BENNETT JONES LLP

The Commissioner of Patents and Trademarks
Washington, D.C. 20231,
U.S.A.

BOX: PATENT APPLICATION

PROVISIONAL APPLICATION FILING
UNDER 37 CFR 1.53(b)(2)
COVER SHEET

Attorney Docket No.	**45023-8**

Sir:

Transmitted herewith for filing is the provisional patent application of:

Inventors	**THEMIG, Daniel Jon; Cochrane, Canada**
Title	**METHOD TO PLACE WELLBORE STIMULATION FLUIDS IN OIL AND/OR GAS WELLS**

The application comprising:

_1_ page of application cover sheet
_4_ pages of Specification; and
_5_ sheet(s) of drawings.

and enclosed with the application are

[X] A post card.

The Commissioner is hereby authorized to charge the required filing fees amounting to EIGHTY DOLLARS ($80.00) and any additional fees which may be required, or credit any overpayment to Deposit Account No. **02-2057**. Two copies of this form are enclosed for use in connection with any Deposit Account activity.

Respectfully submitted

Roseann B. Caldwell
Registration No. 37,077

August 20, 2002

BENNETT JONES LLP
Suite 4500, 855 2nd Street S.W.
Calgary, Alberta,
CANADA
T2P 4K7

Telephone: (403) 298-3661

Encl.

Re: Patent application – Method to place wellbore stimulation fluids in oil and/or gas wells

Applicants: Packers Plus Energy Services Inc. – Canada Corporation - 2020 736 6th Ave SW, Calgary, Alberta T2P 3T7

Inventor – Themig, Daniel Jon 52 Glenhill Dr. Cochrane, Alberta T4C 1G9

The invention relates to a method for placing wellbore stimulation fluids in oil and/or gas wells and, in particular, systems and methods for stimulating, acidizing, or fracturing an open hole horizontal, vertical, or multi-lateral (branched) well.

Background of the invention:

When drilling an oil or gas well, an operator may decide to leave productive intervals uncased (open hole) to expose porosity and improve wellbore inflow. When natural well inflow is not economical, the well may require stimulation. This may be accomplished by pumping acid, cleaning chemicals or proppant laden fluid into the well to improve well productivity. A perforated liner (with pre-sized holes throughout or at chosen segments) in the liner may be run, as shown in Figure 1. This method is termed sprinkling. When fluids are pumped into the liner, a pressure drop is created across the sized ports. The pressure drop causes approximate equal volumes of fluid to exit each port, to distribute stimulation fluids to desired segments of the well. Generally, the fluid must be pumped at high rates to achieve this "limited entry" result.

Other procedures for open hole stimulation are foam diverters, gelled diverters, and coil tubing conveyed acid, and limited entry through tubing to distribute fluids. Each of these may or may not be effective in distributing fluids to the desired segments in the wellbore.

Recently, the present applicant has begun conducting stimulations using a staged method and assembly, as shown. This method is descried in applicant's corresponding US provisional application 60/331,491, filed November 19, 2001, incorporated herein by reference.

Summary of the invention:

The methods described herein may improve the results due to better control over fluid placement, as well as combining the effectiveness for focused fluid placement in combination with distributed fluid placement. It may also allow for differences in formation treating pressures in the wellbore that may be induces or naturally accruing. Furthermore, the methods and procedures described above may include the benefits of improved well control and safety, better control of wellbore fluid placement, enhance fracture length extension, higher stimulation pressures, and effective stimulation of multiple leg wells in open hole.

Selective segment "Multi-stage Sprinkler" system (Figure 2)

An uncased (open hole) wellbore can be more effectively stimulated using a system which includes a section of tubing with specially designed, selectively opened ports that sprays or "jets" a specific segment of the wellbore in order to focus the treatment on that segment of the well. A series of limited entry (size restricted) ports create a "sprinkler" effect on chosen segments to distribute the stimulation fluids across that selected segment (or segments). A tubing or casing string is made up with a series of size restricted ports subs in which the ports are each covered with a protective pressure holding internal cap, the ports being divided into a series of segments and a movable sleeve is provided for each segment. The sleeve includes seats or profiles that can act as a cutters to cut off the protective caps when the sleeve is driven along the tubing string segment.

Once the system is run into the well, stimulation fluids are pumped into the end section of the well to begin the stimulation treatment, identified as stage 1 in the drawing. Initially, fluids will be forced to the lower section of the well. The lower segment

of the tubing can include a plurality of normally open size restricted ports, which do not require opening for stimulation fluids to be jetted therethrough. Alternately, the ports can be installed in closed configuration, but opened once the tubing is in place.

When desired to stimulate another section of the well, a ball or plug is pumped by fluid pressure, arrow P, down the well and will seat in a selected cutter sleeve sized to accept the ball or plug. The force of the moving fluid behind the ball will push the cutter sleeve against any force, such as a shear pin, holding the sleeve in position and down the tubing string, arrow S. As it moves down, it will remove the pressure holding caps from the ports in its segment of the tubing string. Once the cutter sleeve reaches a desired depth, it will be stopped by a no-go shoulder. Since fluid pressure will hold the ball in the sleeve, this effectively shuts off the lower segment of the well (previously treated stage 1).

Treating fluids will then be forced into the newly opened ports using limited entry or a tubing to wellbore pressure drop to insure distribution. If desired, the segment of the well may be isolated from other parts of the wellbore using open hole packers.

After the desired volume of stimulation fluids are pumped, a slightly larger second ball or plug is injected into the tubing and pumped down the well, and will seat in a cutter sleeve which is selected to retain the larger ball or plug, such as the stage 3 sleeve as shown. The force of the moving fluid will push the cutter sleeve down the tubing string and as it moves down, it will remove the pressure holding cap from a segment of the well. Once the cutter reaches a desired depth, it will be stopped by a no-go shoulder, effectively shutting off the lower segment of the well (previously treated stages 1 and 2). This process can be repeated a number of times until most or all of the wellbore is threaded using a sprinkler approach over each individual section.

Casing or tubing circulating system.

Tubing may be run into a well, and used to circulate out existing wellbore fluids (drilling mud for example) and replaced with a different fluid. To accomplish this, the tubing must have pressure integrity. A tubing or casing string is made up with a series size restricted ports subs in which the ports are covered with a protective pressure holding internal cap and a single or series of movable sleeves with seats or profiles that can act as a cutters to cut off the protective caps. Once the system is run into the well, fluids can be circulated down the tubing or casing to displace existing wellbore fluids out of the well. Initially, fluids will be forced to the end o f the tubing string. When desired, a ball or plug is pumped down the well, and will seat in the (or one of the) cutter sleeves. The force of the moving fluid will push the cutter sleeve down the tubing string and as it moves down, it will remove the pressure holding cap from a segment of the well. Fluids may then exit any or all of the exposed ports, Once the cutter reaches a desired depth, it will be stopped by a no-go shoulder, effectively shutting off the end of the tubing string and/or the lower segment of the well (previously treated).

Combined "Multi-stage Frac and Sprinkler System" stimulation system (Figure 3)

The multiple segment sprinkler system described above can also be combined with a series of ball activated sliding sleeves and open hole packers to allow some segments of the well to be stimulated using a sprinkler approach and other segments of the well to be simulated using a focused fracturing approach.

In this embodiment, a tubing or casing string is made up with some segments formed of subs having a series of size restricted ports therethrough and in which the ports are each covered with protective pressure holding internal caps and each segment including a movable sleeve with seats or profiles that can act as a cutter to cut off the protective caps to open the ports. Other segments have open hole packers thereabout and a ball or plug activated sliding sleeve, such as is described in applicant's aforementioned provisional application, to create a "focused" stimulation effect. Once the system is run into the well, the tubing may be pressured to set some or all of the open hole packers. When the packers are set, stimulation fluids are pumped into the end section of the tubing to begin the stimulation treatment, identified as stage 1. Initially, fluids will be forced to the lower section of the well.

Sections of the well that use a "sprinkler approach" will be treated as follows. When desired, a ball or plug is pumped down the well, and will seat in one of the cutter sleeves. The force of the moving fluid will push the cutter sleeve down the tubing string and as it moves down, it will remove the pressure holding caps from the segment of the well through which it passes. Once the cutter reaches a desired depth, it will be stopped by a no-go shoulder and the ball will remain in the sleeve effectively shutting off the lower segment of the well (previously treated). Stimulation fluids are then pumped as required.

Segments of the well that use a "focused stimulation approach" will be treated as follows. Following the stimulation treatment on this segment of the well, another ball or plug (generally slightly larger) and will seat in and shift open a pressure shifted sliding sleeve, and block off the lower segment(s) of the well. Stimulation fluids are directed out the sliding sleeve and are contained by the open hole packers to allow for treating only that section of the well.

The stimulation process can be continued using "sprinkler" and/or "focused" placement of fluids, depending on the segment which is opened along the tubing string.

Shifting Sleeve/Port Sleeve (Figure 4)

In another embodiment, instead of the shearable caps, sliding port sleeves can be used to control fluid passage through ports. In particular, a series of limited entry moveable sliding port sleeves are installed over a plurality of ports in a casing string. A ball or plug is introduced to the string and pumped into the well. The ball engages a shifting sleeve and fluid pressure behind the ball/sleeve will move it down in the well. When the shifting sleeve passes through the limited entry port sleeve, a set of shifting dogs or keys engage in a shoulder or profile on the port sleeve. As they engage, the port sleeve is shifted to the open position not covering the port and the limited entry port is exposed. The shifting dogs to release, as by increasing pressure behind the ball/sleeve and the shifting sleeve moves downward to the next limited entry port sleeve.

The process continues until all sleeves are shifted to the open position. The shifting sleeve will stop when it reaches a shoulder and will stop fluid from entering the toe end of the well. All or most additional fluid will be diverted through the newly exposed ports.

Lateral wellbore isolation system (Figure 5)

A wellbore with lateral or sidetrack – multiple legs can be effectively stimulated with a junction isolation system using packers, such as solid body open hole packers, combined with tubing. A solid body packer is defined as a tool to create a seal between tubing and casing or the borehole wall using a packing element which is mechanically extruded, using either mechanically or hydraulically applied force. A well may be drilled with multiple legs or laterals that may be vertical, horizontal, or shaped otherwise. When junctions to the legs are created, isolating one leg from the remainder of the wellbore can be especially important to provide the ability to stimulate legs individually. This is especially true in open hole junctions. In one embodiment, a junction isolation system can be installed that utilizes tubing combined with packers such as solid body open hole packers that are placed in a selected lateral at some distance past the wellbore junction. Once the packers are set, they are used to isolate that leg form the remainder of the wellbore. A valve is used in association with the packer that substantially maintains the seal at the packer, but is openable to permit communication to the lateral below the packer by engagement with a tubing string. Stimulation fluids can be pumped down the tubing string and forced into the selected lateral by connecting at the valve of the selected lateral. Following the stimulation, the packers may be left in the well for future isolation or may be removed.

The solid body packers provide high pressure sealing in the open holes and may be equipped with multiple packing elements that will load into each other to provide additional pack-off. The tubing string may be connected to a packer in the casing to provide additional stability to the system. Also, an open hole slip system may be required to stabilize the packers during pressure pumping operations.

A system to isolate open hole laterals and junctions for stimulation may be used with any wellbore stimulation arrangement such as for example with a "sprinkler", focused packer and sleeve system, or a multiple stage "sprinkler" system, or any combination thereof. It may also be used during production of the well.

Claims – multi-stage sprinkler system:

1. Wellbore fluids can be distributed to segments of the well bore using "limited entry" by creating a pressure drop through pumping flow restrictions.
2. High pumping rates and pressures may be required to achieve limited entry over a long interval.
3. A series for stages to create a sprinkler effect over smaller intervals may reduce the requirements for high pumping rates.
4. Smaller segments that are treated may allow and increase pumping rate per foot of formation being treated may be more effective in establishing fracturing length of fluid distribution.
5. A higher density of fluid exit points may create more effective stimulation results
6. Ports with internal protective covers can be installed in a tubing string and then into a well.
7. The protected ports can provide pressure holding capability to allow stimulation fluids to be routed to other segments of the well.
8. A movable sleeve can be installed into the tubing string that will remove the protective cap from the ports to effectively open the port.
9. A ball or plug can be pumped into a well that will seat in the movable cutter sleeve.
10. Pressure from moving fluids push the moveable cutter sleeve down the wellbore and effectively remove multiple protective caps to open these ports.
11. The moveable sleeve will seat in a no-go to seal off the lower portion of the well.

12. More effective stimulation may be accomplished by increasing the density of the port placement.
13. Pumping costs may be reduced using this method due to lower pumping rate requirements.
14. This system will allow the wellbore fluids to be circulated out of the well and replaced with an alternative fluid.

Casing or tubing circulating system.

1. It may be desirable to displace existing wellbore fluids from a well before installing a sprinkler system
2. If sprinkler ports are exposed, it may not be possible to circulate to the end of the well
3. A system of protected ports can provide pressure integrity for the liner
4. Once the wellbore fluids have been circulated, the movable cutter can expose ports for stimulation
5. The method may remove the need for perforating after it is installed, thereby creating cost savings.

Combined "Sprinkler and Focused" stimulation system

1. A series of "sprinkler" combined with "focused" fracturing or stimulation may provide enhanced stimulation results.
2. Stages in a well may be treated selectively with segment "sprinkler" systems
3. Stages in the same well may be treated using packers and pressure shifted sliding sleeves.
4. This method may be much faster that conventional methods (movable straddle isolating packers or bridge plugs)
5. A sprinkler system can provide stimulation fluid distribution
6. A focused fracturing system may provide long fracturing length.

Lateral juncture isolation for open hole sidetracks

1. Wells with multiple legs can be more effectively stimulated if done so individually.
2. A system has been developed to isolate a wellbore juncture using solid body Packers
3. High pressure stimulation operations can be performed using this method and system
4. Open hole junctures can be isolated in stimulated individually.
5. The system can be used for several legs in a single well
6. The system can be used to isolate the lateral after stimulation is completed.
7. Stimulations and wellbore fluids can flow back through the isolation system
8. Open hole sidetrack wells are less expensive than cased hole sidetrack.
9. Isolation of laterals may be required to provide effective stimulation
10. Solid body, multi-element packer as described can provide high pressure sealing
11. This method can result in cost savings as well as higher well productivity.

DOCKET ALARM

Explore Litigation Insights

Docket Alarm provides insights to develop a more informed litigation strategy and the peace of mind of knowing you're on top of things.

Real-Time Litigation Alerts

Keep your litigation team up-to-date with **real-time alerts** and advanced team management tools built for the enterprise, all while greatly reducing PACER spend.

Our comprehensive service means we can handle Federal, State, and Administrative courts across the country.

Advanced Docket Research

With over 230 million records, Docket Alarm's cloud-native docket research platform finds what other services can't. Coverage includes Federal, State, plus PTAB, TTAB, ITC and NLRB decisions, all in one place.

Identify arguments that have been successful in the past with full text, pinpoint searching. Link to case law cited within any court document via Fastcase.

Analytics At Your Fingertips

Learn what happened the last time a particular judge, opposing counsel or company faced cases similar to yours.

Advanced out-of-the-box PTAB and TTAB analytics are always at your fingertips.

API

Docket Alarm offers a powerful API (application programming interface) to developers that want to integrate case filings into their apps.

LAW FIRMS
Build custom dashboards for your attorneys and clients with live data direct from the court.

Automate many repetitive legal tasks like conflict checks, document management, and marketing.

FINANCIAL INSTITUTIONS
Litigation and bankruptcy checks for companies and debtors.

E-DISCOVERY AND LEGAL VENDORS
Sync your system to PACER to automate legal marketing.