United States Patent

[11] 3,568,767

[72] Inventor **Folker H. Weiss**
Los Altos, Calif.

[21] Appl. No. **793,482**
[22] Filed **Jan. 23, 1969**
[45] Patented **Mar. 9, 1971**
[73] Assignee **Lockheed Aircraft Corporation**
Burbank, Calif.

[54] **TELESCOPING WIRELINE LUBRICATOR**
3 Claims, 2 Drawing Figs.

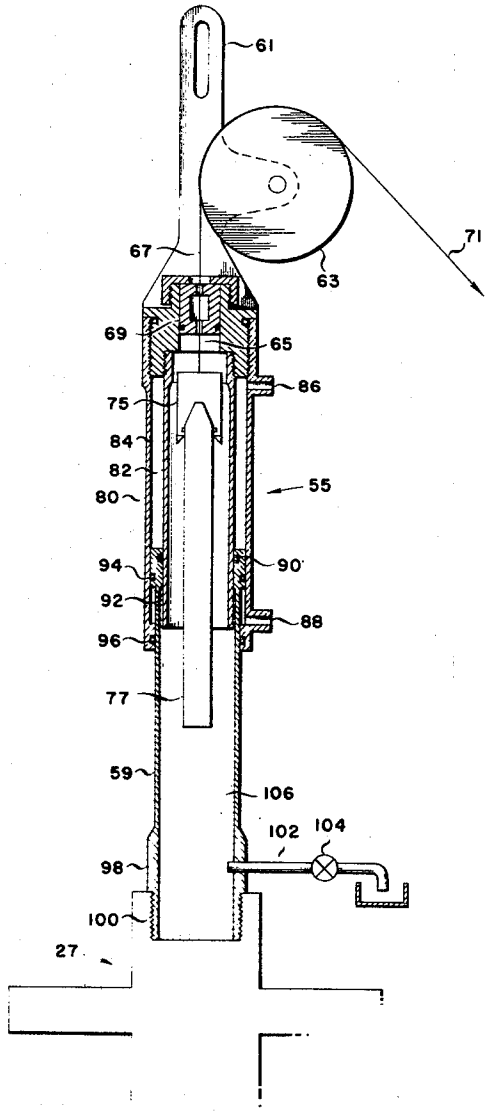
[52] **U.S. Cl.** **166/.5,** 166/77, 166/85
[51] **Int. Cl.** **E21b 33/035**
[50] **Field of Search** 166/77, 85, 84, 70, 69

[56] **References Cited**
UNITED STATES PATENTS

2,143,251	1/1939	Savitz	166/84
2,555,145	5/1951	McKinney	166/77X
3,212,581	10/1965	Marshall	166/84
3,216,731	11/1965	Dollison	166/84X
3,415,317	12/1968	Drivet	166/.6

Primary Examiner—Marvin A. Champion
Assistant Examiner—Richard E. Favreau
Attorneys—H. Donald Volk and George C. Sullivan

ABSTRACT: A telescoping wireline lubricator is provided with first and second telescopically extendable tubular sections so that the lubricator is especially adapted for conducting wireline operations in a closely confined area such as an underwater wellhead installation.



PATENTED MAR 9 1971

3,568,767

SHEET 1 OF 2

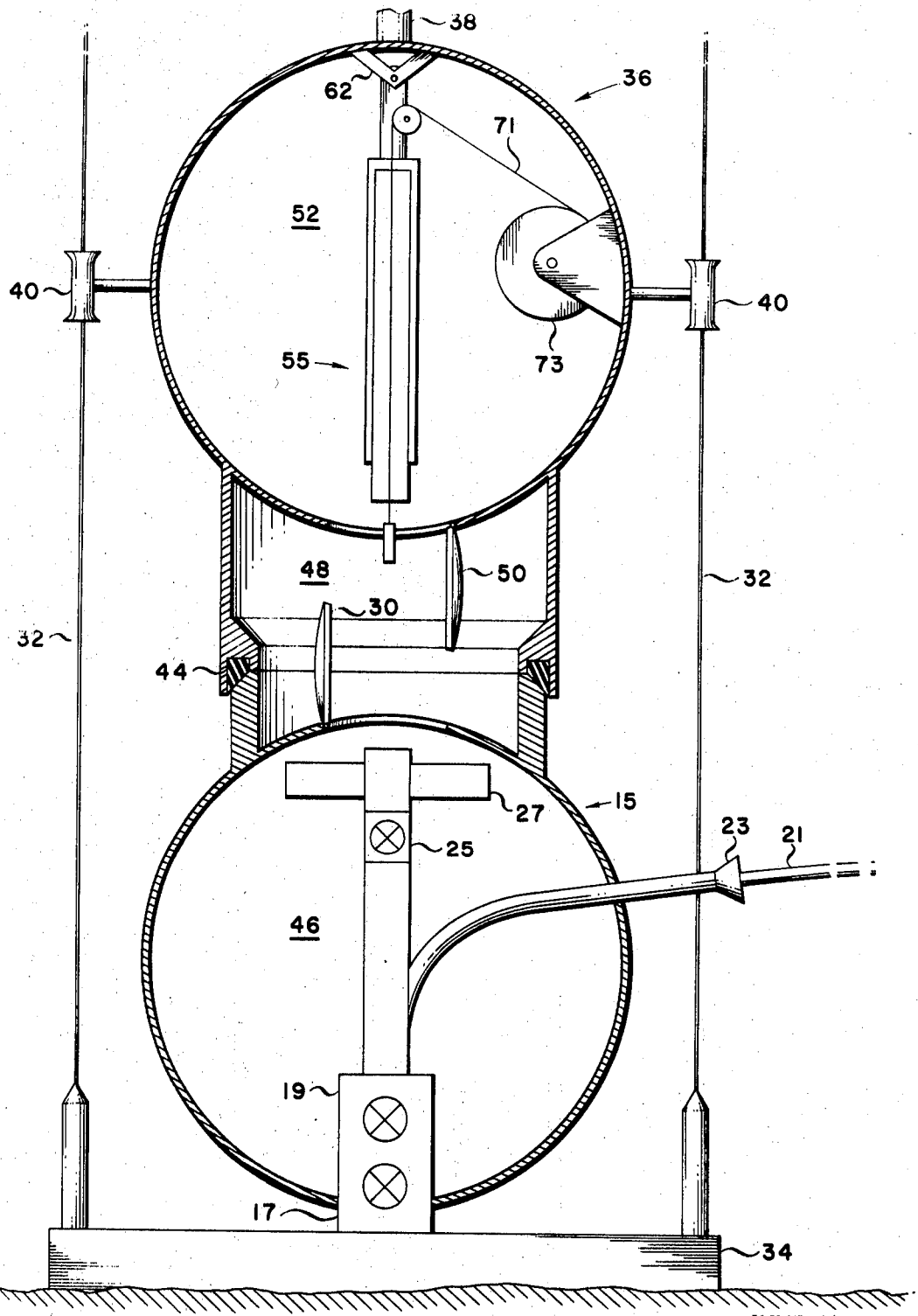


FIG. 1

INVENTOR.
FOLKER H. WEISS
BY George Cahuelwin
Agent
H. Donald Volk
Attorney

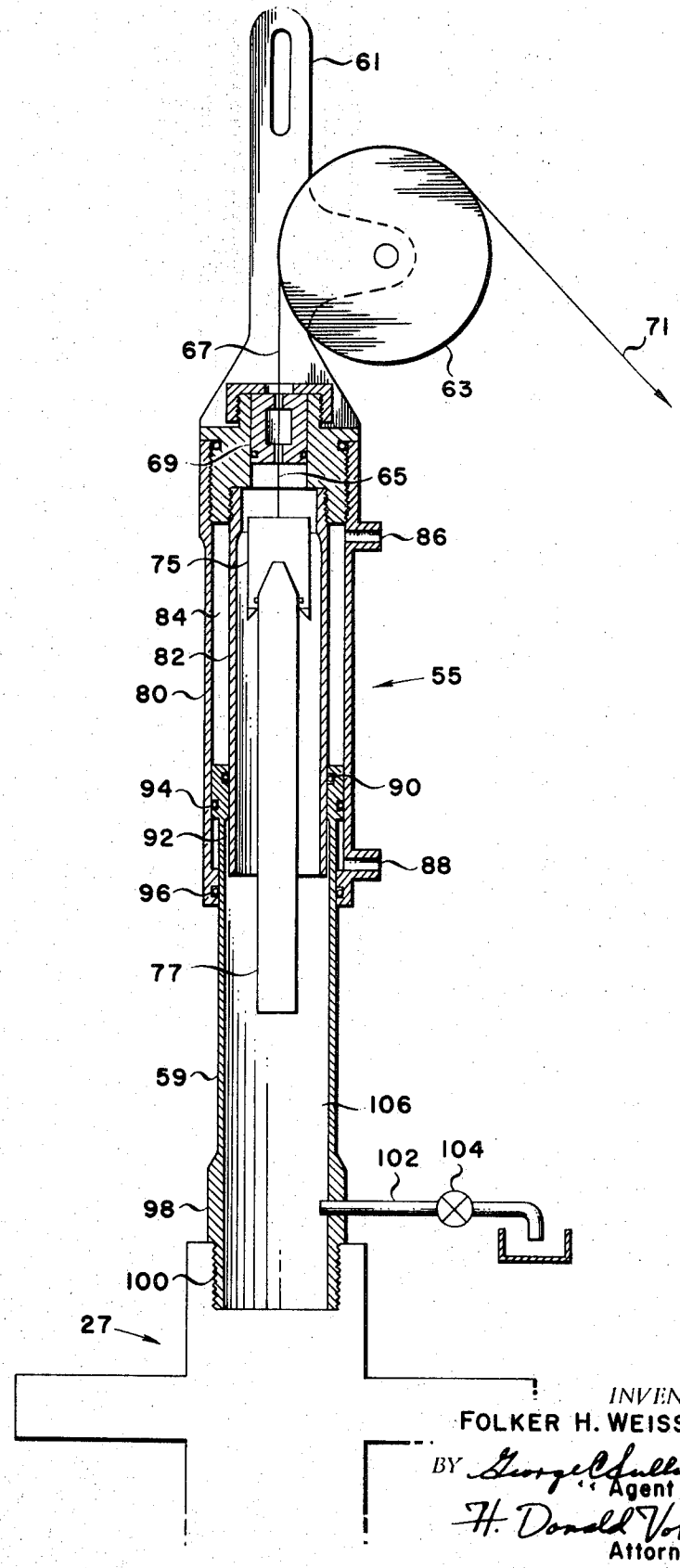


FIG. 2

INVENTOR.
FOLKER H. WEISS
BY George C. Sullivan
Agent
H. Donald Volk
Attorney

TELESCOPING WIRELINE LUBRICATOR

BACKGROUND OF THE INVENTION

The present invention is directed to wireline equipment such as is typically utilized in the petroleum industry. The invention is specifically directed toward a new and improved telescoping wireline lubricator assembly. The invention is particularly suited for wireline operations conducted from a subsea chamber at or near the ocean floor.

In general, when conducting wireline operations on an oil or gas well, a lubricator assembly is employed to allow insertion of wireline tools into the well. The lubricator is normally attached to the wellhead flow controlling components (Christmas tree) in a suitable manner such as by a flange connection. In the vicinity of the flange connection a wireline valve is provided which is capable of sealing around the wire strand utilized to pass wireline tools into and out of the well.

Typical tasks which are performed by wireline operations include the setting and removing of down-hole flow control equipment, paraffin scraping, sand bailing and fishing operations. After each trip into the well bore with whatever tool is used for a given operation, the lubricator must be disassembled to remove the tool and contaminants which are brought up with the tool.

Prior art wireline lubricators typically comprise long sections of pipe which are manually screwed or otherwise coupled together. These lubricator assemblies are relatively long (approximately 30 feet) and very heavy. Such a lubricator is a difficult assembly to work with in underwater operations due to the space required for its operation and storage. In addition such prior art lubricators are extremely difficult to assemble and remove in an underwater environment due to their great weight and size.

Accordingly, it is the principal object of the present invention to provide a telescoping wireline lubricator assembly which eliminates problems of moving and assembling the lubricator as is typically required in prior art devices as well as alleviating the problem of storing the lubricator when it is not in use.

Other and further objects and advantages of the present invention will be apparent from the following description and claims and are illustrated in the accompanying drawings which, by way of illustration, show preferred embodiments of the present invention and the principles thereof and what are now considered to be the best modes contemplated for applying these principles. Other embodiments of the invention embodying the same or equivalent principles may be used and structural changes may be made as desired by those skilled in the art without departing from the present invention and the purview of the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an overall longitudinal view of an exemplary underwater installation illustrating a typical application of the telescoping wireline lubricator of the present invention; and

FIG. 2 is a longitudinal view, partially in section, illustrating the structural details of an exemplary embodiment of the telescoping wireline lubricator of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG. 1 is an overall view illustrating the major components of an exemplary system wherein the telescoping wireline lubricator of the present invention has particular utility. It should be understood that the invention has utility in other underwater chamber configurations and could be used on land as well.

In FIG. 1 an underwater wellhead cellar capsule 15 is shown positioned on an underwater wellhead 17. The wellhead cellar 15 is provided with a standard production "Christmas" tree 19. The Christmas tree is provided with the usual master valves and wing connections for the delivery of petroleum products. These petroleum products may then be flowed to a surface station or underwater gathering station by means of flow lines 21 which pass through a fluidtight mouth 23 formed in the wall of the cellar 15.

For performing wireline operations the upper portion of the Christmas tree is provided with a swab valve 25. The purpose of the swab valve is to allow vertical access of wireline components into the well bore. When conducting wireline operations a wireline blowout preventer 27 is positioned on the Christmas tree above the swab valve 25 to close off the wellbore should a malfunction occur during wireline operations. As shown, the wellhead cellar is provided with an access hatch 30 which is normally closed to ensure that the cellar is fluidtight and not subject to the corrosive action of sea water and fouling caused by marine life.

Typical guide lines 32 extend upwardly to the water surface from a wellhead support base 34. These guide lines are utilized to lower equipment, such as underwater workover and utility capsules, down into engagement with the wellhead cellar 15.

As shown in FIG. 1 an atmospheric utility capsule 36 containing the telescoping wireline lubricator of the present invention is shown after it has been lowered down into sealing engagement with the wellhead cellar 15. The operation of lowering the utility capsule 36 down into sealed engagement with the cellar 15 may be accomplished by means of a drill pipe running string 38. Other means such as a hauldown cable system may also be used for this lowering operation, as can be appreciated by those skilled in the art. Although not shown in the drawing suitable conduits for air, hydraulic and electrical power, etc. extend to the capsule from the water surface in a manner similar to the running string 38. The utility capsule 36 is provided with guide shoes 40 which fit about the guide lines 32. This ensures that proper alignment is provided for the fluidtight connection between the utility capsule 36 and the cellar 15.

As the utility capsule 36 comes into contact with the cellar 15 a fluidtight seal is established at 44. At this time the interior chamber 46 of the wellhead cellar as well as the chamber area shown at 48 are placed at atmospheric pressure by a procedure such, for example, as that described in assignee's copending application for "Sealing system For Underwater Installation" by Sydney S. Helmus, now U.S. Pat. No. 3,485,056.

After the seal at 44 has been made an operator in the atmospheric utility capsule 36 opens a hatch 50 in the lower portion of the utility capsule. The operator then descends from a chamber 52 of the utility capsule down into the wellhead cellar via the open hatch 30. At this time the operator may install the swabbing valve 25 and the wireline blowout preventer 27 if these assemblies are not already in place on the Christmas tree 19. The production flow valves would also be closed prior to any wireline operations. The capsules are now in condition for the commencement of wireline operations utilizing the telescoping wireline lubricator assembly which is generally shown at 55 in FIGS. 1 and 2.

The specific structural details of the novel telescoping wireline lubricator are best shown in FIG. 2. As shown in FIG. 2 the telescoping lubricator 55 comprises a first tubular section 57 and a second tubular section 59 which is telescopically movable into and out of the first tubular section. The upper portion of the first tubular section is provided with a mounting lug or fixture 61 for suspending the lubricator assembly 55 from the utility capsule 36 in a stable manner, by means of a mounting bracket 62.

A wireline guide sheave 63 is also mounted on the upper portion of the first tubular section 57. The sheave 63 serves to guide one end 65 of a wireline 67 into a packing gland and stuffing box seal assembly shown at 69. The seal assembly 69 sealingly engages the wireline and prevents fluids from escaping from the upper end of the member 57 when the wireline is being moved therethrough. The other end 71 of the wireline is attached to a suitable tensioning winch 73 (see FIG. 1). The end 65 of the wireline is provided with a conventional socket member 75 for attaching wireline tools, such as shown at 77, to the wireline. Any suitable latching mechanism or threads may be provided in the socket member 75 for attaching the tool 77.

The first tubular section 57 of the lubricator is provided with an outer cylindrical wall 80 and an inner cylindrical wall 82. These walls 80 and 82 define an annular chamber 84. A first pressure fluid port 86 is formed in the outer cylindrical wall 80 near one end of the annular chamber 84 and a second pressure fluid port 88 is formed in the outer cylindrical wall near the other end of the chamber.

A piston element 90 is formed on a first end 92 of the second tubular section 59. The piston element 90 is provided with suitable seal means 94 for ensuring sealing engagement of the piston in the chamber 84 when the tubular section 59 is slidably and telescopically moved relative to the tubular section 57. At this juncture it should be observed that the inner wall 82 of the tubular section 57 also serves as a protective shield preventing contaminants from the well bore from attacking or depositing on the sealing surfaces of the chamber 84. A further seal or packing gland 96 is provided at the lower end of the first tubular section to ensure sealing engagement between the tubular section 57 and tubular section 59 preventing leakage of pressure fluid from the annular chamber 84. The tubular section 59 may be telescopically extended by the admission of pressure fluid to the port 86 from a suitable source (not shown). Conversely, admission of pressure fluid to the port 88 serves to telescopically retract tubular section 59 into tubular section 57.

The lower end 98 of the tubular section 59 is provided with means for forming a conventional quick connection and sealed coupling 100 in cooperation with mating means formed on the wireline blowout preventer 27 located in the wellhead cellar 15. In addition, the lower end 98 of the tubular section 59 is provided with a drain conduit 102 having a valve 104 therein for draining the internal chamber 106 of the lubricator 55. The purpose of the drain conduit 102 will be readily understood from the description of the operation of the components as set out below.

The operation of the telescoping wireline lubricator will now be described with reference to both FIGS. 1 and 2. The wireline socket 75 is first fed downwardly through the lubricator assembly 55 to the position shown in FIG. 1. The desired wireline tool or tools 77 are then connected to the socket in a manner which is best shown in FIG. 2.

Pressure fluid is then admitted to the port 86 and the tubular section 59 of the lubricator 55 is extended downwardly until it moves into sealing connection at 100 with the wireline blowout preventer 27 (see FIG. 2). The swabbing valve 25 located on the Christmas tree 19 is then opened and the interior chamber 106 of the lubricator assembly 55 is pressurized with fluid from the well bore. Tension in the wireline 67 is then relaxed which allows the wireline tool 77 to drop into the wellbore where the tool may be manipulated to perform a particular downhole function. The stuffing box 69 is formed in the upper tubular section 57 of the lubricator assembly prevents the escape of well fluids.

After the wireline tool has completed a downhole operation tension is applied to the wireline and the tool is pulled back up inside the interior chamber 106 of the lubricator assembly. The swabbing valve 25 is then closed and the fluid contained in the interior chamber 106 of the lubricator assembly is drained off by opening the drain valve 104 in the drain conduit 102. Pressure fluid is then admitted to the chamber 84 via the port 88 thereby telescopically retracting the tubular section 59 upwardly into the tubular section 57 of the lubricator assembly. The wireline tool may now be conveniently removed from the wireline socket 75 and other wireline operations may then be performed in a like manner.

While I have illustrated and described preferred embodiments of my invention, it is to be understood that these are capable of variation and modification, and I therefore do not wish to be limited to the precise details set forth, but desire to avail myself of such changes and alterations as fall within the purview of the following claims.

I claim:

1. A wireline lubricator for use in performing wireline operations at an underwater well installation comprising:
- a first tubular section having near a first end an outer cylindrical wall and an inner cylindrical wall defining an elongated annular chamber therebetween;
- a second tubular section slidably received in the annular chamber of said first tubular section;
- piston means formed at a first end of the second tubular section and slidably received in the chamber of said first tubular section in fluidtight relation with the walls of the chamber;
- first port means communicating with a first end of said annular chamber for the admission of pressure fluid to said chamber which causes telescopic extension of the second tubular section;
- second port means communicating with a second end of said annular chamber for the admission of pressure fluid to said chamber which causes telescopic retraction of the second tubular section;
- a wireline guide element associated with the first tubular section near a second end thereof; and
- a wireline sealing element near a second end of said first tubular section for maintaining one end of a lubricator cavity defined by the interior portions of the first and second tubular elements fluidtight when a wireline is passed through the wireline sealing element into said lubricator cavity; and wherein said second end of the second tubular section is provided with means for forming a fluidtight connection with an underwater well production assembly.

2. A wireline lubricator as set forth in claim 1 wherein the second tubular section is provided with a closable drain means for the removal of fluids from the lubricator cavity.

3. A wireline lubricator for use in performing wireline operations at an underwater well installation comprising:
- a first tubular section having near a first end an outer cylindrical wall and in inner cylindrical wall defining an elongated annular chamber therebetween;
- a second tubular section slidably received in the annular chamber of said first tubular section;
- piston means formed at a first end of the second tubular section and slidably received in the chamber of said first tubular section in fluidtight relation with the walls of the chamber;
- first port means communicating with a first end of said annular chamber for the admission of pressure fluid to said chamber which causes telescopic extension of the second tubular section;
- second port means communicating with a second end of said annular chamber for the admission of pressure fluid to said chamber which causes telescopic retraction of the second tubular section;
- a wireline guide element associated with the first tubular section near a second end thereof; and
- a wireline sealing element near a second end of said first tubular section for maintaining one end of a lubricator cavity defined by the interior portions of the first and second tubular elements fluidtight when a wireline is passed through the wireline sealing element into said lubricator cavity, and wherein said second tubular section is provided with a closable drain means for the removal of fluids from the lubricator cavity.