 - column 4, line 65, and figures 1A-2C.	1-11
A	US 6896060 B2 (TILLET, JR., RAY O.) 24 May 2005 See abstract, column 2, lines 7-48, and figures 1A-1B.	1-11
A	US 2011-0083851 A1 (EVANS, ROBERT W.) 14 April 2011 See abstract, paragraph [0010], and figures 1A-1B.	1-11



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

15 May 2014 (15.05.2014)

Date of mailing of the international search report

15 May 2014 (15.05.2014)

Name and mailing address of the ISA/KR

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2014/013754

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