United States Patent

[11] 3,556,209

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[21] Appl. No. **820,422**
[22] Filed **Apr. 30, 1969**
[45] Patented **Jan. 19, 1971**

[73] Assignee **Esso Production Research Company**

[54] **RETRIEVABLE WIRELINE LUBRICATOR AND METHOD OF USE**
6 Claims, 4 Drawing Figs.

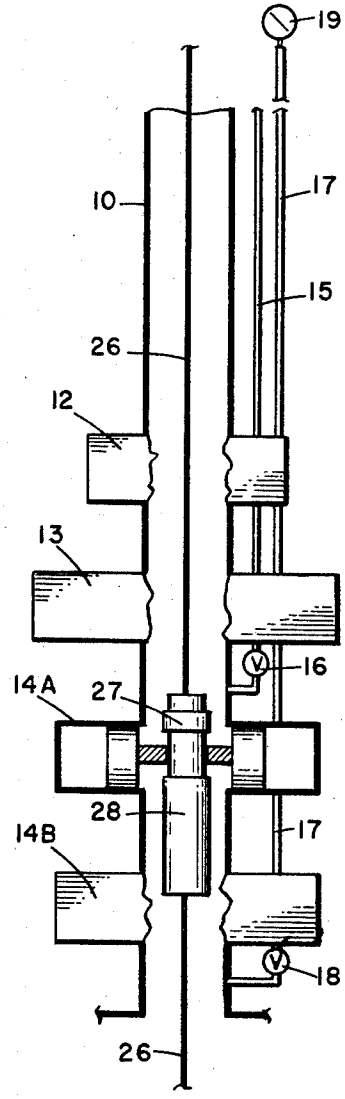
[52] **U.S. Cl.** **166/.5,** 166/70, 166/84
[51] **Int. Cl.** **E21b 33/035**
[50] **Field of Search** ..... 166/.5, .6, 315, 67, 69, 70, 75, 77, 77.5, 82, 84, 85; 251/1; 277/34

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ABSTRACT: A lubricator for use in running well tools suspended from a wireline in wells where the wellhead and blowout preventers are submerged and connected to a floating vessel by a marine conductor pipe. The lubricator includes a stuffing box connected to a tubular member. The stuffing box is arranged on the wireline above the connection of the wireline and a well tool suspended therefrom to provide a pressure seal around the wireline and the tubular member surrounds the wireline. The stuffing box and tubular member are lowered on the wireline into a well until the tubular member is positioned adjacent to a blowout preventer. The blowout preventer is closed on the tubular member to prevent vertical movement of the lubricator and to effect a pressure seal around the tubular member. The well tool is then lowered into the well and wireline well work is carried out. Thereafter, the blowout preventer is opened and the lubricator is pulled to the floating vessel as the wireline and well tool attached thereto are retrieved.



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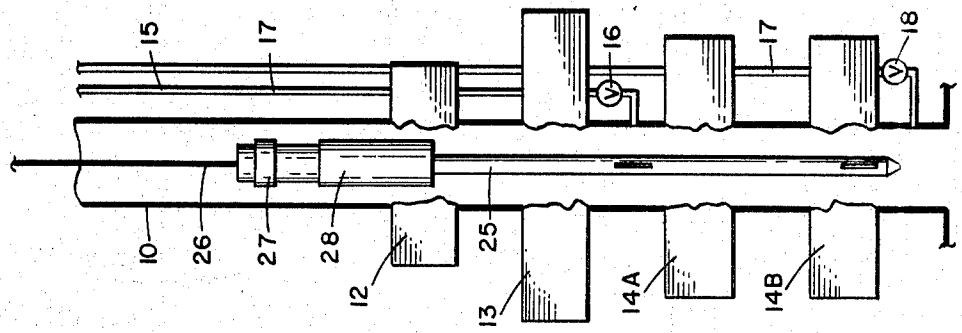


FIG. ID.

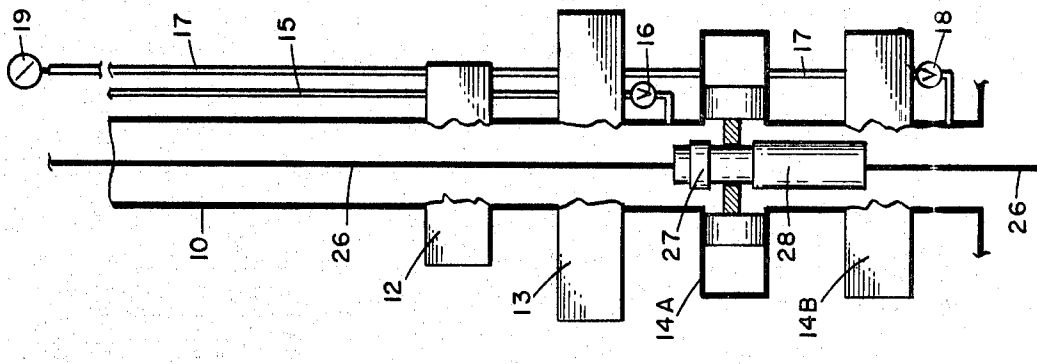


FIG. IC

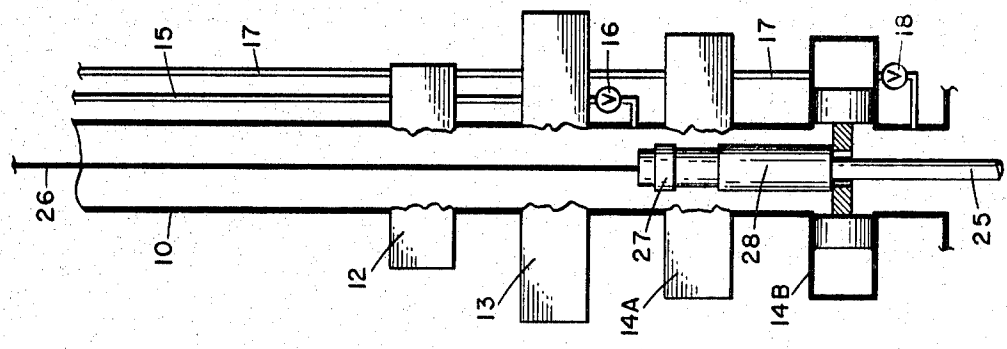


FIG. IB.

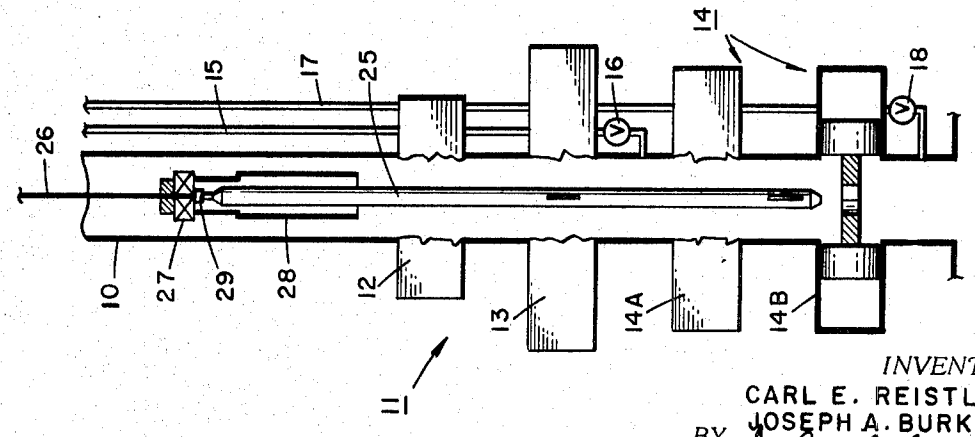


FIG. IA

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RETRIEVABLE WIRELINE LUBRICATOR AND METHOD OF USE

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

The present invention concerns a retrievable wireline lubricator for underwater pressure control in well operations.

In conducting well operations from a floating vessel, wellhead and blowout prevention equipment are positioned on the sea floor. A marine conductor pipe or riser connects the vessel to such underwater equipment. The marine conductor pipe is not subjected to well pressures because of its length and its dynamic response to sea conditions. During completion and workover operations, it is necessary to run equipment such as diagnostic, logging, perforating and well control tools into a submerged well through the marine conductor pipe on wirelines. In order to operate safely with such wireline tools, a stuffing box or packoff must be provided around the wireline above the wellhead in order to contain well fluids under pressure.

SUMMARY OF THE INVENTION

In accordance with the teachings of the invention, the apparatus employed in running equipment into wells on a wireline where the wellhead and blowout preventers are submerged and connected to a floating vessel by a marine conductor pipe briefly comprises a lubricator including a tubular member and a stuffing box for providing a pressure seal around the wireline affixed to the tubular member and arranged on the wireline above the connection of the wireline and the equipment suspended therefrom. The method for using such apparatus is as follows: The wireline is lowered until the lubricator is positioned immediately adjacent to a submerged blowout preventer; the blowout preventer is then closed on the tubular member to effect a pressure seal around it. When recovering the retrievable lubricator, the wireline is raised until the upper end of the equipment suspended from the wireline bumps the stuffing box. The blowout preventer is opened and the wireline equipment and lubricator are retrieved.

BRIEF DESCRIPTION OF THE DRAWING

FIGS. 1A—1D are schematic views illustrating the apparatus and operation of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the drawing, there is shown a marine conductor pipe or riser **10** installed on an underwater blowout preventer (BOP) stack generally designated **11** which in turn is installed on an underwater wellhead (not shown). Riser **10** is connected at its upper end to a floating vessel (not shown) at the water's surface. BOP stack **11** includes a stripper BOP **12**, a blank or shear ram BOP **13** and a dual pipe BOP **14** having upper and lower pipe rams **14A** and **14B**, respectively. An upper choke-and-kill line **15** provided with a valve **16** extends from the vessel and connects to BOP stack **11** above BOP **14** and a lower choke-and-kill line **17** provided with a valve **18** extends from the vessel and connects to BOP stack **11** below BOP **14**. As indicated in FIG. 1C, a pressure gauge **19** is installed in lower choke-and-kill line **17** on the vessel.

As seen in FIG. 1A, a well equipment component **25**, shown as a tool string, and which may be a diagnostic or logging or perforating or well control tool, is suspended from the lower end of a wireline **26** at rope socket **29**. Wireline **26** may be suitably a conductor, cable or piano-type wireline. A stuffing box **27** surrounds wireline **26** and is mounted on and affixed to the upper end of a tubular member **28** which also surrounds wireline **26**. Blowout preventer **12** and **13** and upper pipe rams **14A** of BOP **14** are open. Lower BOP rams **14B** are closed. Lubricator **28** is made up on wireline **26** above rope socket **29** on tool string **25**. In the closed position of lower BOP rams **14B**, tool string **25** is, but tubular member **28** is not, capable of passing through BOP rams **14B**.

As seen in FIG. 1B, wireline **26** has been lowered through riser **10** until tool string **25** passes into BOP **14** and substantially through the opening in lower BOP rams **14B**. The lower end of tubular member **28** bumps bottom BOP rams **14B** which positions the upper portion of tubular member **28** adjacent upper BOP rams **14B**.

As illustrated in FIG. 1C, upper BOP rams **14A** are closed on tubular member **28** to effect a pressure seal around tubular member **28** and to secure it and stuffing box **27** against vertical movement. Lower BOP rams **14B** are then opened. Lubricator pressure may be monitored in a conventional manner by opening underwater valve **18** on lower choke-and-kill line **17** on which surface pressure gauge **19** is located. The desired wireline operations are then conducted.

As illustrated in FIG. 1D, when ready to remove wireline **28** and tool string **25** from the well after the wireline operations have been carried out, wireline **26** is pulled up until rope socket **29** bumps stuffing box **27**. Upper BOP rams **14A** are then opened. Tool string **28** along with lubricator **28** and stuffing box **27** are pulled up to the vessel. Valve **18** is then closed.

When retrieving the wireline and lubricator and well equipment when the well is under pressure, it is necessary to equalize such pressure above and below stuffing box **27** prior to opening BOP rams **14A**. If a remotely operable down-hole safety valve (not shown) exists in the well, such valve may be closed and the pressure below stuffing box **27** bled off through choke-and-kill line **17**. However, if no such valve exists below the stuffing box, the well may be loaded out with a kill fluid pumped through lower choke-and-kill line **17**.

Tubular member **28**, which may be a length of pipe, is preferably of larger diameter along its lower end (when arranged on wireline **26**), as shown. Such a tubular or cylindrical configuration is used with BOP pipe rams such as the dual pipe BOP rams **14A** and **14B** described above. However, other configurations may be used for the means about which the BOP effects a pressure seal. Such means may be other than round in cross section, such as square, when a stripper or inflatable-type BOP is used instead of BOP pipe rams. As used herein, the term "tubular member" means any configuration for such means, whether it be round, square or otherwise.

While use of the lubricator with dual pipe rams-type BOP has been illustrated and described herein, a single pipe ram-type BOP or a stripper or inflatable-type BOP might be used instead. When operating with either of the latter type blowout preventer (and even with a dual pipe BOP), the lubricator would be simply lowered into the BOP the lubricator would be simply lowered into the BOP and then the BOP would be closed on the tubular member.

Advantages of the retrievable lubricator include eliminating the need to pull the BOP stack and riser each time a different size of wireline is run during completion or service operations and permitting the running of full bore tools (such as bits or packers) without making trips with the underwater equipment to and from the vessel.

We claim:

1. Apparatus for use in running equipment suspended from a wireline into a well comprising:

a floating vessel;

a submerged blowout preventer connected to the well

a marine conductor pipe connected at one end to said blowout preventer and at the other end to said floating vessel;

a tubular member, said tubular member surrounding said wireline; and

a stuffing box affixed to said tubular member and arranged on said wireline above the connection of said wireline and said equipment suspended therefrom, said stuffing box effecting a pressure seal around said wireline and said blowout preventer surrounding said tubular member to effect a pressure seal around said tubular member and prevent vertical movement of said tubular member.

2. A method for use in running equipment suspended on a wireline into a well where the wellhead and blowout preventer are submerged and connected to a floating vessel by a marine conductor pipe comprising the steps of: a

arranging a lubricator on a said wireline, said lubricator including a tubular member surrounding said wireline and a stuffing box connected to said tubular member for effecting a pressure seal around said wireline;

lowering said wireline and lubricator through said marine conductor pipe until said tubular member is positioned adjacent to said submerged blowout preventer;

closing said blowout preventer on said tubular member to effect a pressure seal around said tubular member and prevent vertical movement of said lubricator; and

then lowering said equipment into said well on said wireline.

3. A method as recited in claim 2 in which said blowout preventer comprises upper and lower pipe rams, said upper pipe rams being open and said lower pipe rams being closed

and wherein said lowering steps includes lowering said equipment through said lower rams until said tubular member engages said lower rams.

4. A method as recited in claim 3 including closing said upper rams on said tubular member and opening said lower rams prior to lowering said equipment in said well.

5. A method as recited in claim 4 further including pulling said wireline up until the upper end of said equipment engages said stuffing box; then opening said upper rams and pulling said wireline to said vessel through said marine conductor pipe.

6. A method as recited in claim 5 including installing a choke-kill line extending from said vessel to said well below said blowout preventer, said line being provided with a remotely operable valve and a pressure gauge; and then opening said valve after said upper rams are closed to monitor pressure on said tubular member.