United States Patent

Graff

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[54] **WELL JAR WITH EXTERNALLY OPERABLE TRIP RELEASE**

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[51] **Int. Cl.**.....**E21b 1/10**

[58] **Field of Search**.....175/293, 294, 297, 299, 300, 175/302, 303, 304; 166/178

[56] **References Cited**

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[57] **ABSTRACT**

A well jar having telescoping members movable between extended and retracted positions, a tripping mechanism for releasably retaining said members in retracted position, and means operable at the surface for releasing said tripping mechanism so that the jar is run into a well with said members in an extended position.

5 Claims, 2 Drawing Figures

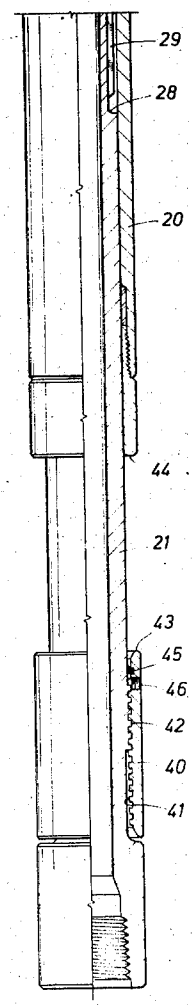


FIG. 1

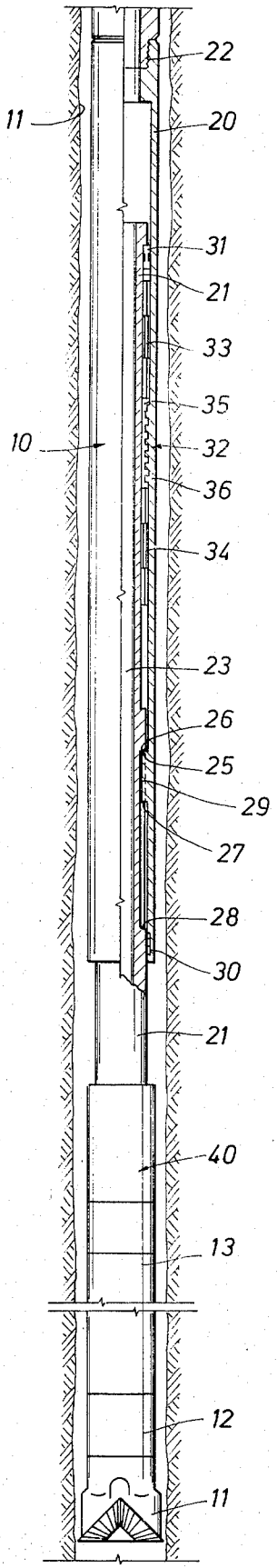
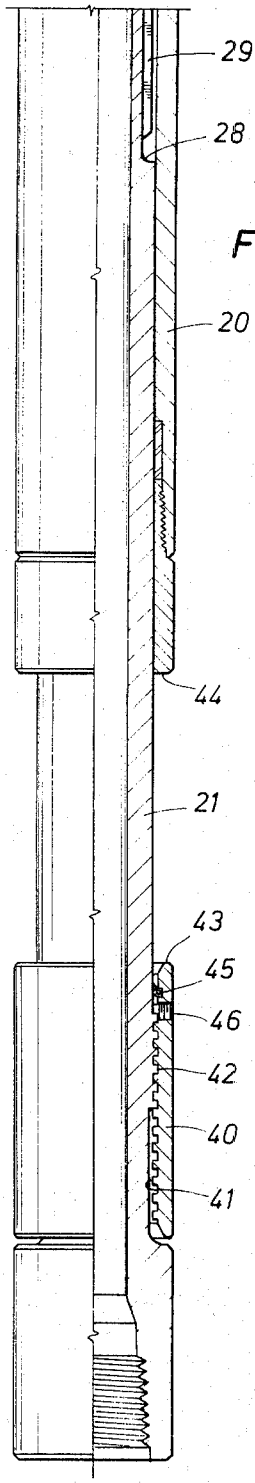


FIG. 2



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WELL JAR WITH EXTERNALLY OPERABLE TRIP RELEASE

This invention relates generally to well jars used in boreholes, and more specifically to a well jar having an externally operable means for tripping the jar to place it in its fully extended condition prior to running into the well bore.

Well jars generally comprise telescoping housing and mandrel members having impact surfaces that can be engaged by telescoping movement to impart jarring blows to an object that is stuck in the well. In order to intensify the jarring blows, a tripping mechanism is typically provided that functions to restrain the members in an intermediate or "cocked" position until a sufficient longitudinal force has been applied by manipulating the pipe string, whereupon the tripping mechanism releases to enable unrestricted telescoping motion to bring the impact surfaces together in a violent manner.

It is considered to be undesirable, however, to have the jar in the cocked condition during running into the well bore. This is mainly because ordinarily a number of heavy drill collars or the like are run below the jar to provide the weight necessary for drilling or milling operations, and there is a substantial risk that the jar might hit accidentally, for example, when the drill string is suddenly stopped to add additional pipe joints at the surface. The jarring action could cause the surface pipe slips to release, dropping the pipe string into the well. Furthermore, during a number of typical well bore operations such as drilling, the jar is normally positioned in tension and in an extended condition, so that it is desirable to have the jar in such condition when the bit reaches the bottom so that drilling operations can proceed immediately.

Accordingly, the primary object of this invention is to provide a new and improved well jar having externally operable means that can be readily manipulated at the surface to release the jar from a cocked position so that it is fully extended prior to lowering into the well bore.

This and other objects are attained in accordance with the concepts of the present invention through the provision, in combination with a well jar having a mandrel telescopically disposed within a housing and spaced apart impact surfaces that can be engaged by telescoping movement to deliver a jarring blow, the well jar further having a tripping means for releasably restraining the members against telescoping movement, of a rotatable means on the mandrel having an axial cam connection therewith, so that rotation serves to feed said means longitudinally along said mandrel. One end of said rotational means is adapted to engage said housing so that rotation will cause oppositely directed longitudinal force to be applied to said mandrel and housing to release said tripping mechanism from a cocked position, thereby enabling movement to a fully extended condition. The rotation means can be conveniently operated at the surface by power tongs or other available rig equipment, and the jar in an extended condition cannot be accidentally tripped while running. Also, the jar is in condition for usage immediately upon reaching operating depth. Moreover, the present invention provides a method for testing the jar at the surface to ensure that it is fully operational.

The present invention has other objects and advantages that will become more fully apparent in connection with the following detailed description, when taken in conjunction with the appended drawings in which:

FIG. **1** is a somewhat schematic illustration of a well jar equipped with the present invention and positioned in a well bore; and

FIG. **2** is an enlarged sectional view with portions in side elevation showing structural detail of the present invention.

Referring initially to FIG. **1**, a jar **10** is shown being lowered downwardly through a well bore **11**, the jar being attached in a drill string that includes a number of drill collars **13** above and below the jar. A typical drill bit is attached to the lower end of the string. The jar **10** is shown in its fully extended condition, having been placed in such condition at the surface prior to lowering into the well bore.

The jar **10** generally includes a tubular housing **20** that is telescopically disposed over a tubular mandrel **21**, the housing being directly connected at **22** to the drill collars thereabove. The mandrel **21** has a central bore that continues the drilling fluid circulation path through the drill string. The housing **20** is shown in its fully extended position with respect to the mandrel **21**, however it will be appreciated that the housing is movable to some extent in both longitudinal directions along the mandrel from a central or "cocked" position, upward movement causing one "hammer" provided by an inwardly extending shoulder surface **25** to strike an "anvil" provided by an outwardly extending shoulder surface **26** on the mandrel, downward movement causing another hammer surface **27** to strike a second anvil surface **28**. In the typical operation of the jar **10**, the impact force in either direction is transmitted by the mandrel to stuck tools therebelow. The housing **20** and the mandrel **21** have coengaging splines **29** for transmitting torque and rotation through the jar during drilling operations. A seal packing **30** prevents drilling fluids from entering in between the housing **20** and the mandrel **21** at their lower ends, whereas a floating or compensating seal packing unit **31** is used to prevent fluids from entering at their upper ends. The vacant spaces between the housing and the mandrel are filled with a typical lubricating oil or the like.

A tripping mechanism indicated generally at **32** is disposed in between upper and lower resilient structures **33** and **34** which function to restrain longitudinal movement of the housing **20** in either direction from the cocked or intermediate position to enable energy to be stored in the drill pipe before the jar hits to intensify the jarring action. The details of the tripping mechanism **32** form no part of this invention and are fully disclosed in copending Application Ser. No. 82,284, Kisling, filed Oct. 20, 1970, and assigned to the Assignee of this invention. Briefly, however, the tripping mechanism **32** includes an annular expansible and contractible latch sleeve **35** having internal threads that grip external threads on the mandrel **21**, the sleeve being held engaged with the mandrel by locking surfaces on a locking sleeve **36**. Upon a selected extent of longitudinal movement of the housing **20** along the mandrel **21**, such movement being resisted by the resilient structures **33** or **34**, the sleeve member **35** is

released for outward movement so that the housing can move freely along the mandrel until a hammer encounters an anvil to effect a jarring action. The tripping mechanism **32** can be recocked by moving the housing **20** in the opposite direction so that jarring blows can be repeatedly struck in either direction until the stuck object is driven loose. The lower end of the mandrel **21** extends downwardly from the lower end of the housing **20** and is connected to the drill collars as was previously described.

The mandrel portion below the lower end of the housing **20** is provided with an externally operable means for tripping the jar **10** at the surface in accordance with the present invention, so that the jar is lowered into the well bore in its fully extended position as shown in FIG. **1**. As shown in enlarged detail in FIG. **2**, the externally operable means includes a collar **40** having internal threads **41** that mesh with external threads **42** on the mandrel **21**. The mandrel threads **42** are located along the mandrel and with respect to the length of the jar stroke such that when the collar **40** is in its lowermost position in respect to the mandrel, the collar does not interfere with longitudinal movement that occurs as the hammer surface **27** approaches the anvil surface **28**. However, with the jar **10** in the cocked or intermediate position, the collar **40** can be fed upwardly along the mandrel by relative rotation, and to a position where the upper end surface **43** of the collar to be engaged with the lower end surface **44** of the housing **20**. Thereafter, further relative rotation will force the mandrel **21** downwardly and the housing **20** upwardly with the result being that the tripping mechanism **32** is forced to release. In order to isolate the threads **41** and **42** from sediments in the drilling fluids, a wiper seal **45** is located between the upper end of the collar **40** and the mandrel **21**, and to further ensure protection of the threads, a port **46** is provided so that grease can be injected in and around the threads.

In operation, the jar **10** should be in its fully extended position when lowered into the well so that a jarring action will not be accidentally effected for reasons previously described and so that the jar is conditioned for drilling or milling operations immediately upon reaching bottomhole. With the jar **10** in a cocked position, power tongs or other conventional rig equipment are used at the surface to rotate the collar **40**, thereby feeding it into engagement with the housing **20**. Continued rotation will then force the mandrel **21** and the housing **20** in opposite directions to release the tripping mechanism **32**. Upon release, the collar **40** is rotated in the reverse direction to feed it downwardly along the mandrel **21** and to its lowermost position so that the housing and mandrel can telescope freely during jarring operations.

It will also be appreciated that the present invention provides a method of testing the jar **10** at the surface to determine if the jar is fully operational, since the amount of torque required to overcome and release the tripping mechanism **32** will be considerable compared to the free feed torque for the collar **40**. Also, it is possible to check with a torque meter or the like if the jar **10** is operational at the proper tripping load.

It will now be apparent that a new and improved well jar has been provided having externally operable means for tripping the jar at the surface so that it is run into a well in an extended condition. Although the present invention has been disclosed in connection with a two-way hitting jar, of course the principles are equally applicable to a one-way hitting jar. Since certain changes or modifications may be made by those skilled in the art without departing from the inventive concepts involved, it is the aim of the appended claims to cover all such changes and modifications falling within the true spirit and scope of the present invention.

I claim:

1. A well jar apparatus comprising: a mandrel member slidably disposed with a housing member and movable axially relative thereto between a cocked position and a jarring position; releasable means for restraining axial movement from said cocked position; and externally operable means on one of said members adapted for longitudinal movement along said one member a distance greater than the extent of axial movement of said members from said cocked position to said jarring position, said externally operable means engaging said other member during said longitudinal movement and forcing release of said releasable means to enable said members to be moved to said jarring position before running into a well bore.

2. The well jar apparatus of claim **1** wherein said externally operable means includes an annular member threaded to said one member, whereby rotation causes feeding of said annular member along said one member into engagement with the other of said members.

3. A well jar apparatus comprising: a mandrel member slidably disposed within a housing member and movable axially relative thereto between a cocked position and a jarring position; releasable means for restraining such axial movement from said cocked position; and rotationally operable means on said mandrel member adapted to be fed longitudinally along said mandrel member and into engagement with said housing member for forcing release of said releasable means so that said members can be placed in said jarring position prior to lowering said jar into a well bore, said rotationally operable means comprising a collar threaded to said mandrel member, said collar having a threaded length that is greater than the extent of axial movement of said mandrel member relative to said housing member from said cocked position to said jarring position.

4. The well jar apparatus of claim **3** wherein said collar has substantially the same outer diameter as said housing member.

5. The well jar of claim **3** further including seal means for isolating the threads on said collar and said mandrel member from settlements in well bore drilling fluids.

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