

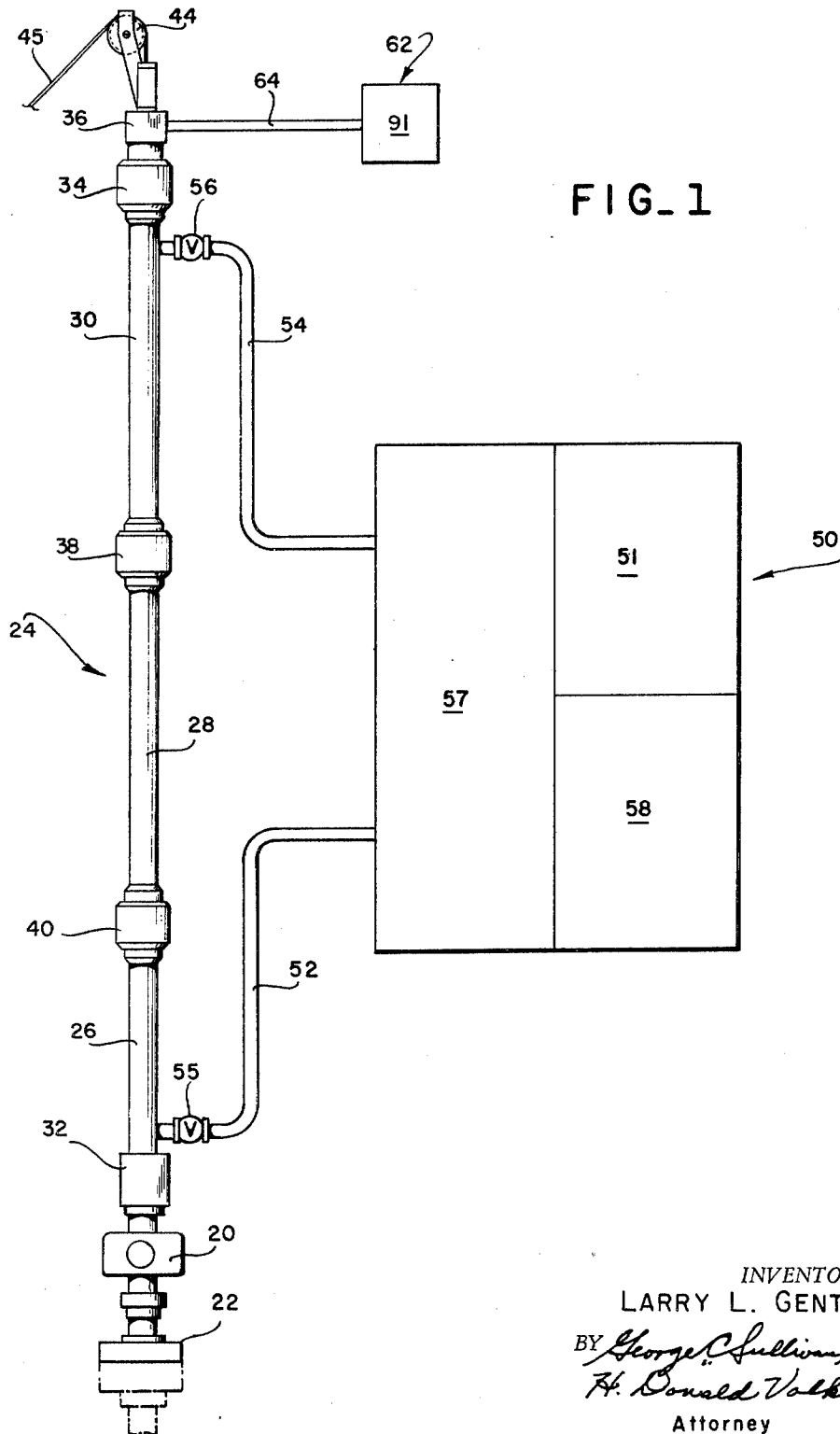
March 17, 1970

L. L. GENTRY
CLOSED FLUSHING AND VAPOR ELIMINATION SYSTEM
FOR WIRELINE COMPONENTS

3,500,907

Filed Dec. 5, 1968

3 Sheets-Sheet 1



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3 Sheets-Sheet 2

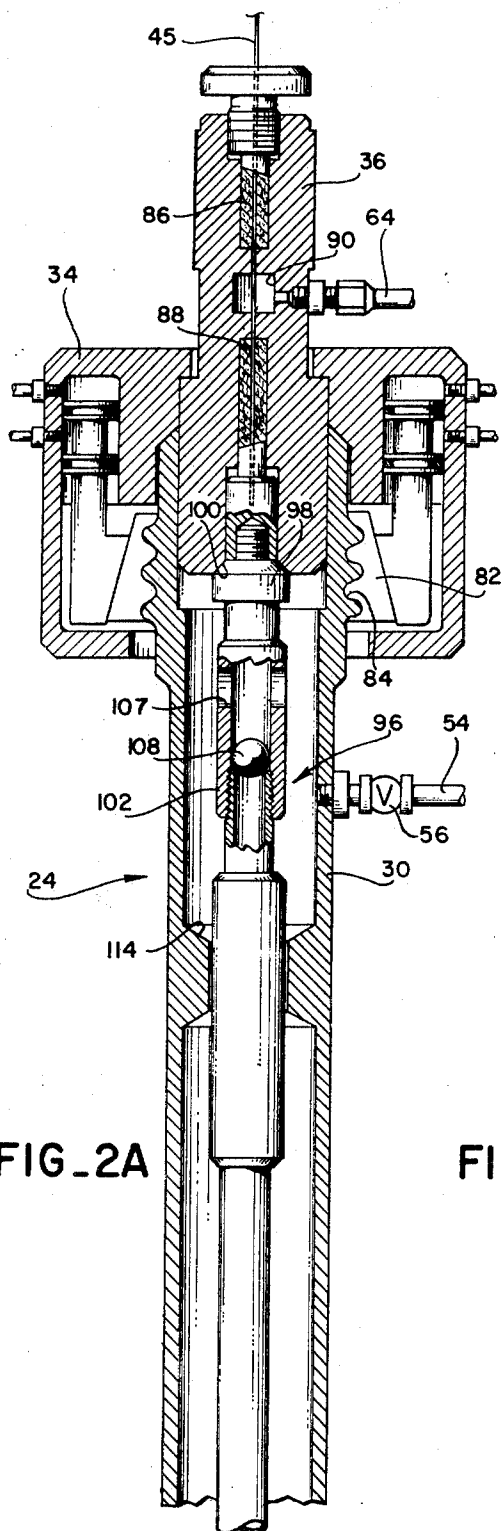


FIG. 2A

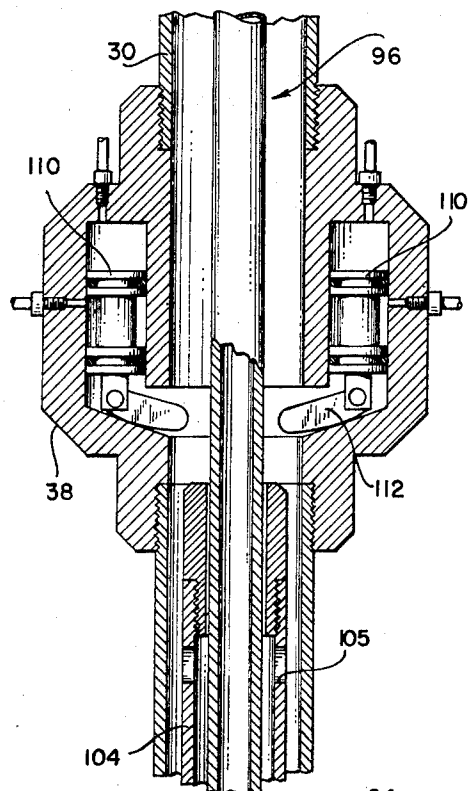
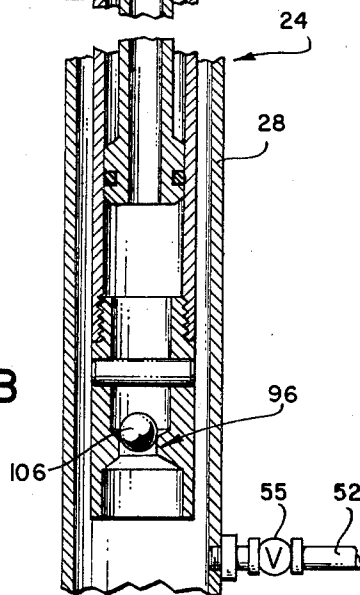


FIG. 2B



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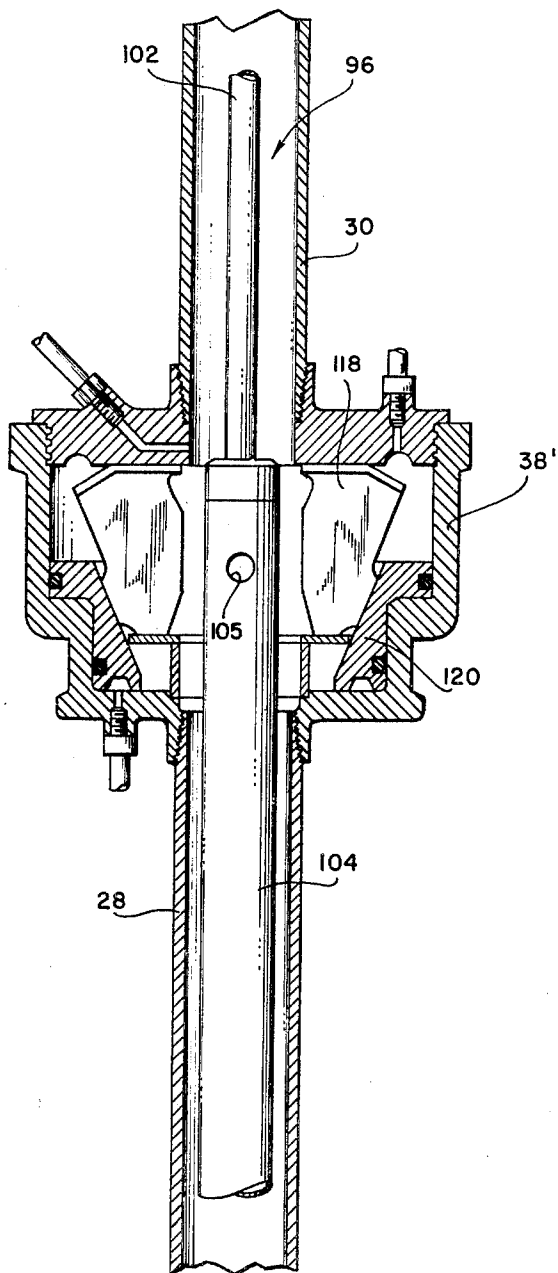
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FIG. 3



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3,500,907 CLOSED FLUSHING AND VAPOR ELIMINATION SYSTEM FOR WIRELINE COMPONENTS

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Filed Dec. 5, 1968, Ser. No. 781,553
Int. Cl. E21b 33/05

U.S. Cl. 166—70

5 Claims

ABSTRACT OF THE DISCLOSURE

A closed flushing and vapor elimination system is provided for cleaning wireline tools under conditions, such as a subsea chamber at an underwater wellhead, where toxic and unpleasant fumes could be harmful to human operators at the wellhead. The system further provides more efficient wireline operations since wireline tools may be cleaned without removing them from the closed system.

BACKGROUND OF THE INVENTION

The present invention is directed to wireline equipment such as is typically utilized in the petroleum industry. The invention pertains more particularly to a closed flushing and vapor elimination system for cleaning wireline tools.

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 baling 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 and the wireline tool itself must then be manually cleaned after removal from the lubricator.

Such a procedure is not acceptable in a closely confined area, such as an underwater capsule, where operators must work with good ventilation. The contaminants and unwanted residue which are brought up with the wireline tools from the well bore and the toxic and unpleasant fumes emanating from hydrocarbons, etc., in the well must be disposed of in a manner which is safe for the operators.

Accordingly it is the principal object of the present invention to provide a closed flushing and vapor elimination system for cleaning wireline tools whereby the lubricator assembly may be flushed of its contents without exposing operator at the wellhead to any contaminants, noxious vapors or other unsafe condition.

It is a further object of the invention to provide a vapor collection system which will prevent vapor from penetrating through the wireline stripper associated with the lubricator assembly and contaminating the operator's working environment.

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 schematic view illustrating the major components of an exemplary embodiment of a closed flushing and vapor elimination system constructed in accordance with the present invention;

FIGS. 2A and 2B comprise a longitudinal view partially in section illustrating a wire line lubricator assembly having a wireline tool positioned therein for a cleaning operation; and,

FIG. 3 is a modified embodiment of a retaining mechanism which may be used to hold a wireline tool in the lubricator assembly during a cleaning operation.

DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG. 1 is an overall view illustrating the major components of an exemplary embodiment of a closed flushing and vapor elimination system constructed in accordance with the present invention. It should be understood that the components illustrated in FIG. 1 are preferably enclosed in an atmospheric capsule which is lowered down into engagement with an underwater wellhead so that human personnel may perform operations at the wellhead.

In FIG. 1 a wireline valve 20 is provided with a flange connection 22 which is adapted for connection to a "Christmas tree" facility (not shown) to facilitate the entry of wireline components into the well bore. The wireline valve 20 is a standard component capable of sealing around a wireline should such a sealing operation be required while wireline components are being passed into and out of the well.

A wireline lubricator is shown generally at 24 and comprises a lower lubricator section 26, a center lubricator section 28 and an upper lubricator section 30. The lower lubricator section 26 is attached to the wireline valve 20 by a hydraulically actuated collet assembly 32. A similar hydraulically actuated collet assembly 34 is used to connect the upper lubricator section 30 to a wireline stripper 36.

A coupling and collet assembly 38, which will be described in greater detail at a later point in the description, is used to couple the upper lubricator section 30 to the center lubricator section 28. A coupling element 40 is used to connect the center lubricator section 28 to the lower lubricator section 26. A wireline reel 44 is located adjacent to the wireline stripper 36 for passing a wireline 45 through the stripper in a manner well known in the art.

A hydraulic pumping unit shown generally at 50 is provided for pumping flushing fluids through the lubricator assembly 24 by way of conduit connections 52 and 54 which are provided with two-way valves 55 and 56. A vapor elimination assembly shown generally at 62 is connected to the wireline stripper 36 by means of a conduit 64. The function and operation of the vapor elimination system 62 will be described in further detail at a later point in the description.

The overall purpose of the system shown in FIG. 1 is to recover and clean an oil well tool connected to the wireline 45 to a location inside the lubricator assembly 24. After the tool has been recovered in the lubricator assembly 24 the pumping unit 50 may be operated to flow flushing fluids through the lubricator assembly 24 to remove debris and contaminants from the tool after which the lubricator assembly may be disassembled and the cleansed tool may be removed by operators inside the atmospheric capsule. During the wireline operations it is the function of the vapor elimination assembly 62 to prevent noxious gases from escaping into the capsule surrounding

he system where such gases could be harmful to capsule personnel.

Referring now to FIGS. 2A and 2B the collet 34 couples the wireline stripper 36 to the upper lubricator section 30 by means of hydraulically actuated collet finger elements 32 which can be latched into recesses 84 formed on the upper lubricator member 30. The wireline stripper 36 is provided with an upper packing element 86 and a lower packing element 88. A vacuum chamber 90 is provided between the two packing elements 86 and 88. The vacuum chamber 90 communicates with a vacuum pump 91 by means of conduit 64 (see FIG. 1).

Thus, when wireline operations are being conducted through the lubricator assembly 24 and wireline valve 20 the wireline 45 is passed through the packing elements 36 and 88 and the vacuum pump 91 is operated to insure that any gasses coming up from the well (such as hydrogen sulfide, noxious hydrocarbons etc.) are recovered out of the vacuum chamber 90 by the vacuum pump. These gases may then be expelled out through the capsule wall so that personnel inside the capsule are not exposed to the gases.

As also shown in FIGS. 2A and 2B a sand baler indicated generally at 96 has been moved upwardly out of the well into the lubricator assembly 24. As shown in FIG. 2A the sand baler 96 is pulled into the lubricator assembly 24 until a rope socket provided in the nose portion 98 of the sand baler seats in a socket 100 formed in the base of the wireline stripper 36. The sand baler 96 comprises a piston assembly 102 and a cylinder assembly 104. The cylinder assembly 104 consists of a hollow tube having openings 105 associated with a ball check 106 at the lower end. The piston assembly 102 rides within the cylinder and has openings 107 associated with a ball check 108 at the upper end. In a normal sand baling operation the piston 102 travels up and down in the cylinder section 104 to create a vacuum and collect sand and other debris from the well bore.

It should also be observed that the coupling and collet assembly 38 of FIG. 2B is provided with a hydraulically actuated locking valve shown generally at 110. The locking valve 110 is provided with a plurality of dogs 112 which may be actuated to insure that the cylinder section 104 of the sand baler 96 is prevented from rising up into the upper lubricator section 30 during a flushing and sand removal operation.

The upper lubricator section 30 is provided with an inwardly protruding annular shoulder 114 which closely surrounds the piston assembly 102 of the sand baler 96. The purpose of the internal shoulder 114 is to provide a flow restriction to insure that the flushing stream flow directed from the pumping unit 50 is concentrated through the internal parts of the sand baler 96.

FIG. 3 illustrates a modified embodiment of a coupling and collet assembly 38' which may be provided to retain the cylinder section 104 of the sand baler 96 in position for a flushing operation. The embodiment shown in FIG. 3 comprises a full closing rubber packing unit 118 and a hydraulic actuated contractor piston element 120 which is operable to move the packing unit into sealing engagement with cylinder section 104 of the sand baler 96. It should be observed that embodiment of FIG. 3 provides the dual function of holding the cylinder portion 104 of the sand baler in place and restricting by-pass flow of fluid during a flushing operation. Consequently, use of the embodiment shown in FIG. 3 eliminates the need for the flow restricting shoulder 114 shown in FIG. 2A.

During the flushing operation valves 55 and 56 are opened and a conventional control valve unit 57 within the hydraulic pumping unit 50 is operated to direct flushing fluid flow from a pump 51 into the lower lubricator section 26 via conduit 52 and out the upper lubricator section 30 via conduit 54. Thus the fluid flow is in a direction to open the ball check valves 106 and 108 of the sand baler 96 and the sand and debris will

be carried out into a scrubber section 58 of the pumping system 50. It should be noted that the scrubber section 58 may contain any other desirable equipment for the handling of and the disposal of contaminants and debris removed from the flushing fluid. After the flushing fluid has passed through the scrubber section and had contaminants removed, the fluid may be reflowed into the pumping unit. Residue collected in the scrubber section may be pumped outside the capsule by suitable means (not shown).

While the invention has been described with respect to the cleaning of a sand baler it is to be understood that the invention could be utilized to clean other wireline tools such, for example as, paraffin scrapers, down-hole flow control tools and various wireline fishing tools.

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.

What is claimed is:

1. A closed flushing and vapor elimination system for cleaning wireline components and suitable for use in an underwater atmospheric capsule containing human operators, said system comprising:

an elongated tubular lubricator assembly having a first end in communication with a wellhead for receiving a wireline tool from a well bore located below said wellhead;

valve means associated with said wellhead for selectively sealing off said well bore from said lubricator assembly;

a wireline stripper assembly removably joined to a second end of said lubricator so as to substantially seal off liquid flow from the lubricator assembly into the stripper assembly;

vapor elimination means operatively associated with said wireline stripper assembly for removing gases and vapors from said wireline stripper assembly;

said lubricator assembly having retaining means for retaining a wireline tool in position for a fluid cleaning operation;

a first conduit communicating a closed circuit fluid pumping system with said first end of the lubricator assembly; and,

second conduit means communicating said pumping system with said second end of the lubricator assembly at a location below said wireline stripper assembly.

2. Apparatus as set forth in claim 1 wherein the retaining means comprises mechanical latching means operable to engage a tool and prevent movement of said tool during a fluid cleaning operation;

said lubricator assembly further having flow restricting means near the second end thereof to ensure that fluid flow from said pumping system is directed through the internal portions of a tool positioned in the lubricator assembly.

3. Apparatus as set forth in claim 1 wherein the retaining means comprises a hydraulically actuated annular packer operable to sealingly engage a tool which has been moved into said lubricator assembly.

4. Apparatus as set forth in claim 1 wherein said wireline stripper assembly is removably joined to said lubricator assembly by a collet having hydraulically actuated finger elements operable to engage notched portions formed on the external portion of the second end of said lubricator assembly.

5. Apparatus as set forth in claim 1 wherein said wireline stripper assembly is provided with two spaced packing units for sealingly engaging a wireline which is passed through the stripper, a vacuum chamber formed

between said packing units, and conduit means communi-
cating said vacuum chamber with a vacuum pump.

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JAMES A. LEPPINK, Primary Examiner

U.S. Cl. X.R.

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