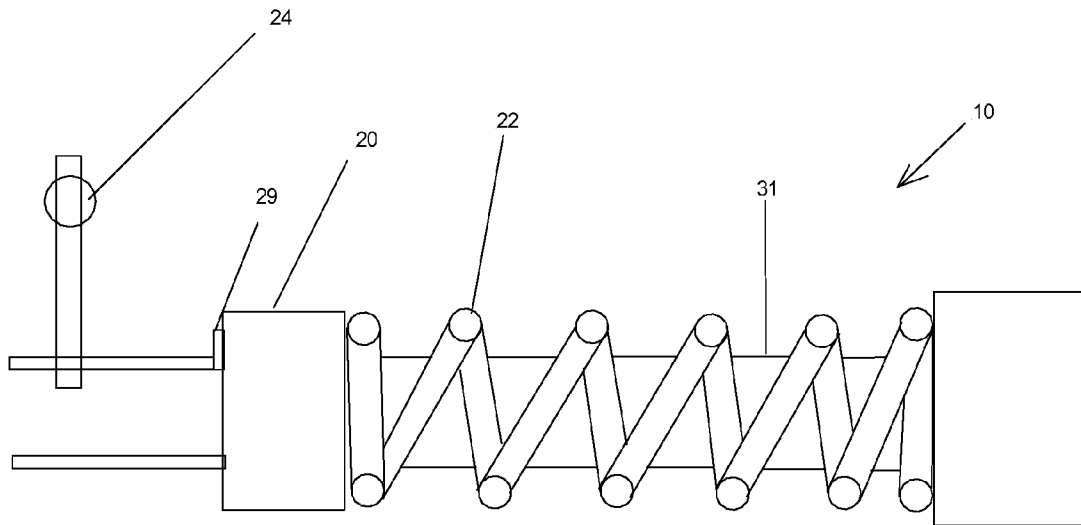




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LANDSIEDEL(10) **Pub. No.: US 2015/0129220 A1**(43) **Pub. Date: May 14, 2015**(54) **PUMP ACTUATED JAR FOR DOWNHOLE
SAMPLING TOOLS**(52) **U.S. Cl.**
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CORPORATION**, Sugar Land, TX (US)(21) Appl. No.: **14/078,933**(22) Filed: **Nov. 13, 2013****Publication Classification**(51) **Int. Cl.**
E21B 31/113 (2006.01)
E21B 7/00 (2006.01)(57) **ABSTRACT**

An apparatus configured to impart a force on a downhole component, having a piston configured to expand from a movement of a drilling fluid in a downhole environment, a weight configured to move from a first position to a second position, wherein the weight contacts the piston and the piston is configured to move the weight from the first position to the second position when the piston expands from movement of the drilling fluid, a spring configured to contact a bearing surface and the weight, wherein movement of the weight toward the second position compresses the spring, a return spring configured to impart a force on the weight to return the weight to the first position from the second position and a trigger mechanism configured to actuate a return of the weight from the second position to the first position by the return spring.



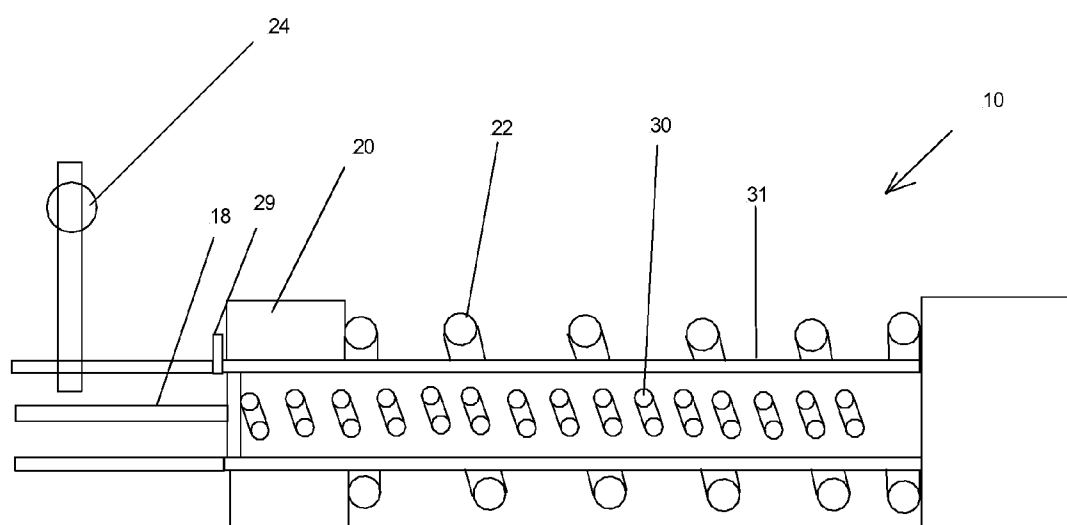


FIG. 1

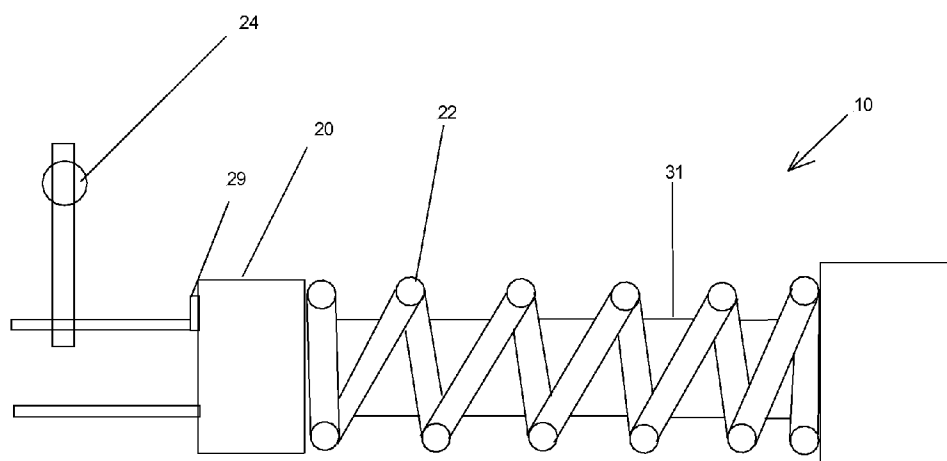


FIG. 2

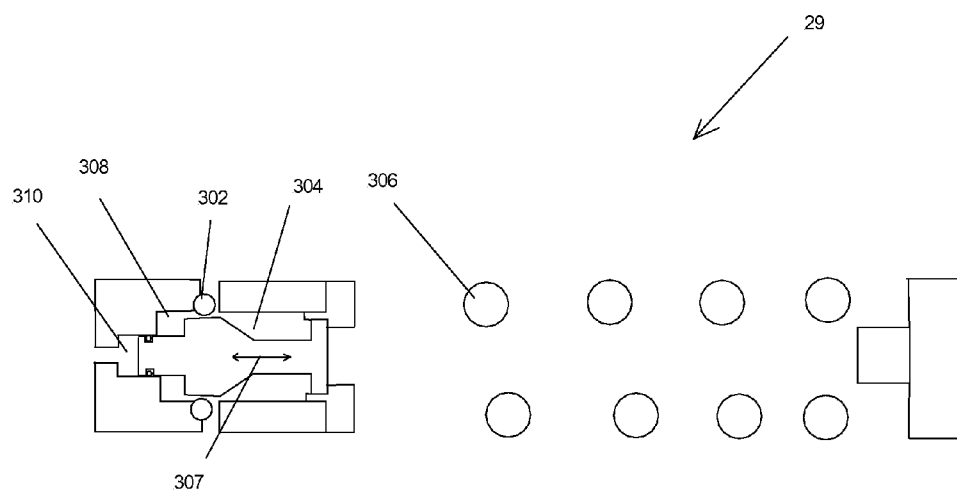


FIG. 3

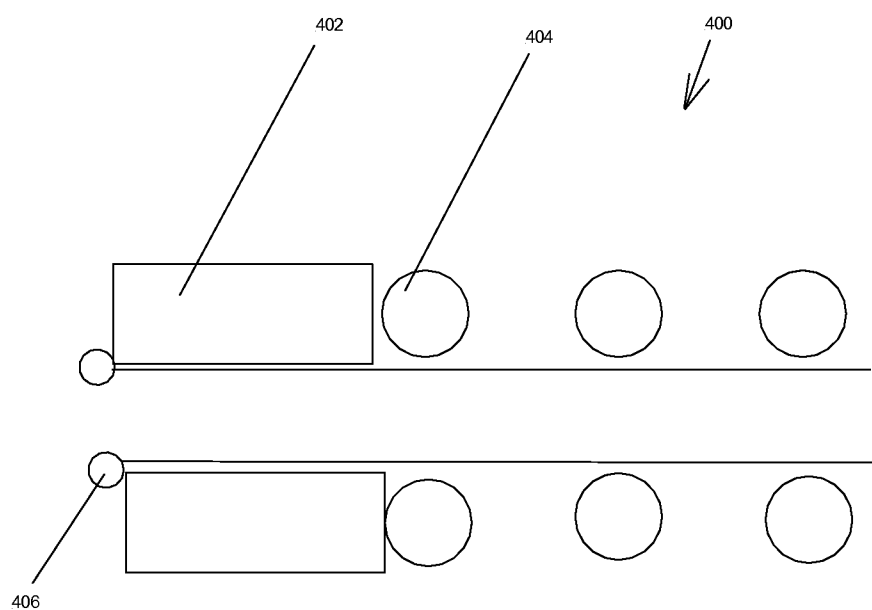


FIG. 4

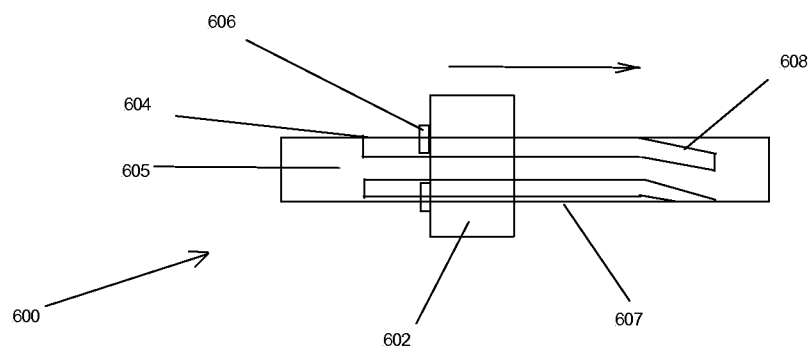


FIG. 5

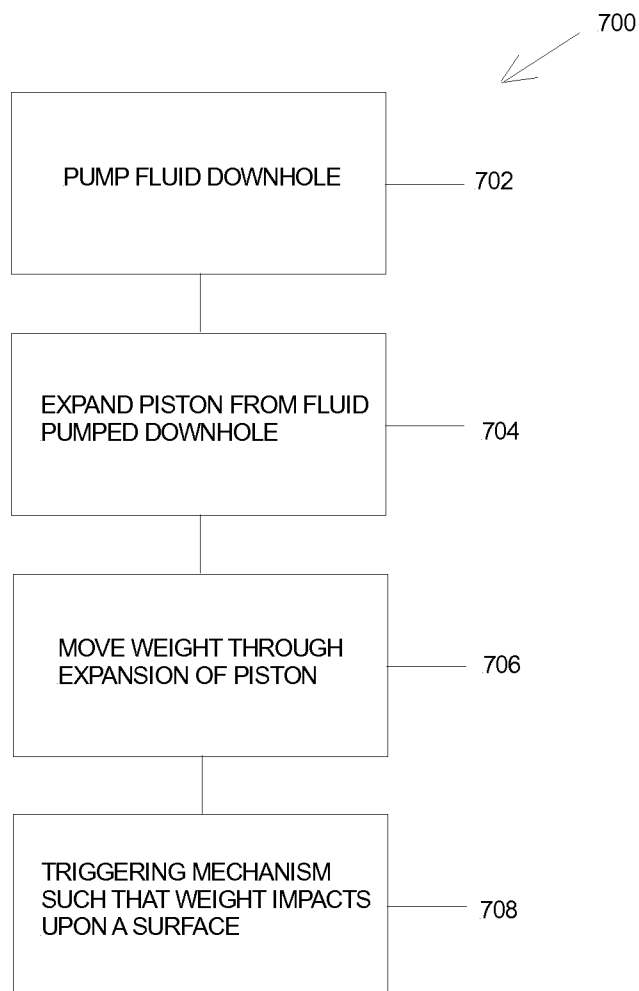


FIG. 6

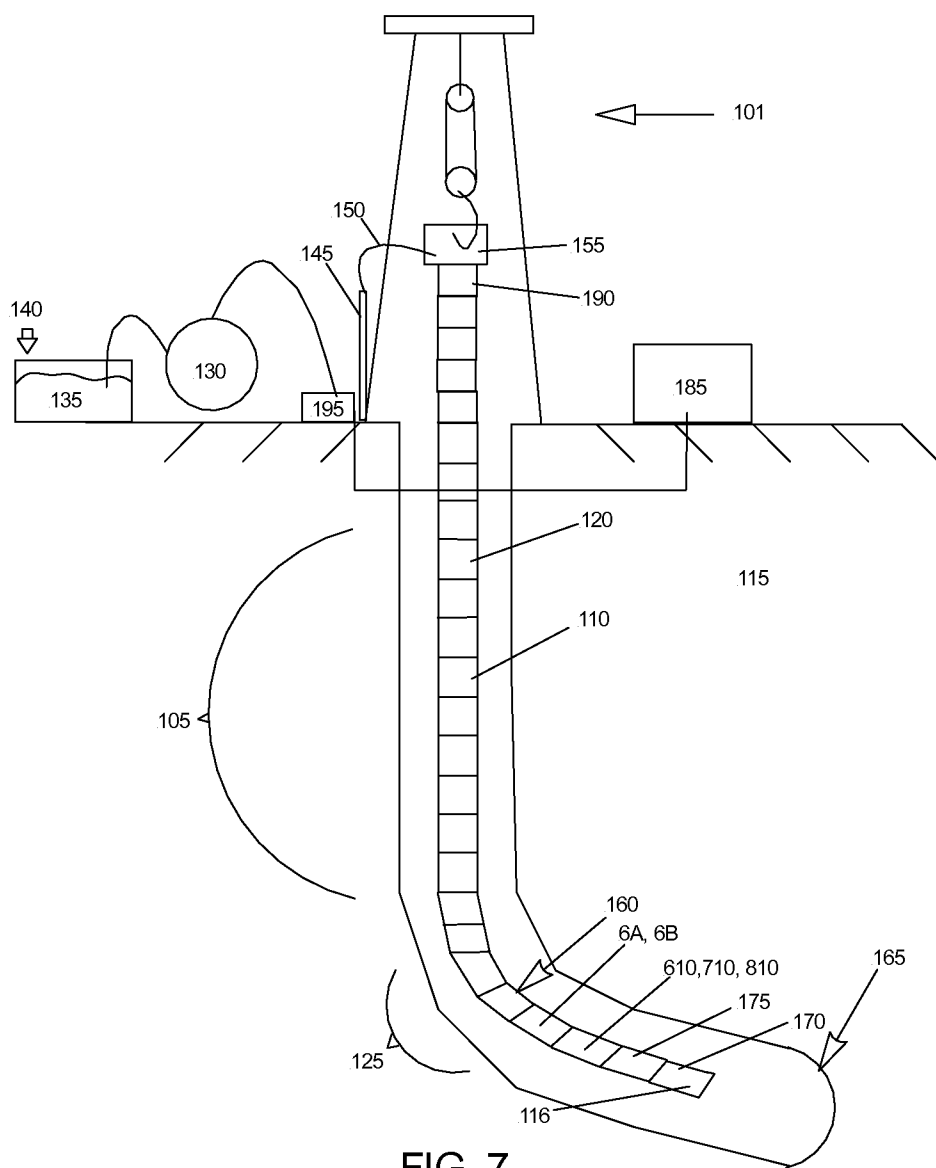


FIG. 7

PUMP ACTUATED JAR FOR DOWNHOLE SAMPLING TOOLS

FIELD OF THE INVENTION

[0001] Aspects of the disclosure relate to downhole drilling and subsurface investigation. More specifically, aspects of the disclosure relate to a pump actuated jar mechanism for downhole sampling tools.

BACKGROUND INFORMATION

[0002] Tool sticking is a leading source of nonproductive time in field operations for both wireline and drilling operations in the oilfield industry. Typically, when a tool string becomes “stuck” in a borehole, a mechanism called a “jar” is used to dislodge the stuck tool string. The jar is actuated by applying tension to a wireline cable up to approximately one thousand (1000) to three thousand (3000) pounds force above tool weight. Applying this force causes the jar to release under tension and travel freely for approximately 6 inches (15.24 centimeters). The moving portion of the jar impacts the stationary portion of the jar and an impact force is generated. This sudden impact force is transmitted to the tool string in the hopes of freeing the stuck tool. Jar function is similar to slide hammer operations used to remove plugs, pistons and tight tolerance components in industrial applications. The process described above for the jar can be repeated by slackening the cable and allowing the jar to move back 6 inches (15.24 centimeters) of travel at which point a trigger is reset and the process is repeated, applying tension to the cable.

[0003] There are several disadvantages to conventional jar systems. First, existing jars are run at the top of the tool string while sampling tools most often become stuck at the probe or packer located near the bottom of the tool string. The rapid attenuation of the jarring force along the length of the tool string means that jars have to be set to a very high jarring force to ensure sufficient force reaches the stuck portion of the tool to free the tool. This high force often results in damage to the tools nearest to the jar. Second, the existing wireline jars depend on the stretch of the cable to provide the potential energy force. This high tension, followed by the release and impact, causes rapid degradation of the wireline cable. Third, conventional jars are excessively long and have significant weight as well as being expensive.

[0004] Conventional jars used in drilling apparatus have slightly different configurations, but have similar challenges. The defects of conventional jars limit their usefulness in many applications.

SUMMARY

[0005] In one example embodiment, an apparatus is presented wherein the apparatus is configured to impart a force on a downhole component, having a piston configured to expand from a movement of a drilling fluid in a downhole environment, a weight configured to move from a first position to a second position, wherein the weight contacts the piston and the piston is configured to move the weight from the first position to the second position when the piston expands from movement of the drilling fluid, a spring configured to contact a bearing surface and the weight, wherein movement of the weight toward the second position compresses the spring; a return spring configured to impart a force on the weight to return the weight to the first position from the second position and a trigger mechanism configured to actu-

ate a return of the weight from the second position to the first position by the return spring. The preceding summary is not intended to limit the scope of the invention, but rather provide but one example embodiment that may be used to accomplish the features and methods described.

[0006] In another embodiment, a method for creating a force on a downhole tool is provided having features of pumping a fluid to a downhole location, expanding a piston in the downhole location, an expansion of the piston caused by the fluid entering the piston, moving a weight through the expansion of the piston, the movement of the weight compressing a spring from an uncompressed position to a compressed position, triggering a mechanism such that the weight is allowed to move and the spring returns from the compressed position to the uncompressed position, and impacting the weight upon a surface to deliver a force to a downhole environment.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] FIG. 1 is a side elevation cut away view of a device of a jar with the housing removed for clarity of illustration in conformance with one example embodiment.

[0008] FIG. 2 is a side view of the weight attachment area of FIG. 1 with the housing removed for clarity of illustration.

[0009] FIG. 3 is a side view of a ball bearing trigger mechanism.

[0010] FIG. 4 is a side view of a ball bearing trigger mechanism.

[0011] FIG. 5 is a side view of a keyed, twisting track trigger mechanism embodiment that may be used with FIG. 1.

[0012] FIG. 6 is a flow chart for conducting pump actuated jar activities on downhole components used during drilling operations.

[0013] FIG. 7 is a side elevation view of a drilling apparatus for which the jar of FIG. 1 may be used.

DETAILED DESCRIPTION

[0014] In accordance with the present disclosure, a wellsite with associated wellbore and apparatus is described in order to describe a typical, but not limiting, embodiment of the application. To that end, apparatus at the wellsite may be altered, as necessary, due to field considerations encountered.

[0015] An example well site system is schematically depicted in FIG. 7 wherein components described above are incorporated in the larger systems described therein or are used in configurations utilizing the wellbores established using the systems illustrated in FIG. 8. The well site comprises a well. A drill string 105 may extend from the drill rig 101 into a zone of the formation of reservoir 115. The drill string 105 employs a telemetry system for transmitting data from downhole to the surface. In the illustrated embodiment, the telemetry system is a mud pulse telemetry system.

[0016] Although illustrated with a mud pulse telemetry, the drill string 105 may employ any type of telemetry system or any combination of telemetry systems, such as electromagnetic, acoustic and/or wired drill pipe, however in the preferred embodiment, only the mud pulse telemetry system is used. A bottom hole assembly (“BHA”) is suspended at the end of the drill string 105. In an embodiment, the bottom hole assembly comprises a plurality of measurement while drilling or logging while drilling downhole tools 125, such as shown by numerals 6a and 6b. For example, one or more of the downhole tools 6a and 6b may be a formation pressure while drilling tool.

[0017] Logging while drilling (“LWD”) tools used at the end of the drill string **105** may include a thick walled housing, commonly referred to as a drill collar, and may include one or more of a number of logging devices. The logging while drilling tool may be capable of measuring, processing, and/or storing information therein, as well as communicating with equipment disposed at the surface of the well site.

[0018] Measurement while drilling (“MWD”) tools may include one or more of the following measuring tools: a modulator, a weight on bit measuring device, a torque measuring device, a vibration measuring device, a shock measuring device, a stick slip measuring device, a direction measuring device, and inclination measuring device, and/or any other device.

[0019] Measurements made by the bottom hole assembly or other tools and sensors with the drill string **105** may be transmitted to a computing system **185** for analysis. For example, mud pulses may be used to broadcast formation measurements performed by one or more of the downhole tools **6a** and **6b** to the computing system **185**.

[0020] The computing system **185** is configured to host a plurality of models, such as a reservoir model, and to acquire and process data from downhole components, as well as determine the bottom hole location in the reservoir **115** from measurement while drilling data. Examples of reservoir models and cross well interference testing may be found in the following references: “Interpreting an RFT-Measured Pulse Test with a Three-Dimensional Simulator” by Lasseter, T., Karakas, M., and Schweltzer, J., SPE 14878, March 1988. “Design, Implementation, and Interpretation of a Three-Dimensional Well Test in the Cormorant Field, North Sea” by Bunn, G. F., and Yaxley, L. M., SPE 15858, October 1986. “Layer Pulse Testing Using a Wireline Formation Tester” by Saeedi, J., and Standen, E., SPE 16803, September 1987. “Distributed Pressure Measurements Allow Early Quantification of Reservoir Dynamics in the Jene Field” by Bunn, G. F., Wittman, M. J., Morgan, W. D., and Curnutt, R. C., SPE 17682, March 1991. “A Field Example of Interference Testing Across a Partially Communicating Fault” by Yaxley, L. M., and Blaymires, J. M., SPE 19306, 1989. “Interpretation of a Pulse Test in a Layered Reservoir” by Kaneda, R., Saeedi, J., and Ayestaran, L. C., SPE 21337, December 1991.

[0021] The drill rig **101** or similar looking/functioning device may be used to move the drill string **105** within the well that is being drilled through subterranean formations of the reservoir, generally at **115**. The drill string **105** may be extended into the subterranean formations with a number of coupled drill pipes (one of which is designated **120**) of the drill string **105**. The drill pipe **120** comprising the drill string **105** may be structurally similar to ordinary drill pipes, as illustrated for example and U.S. Pat. No. 6,174,001, issued to Enderle, entitled “Two-Step, a Low Torque, Wedge Thread for Tubular Connector,” issued Aug. 7, 2001, which is incorporated herein by reference in its entirety, and may include a cable associated with each drill pipe **120** that serves as a communication channel.

[0022] The bottom hole assembly at the lower end of the drill string **105** may include one, an assembly, or a string of downhole tools. In the illustrated example, the downhole tool string **105** may include well logging tools **125** coupled to a lower end thereof. As used in the present description, the term well logging tool or a string of such tools, may include at least one or more logging while drilling tools (“LWD”), formation evaluation tools, formation sampling tools and other tools

capable of measuring a characteristic of the subterranean formations of the reservoir **115** and/or of the well.

[0023] Several of the components disposed proximate to the drill rig **101** may be used to operate components of the overall system. These components will be explained with respect to their uses in drilling the well **110** for a better understanding thereof. The drill string **105** may be used to turn and urge a drill bit **116** into the bottom the well **110** to increase its length (depth). During drilling of the well **110**, a pump **130** lifts drilling fluid (mud) **135** from a tank **140** or pits and discharges the mud **135** under pressure through a stand-pipe **145** and flexible conduit **150** or hose, through a top drive **155** and into an interior passage inside the drill pipe **105**. The mud **135** which can be water or oil-based, exits the drill pipe **105** through courses or nozzles (not shown separately) in the drill bit **116**, wherein it cools and lubricates the drill bit **116** and lifts drill cuttings generated by the drill bit **116** to the surface of the earth through an annular arrangement.

[0024] When the well **110** has been drilled to a selected depth, the well logging tools **125** may be positioned at the lower end of the pipe **105** if not previously installed. The well logging tools **125** may be positioned by pumping the well logging downhole tools **125** down the pipe **105** or otherwise moving the well logging downhole tools **125** down the pipe **105** while the pipe **105** is within the well **110**. The well logging tools **125** may then be coupled to an adapter sub **160** at the end of the drill string **105** and may be moved through, for example in the illustrated embodiment, a highly inclined portion **165** of the well **110**, which would be inaccessible using armored electrical cable to move the well logging downhole tools **125**.

[0025] During well logging operations, the pump **130** may be operated to provide fluid flow to operate one or more turbines in the well logging downhole tools **125** to provide power to operate certain devices in the well logging tools **125**. When tripping in or out of the well **110**, (turning on and off the mud pumps **130**) it may be in feasible to provide fluid flow. As a result, power may be provided to the well logging tools **125** in other ways. For example, batteries may be used to provide power to the well logging downhole tools **125**. In one embodiment, the batteries may be rechargeable batteries and may be recharged by turbines during fluid flow. The batteries may be positioned within the housing of one or more of the well logging tools **125**. Other manners of powering the well logging tools **125** may be used including, but not limited to, one-time power use batteries. A wireline may also power the downhole components.

[0026] As the well logging tools **125** are moved along the well **110** by moving the drill pipe **105**, signals may be detected by various devices, of which non-limiting examples may include a resistivity measurement device, a bulk density measurement device, a porosity measurement device, a formation capture cross-section measurement device **170**, a gamma ray measurement device **175** and a formation fluid sampling tool **610**, **710**, **810** which may include a formation pressure measurement device **6a** and/or **6b**. The signals may be transmitted toward the surface of the earth along the drill string **105**.

[0027] An apparatus and system for communicating from the drill pipe **105** to the surface computer **185** or other component configured to receive, analyze, and/or transmit data may include a second adapter sub **190** that may be coupled between an end of the drill string **105** and the top drive **155** that may be used to provide a communication channel with a

receiving unit **195** for signals received from the well logging downhole tools **125**. The receiving unit **195** may be coupled to the surface computer **185** to provide a data path therebetween that may be a bidirectional data path.

[0028] Though not shown, the drill string **105** may alternatively be connected to a rotary table, via a Kelly, and may suspend from a traveling block or hook, and additionally a rotary swivel. The rotary swivel may be suspended from the drilling rig **101** through the hook, and the Kelly may be connected to the rotary swivel such that the Kelly may rotate with respect to the rotary swivel. The Kelly may be any mast that has a set of polygonal connections or splines on the outer surface type that mate to a Kelly bushing such that actuation of the rotary table may rotate the Kelly.

[0029] An upper end of the drill string **105** may be connected to the Kelly, such as by threadingly reconnecting the drill string **105** to the Kelly, and the rotary table may rotate the Kelly, thereby rotating the drill string **105** connected thereto.

[0030] Although not shown, the drill string **105** may include one or more stabilizing collars. A stabilizing collar may be disposed within or connected to the drill string **105**, in which the stabilizing collar may be used to engage and apply a force against the wall of the well **110**. This may enable the stabilizing collar to prevent the drill pipe string **105** from deviating from the desired direction for the well **110**. For example, during drilling, the drill string **105** may “wobble” within the well **110**, thereby allowing the drill string **105** to deviate from the desired direction of the well **110**. This wobble action may also be detrimental to the drill string **105**, components disposed therein, and the drill bit **116** connected thereto. A stabilizing collar may be used to minimize, if not overcome altogether, the wobble action of the drill string **105**, thereby possibly increasing the efficiency of the drilling performed at the well site and/or increasing the overall life of the components at the wellsite.

[0031] Referring to FIG. 1, in the non-limiting aspects described, a sampling tool pump (not shown) is used to build pressure in the flowline (pumping down) which extends a hydraulic piston **18** built into a pump down jar **10**. As the piston **18** extends, the piston **18** pushes a weight **20** against a spring **22**. The device is used to produce a jarring event that will unstuck a downhole device. A burst of kinetic energy is used to break frictional forces and allow the tool to be retrieved on further used downhole. The device may be used with a wireline, as a non-limiting embodiment.

[0032] At a preset extension of the piston **18**, the weight **20** and the spring **22** are released and the spring **22** pushes the weight **20** back against the end of the jar **10**, creating a jarring event, consequently releasing the energy. Pressure can then be released from the flowline by opening a valve **24** in the packer or probe and the piston **18** returns to the starting position by a second, lower force return spring **30** that has the purpose of pushing the piston **18** back to the start position. The second, lower force return spring **30** is located inside a guide sleeve **31**. A trigger mechanism **29** may be used to trigger motion in the jar **10**. Such trigger mechanisms **29** are to be considered non-limiting.

[0033] Once the piston **18** is returned to the start position, the valve **24** in the packer and/or probe can be closed and pressure built in the flowline again, extending the piston **18** and trigger the jar **10** for a second actuation. The process can be repeated the number of times required for freeing the tool string.

[0034] As provided in the FIGS. that follow, there are different trigger mechanisms that may be used with the jar **10**. In one optional embodiment, pistons are used. In one embodiment, a configuration is presented that prevents the jar from triggering unintentionally during the normal operation (i.e. when inflating packers). Additionally, a second flow line may be used in a downhole testing apparatus to control the jarring force with the pressure of a second flowline.

[0035] As provided in FIG. 1, a cross-sectional view (top) and in an outside view, FIG. 2, (exterior partial view) a housing is deleted for clarity of illustration. As will be understood, the actual configuration would include a housing. In FIGS. 1 and 2, the sampling tool pump pressures the flowline (by pumping down), the piston **18** extends, pushing the weight **20** from the left side of the drawing, to the right. This movement compresses the jar spring **22**. After extending a predetermined distance, and storing the desired energy in the spring **22**, the trigger mechanism **29** releases the weight **20** which is accelerated until the weight impacts the stationary portion of the device shown on the left side of the drawing, causing a jarring force to free a stuck tool. After the jar **10** is triggered, the pump is stopped and a valve in the tool, most likely in the probe or packer, opened to release the pressure on the piston, at which point the return spring **30** pushes the piston **18** back to the start position.

[0036] This actuation effectively resets the trigger **29** for the overall mechanism. The valve in the probe or packer can then be closed and the pump started again to repeat jarring.

[0037] The spring **22**, in one non-limiting embodiment, is a stiff spring with a high spring constant. In one example embodiment, the spring **22** has two hundred pounds of force per inch of compression. The assembly of the tool is envisioned to be such that the jarring spring is “pre-compressed” by some amount to preload the spring **22** with sufficient force to prevent movement of the piston/weight until a pressure above the packer inflation pressure is applied to the flowline.

[0038] The sampling tool builds pressure in the flow line as part of the normal operation to “inflate” the packer. In order to prevent unintentional jarring as a result of normal packer inflation, the jarring spring would be pre-loaded as described above. Typical inflation pressures for the packer are approximately five hundred (500) pounds per square inch. In one non-limiting example, a pre-load of the jar spring would entail a flowline pressure of seven hundred fifty (750) pounds per square inch or greater to begin moving the weight. The pressure required to trigger the device can be designed to be variable as a function of the “stroke” of the piston prior to the trigger mechanism releasing the weight. A typical piston stroke length is, for example, six (6) inches or less.

[0039] As provided in FIG. 3 a trigger mechanism **29** is illustrated. In this embodiment, the trigger mechanism **29** is a ball bearing mechanism is one that triggers actuation of the overall jar mechanism. The ball bearings **302** push the weight **307** until reaching the end of the piston stroke, at which point the portion that supports the ball bearings shift, allowing the balls to move “inward” relative to the piston, freeing the weight **307** to consequently “jar” the tool. As provided in FIG. 3, the piston **310** is configured to move the weight **307** in the central section back and forth, thereby allowing the ball bearing **302** to enter the cavity **304** defined by the central section. In the illustrated embodiment, the locked position is when the central section is moving to the right. The free movement occurs when the central section moves to the left striking portion **308**. As provided, when the piston **310** moves in the

pumped condition to the right, the spring 306 deflects, storing potential energy through Hooke's law. When the ball bearings 302 move inward relative to the central axis of the central section, the stored energy may be released by the spring, causing the jarring effect.

[0040] As provided in FIG. 4, a ball bearing trigger mechanism 400 is illustrated that may be used for the trigger mechanism 29 in the previous illustrated embodiments. In this embodiment, a piston may move a weight 402 so that the weight 402 compresses against the spring 404 that stores potential energy. The ball bearings 406 prevent the weight 402 from moving to the left in the illustrated embodiment. The ball bearings 406 move out of the blocking position for the weight through use of a twisting track. When the piston reaches a fully extended position, the ball bearing may enter precut grooves in the weight, allowing the weight to release and travel to the left, causing a jarring effect.

[0041] Referring to FIG. 5, a trigger mechanism 600 alternate embodiment is provided that may be used at element 29. In this embodiment, the trigger mechanism 600 is a keyed, twisting track trigger mechanism. The keyed twisting track trigger mechanism 600 triggers the overall jar effect and may be used instead of the ball bearing mechanism. A weight 602 is keyed to the interior diameter of the housing such that the weight 602 can translate axially but cannot rotate about the guide sleeve/piston.

[0042] The piston 605 has a catch, which may be a three prong tip of the piston 605. The three catches travel in slots 604 in the guide sleeve 607 turn the catches 606 and the piston until they align with openings in the weight 602, releasing the weight 602 and triggering the jar. The alignment between the weight openings and the piston catches 606 is performed through rotation of the tracks in the guide sleeve arrangement 608. The piston 605 is returned and the process is repeated as desired.

[0043] As will be understood, the above concepts will work for either a one or two flowline tool. There are concepts specific to a two flowline tool that allow the use of the second flowline to do one or several of the following:

[0044] 1. Activate or passivate the jar 10—instead of depending on pre-load of the spring to prevent unintentional jarring during packer inflation, the device can be such that pressurizing both lines does not actuate the jar 10, but pressurizing only the sample line with the guard line open to borehole allows actuation of the jar 10. If both lines are pressurized while inflating the packer, the jar 10 will not trigger, but if only one line is pressurized, the jar 10 will actuate.

[0045] 2. Varying the jarring force—the jar 10 may also be designed such that applying pressure (positive or negative) to one of the two lines, prior to actuating the jar with the other flowline, would determine the jarring force. This allows downhole control of the jarring force so that jarring activities may be started with a low level of force with the least potential to damage tools and increase the jarring force as needed until the tools become free.

[0046] Referring to FIG. 6, a method 700 for conducting pump actuated jar activities for downhole sampling tools is presented. The method 700 may be used, for example, in downhole environments in the oil field services industry. Jar activities may also be used in other environments, thus the method 700 is merely an example. In 702, fluid is pumped to a downhole location. In 704, a piston is expanded in the

downhole location wherein the expansion of the piston is caused by fluid entering the piston. In 706, a weight is moved through expansion of the piston, the movement of the weight compressing a spring from an uncompressed position to a compressed position. In 708, the weight impacts upon a surface to deliver a force to a downhole environment.

[0047] In one non-limiting embodiment, an apparatus configured to impart a force on a downhole component is described, comprising a piston configured to expand from a movement of a fluid, a weight configured to move from a first position to a second position, wherein the weight contacts the piston and the piston is configured to move the weight from the first position to the second position when the piston expands from movement of the drilling fluid, a spring configured to contact a bearing surface and the weight, wherein movement of the weight toward the second position compresses the spring, a return spring configured to impart a force on the weight to return the weight to the first position from the second position and a trigger mechanism configured to actuate a return of the weight from the second position to the first position by the return spring.

[0048] In an alternative embodiment, the apparatus may be configured such that the fluid is a drilling fluid.

[0049] In an alternative embodiment, the apparatus may be configured wherein the component is a downhole component.

[0050] In an alternative embodiment, the apparatus may be configured wherein the drilling fluid is in a downhole environment.

[0051] In an alternative embodiment a method for creating a force on a downhole tool, is described comprising pumping a fluid to a downhole location, expanding a piston in the downhole location, an expansion of the piston caused by the fluid entering the piston, moving a weight through the expansion of the piston, the movement of the weight compressing a spring from an uncompressed position to a compressed position, triggering a mechanism such that the weight is allowed to move and the spring returns from the compressed position to the uncompressed position and impacting the weight upon a surface to deliver a force to a downhole environment.

[0052] In another alternative embodiment, the method may be accomplished wherein the force is delivered to a tool string.

[0053] In another alternative embodiment, the method may be accomplished wherein the fluid is a drilling mud.

[0054] In an alternative embodiment, the method may be accomplished wherein the mechanism used for triggering is a ball bearing mechanism.

[0055] In an alternative embodiment, the method may be accomplished wherein the mechanism used for triggering is a keyed, twisting track trigger mechanism.

[0056] In an alternative embodiment, the method may be accomplished wherein the pumped fluid expands the piston through one flowline.

[0057] In an alternative embodiment, the method may be accomplished wherein the pumped fluid expands the piston through one of two flowlines.

[0058] While the aspects have been described with respect to a limited number of embodiments, those skilled in the art, having benefit of the disclosure, will appreciate that other embodiments can be devised which do not depart from the scope of the disclosure herein.

What is claimed is:

1. An apparatus configured to impart a force on a downhole component, comprising:

- a piston configured to expand from a movement of a fluid;
 - a weight configured to move from a first position to a second position, wherein the weight contacts the piston and the piston is configured to move the weight from the first position to the second position when the piston expands from movement of the drilling fluid;
 - a spring configured to contact a bearing surface and the weight, wherein movement of the weight toward the second position compresses the spring;
 - a return spring configured to impart a force on the weight to return the weight to the first position from the second position; and
 - a trigger mechanism configured to actuate a return of the weight from the second position to the first position by the return spring.
2. The apparatus according to claim 1, wherein the fluid is a drilling fluid.
 3. The apparatus according to claim 1, wherein the component is a downhole component.
 4. The apparatus according to claim 1, wherein the drilling fluid is in a downhole environment.
 5. A method for creating a force on a downhole tool, comprising:

- pumping a fluid to a downhole location;
 - expanding a piston in the downhole location, an expansion of the piston caused by the fluid entering the piston;
 - moving a weight through the expansion of the piston, the movement of the weight compressing a spring from an uncompressed position to a compressed position;
 - triggering a mechanism such that the weight is allowed to move and the spring returns from the compressed position to the uncompressed position; and
 - impacting the weight upon a surface to deliver a force to a downhole environment.
6. The method according to claim 5, wherein the force is delivered to a tool string.
 7. The method according to claim 5, wherein the fluid is a drilling mud.
 8. The method according to claim 5, wherein the mechanism used for triggering is a ball bearing mechanism.
 9. The method according to claim 5, wherein the mechanism used for triggering is a keyed, twisting track trigger mechanism.
 10. The method according to claim 5, wherein the pumped fluid expands the piston through one flowline.
 11. The method according to claim 5, wherein the pumped fluid expands the piston through one of two flowlines.

* * * * *