

United States Patent

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- [54] METHOD AND APPARATUS FOR RUNNING A
LINE THROUGH A CONDUIT
14 Claims, 3 Drawing Figs.**

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[50] Field of Search..... 254/134.3,
134.4; 243/32, 33, 39

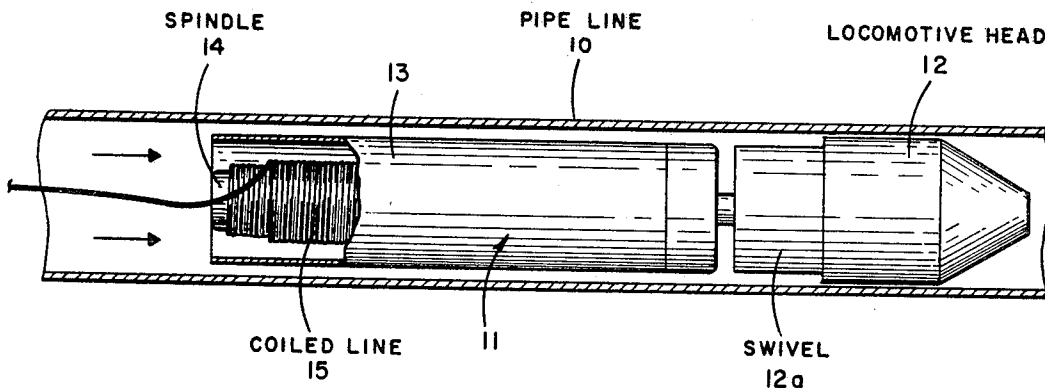
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ABSTRACT: A method for running a line such as a cable or wire through a conduit. The line is packaged, e.g., spooled or coiled, behind a locomotive means (in the sense of direction of movement of the locomotive means) with one end attached to the locomotive means. Preferably, a sheath extends behind the locomotive means in order to accommodate and protect the coiled line. The line may be wound about an open center or about a spindle arranged within the sheath and connected to the locomotive means. The locomotive means and coiled line are arranged in a conduit with the other end of the line extending to the exterior of the conduit. Then, fluid pressure is applied to the locomotive means to propel it and the packaged line through the conduit. The line unwraps or uncoils as the locomotive means is moved through the conduit. The conduit may be a surface pipe line, a flowline connecting above-water installations to below-water well equipment or other type closed conduit forming a fluid passageway between two separated points.



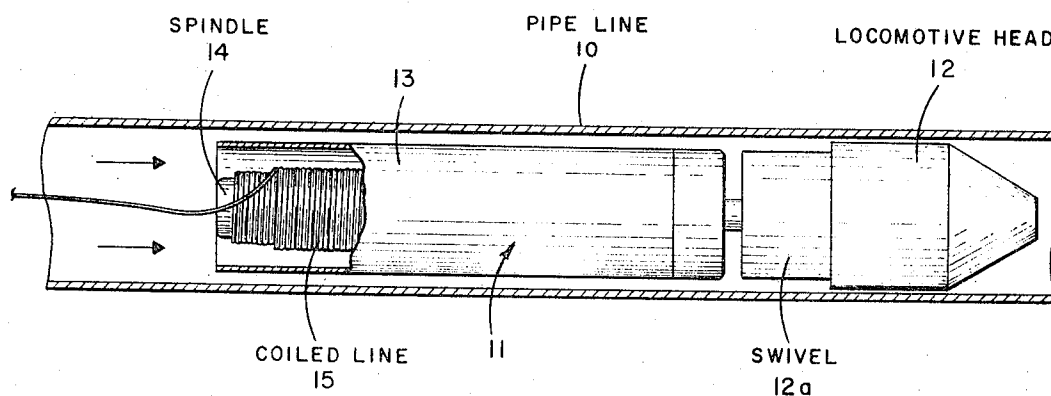


FIG. 1.

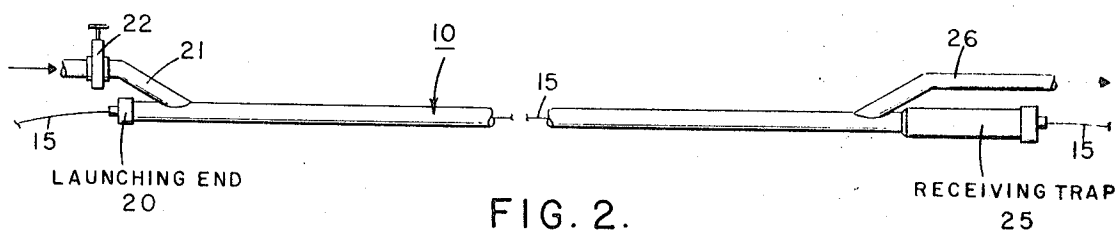


FIG. 2.

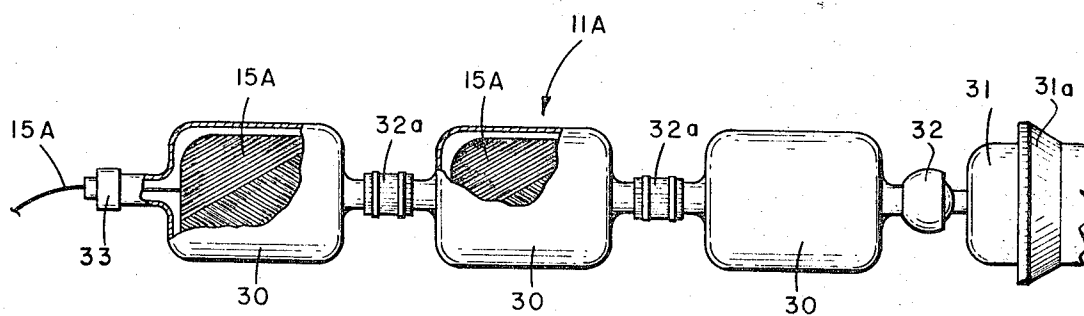


FIG. 3.

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METHOD AND APPARATUS FOR RUNNING A LINE THROUGH A CONDUIT

BACKGROUND OF THE INVENTION

Many times, it is necessary to run a line such as an electrical conductor cable to a remote location to which a pipe line has been laid. Such remote locations, as for example, an offshore submerged wellhead, in many instances, prevent running these lines by poles. However, even when poles are usable they and the acquisition of right-of-ways, and maintenance and installation time are expensive. The present invention offers a simple solution for running lines and in is particularly advantageous for use in offshore operations.

SUMMARY OF THE INVENTION

In accordance with the teachings of the invention, the method for running a line through a conduit includes the steps of arranging in said conduit a line-running device comprising a locomotive means provided with a packaged line having one end attached thereto, the other end of said line extending to the exterior of said conduit; and applying fluid pressure to said locomotive means and propelling said locomotive means through said conduit, said line unwrapping as the locomotive means moves through said conduit. The apparatus used in performing the method includes locomotive means comprising a fluid-pressure movable plug or piston member which closes or substantially closes the bore of the conduit through which the locomotive means is moved; and at least one package of line arranged behind said locomotive means and adapted to unwrap when said locomotive means is propelled through said conduit upon the application of fluid pressure behind said locomotive means. When the time is packaged in more than one unit or spool, the spools are flexibly connected together to permit or facilitate navigation of bends or tight places in the conduit. Each spool or packaged unit of line is preferably contained in a sheath. Optionally, a spindle upon which the line is spooled or coiled may be included.

A primary object of the present invention is to provide an improved technique for running lines through conduits and the apparatus therefor.

BRIEF DESCRIPTION OF THE DRAWING

The above object and other objects and advantages of the invention will be apparent from a more detailed description thereof when taken with the drawings wherein:

FIG. 1 illustrates a locomotive means arranged in a conduit and attached to a coiled or spooled line;

FIG. 2 is a schematic view of a pipe line arrangement to illustrate one application of the invention; and

FIG. 3 illustrates a modification of the device shown in FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In FIG. 1, there is shown a pipe line or other conduit 10 in which is arranged a line-running device or unit 11 which includes a forward locomotive head 12 consisting of a solid cylindrical member having an exterior diameter slightly less than the interior diameter of pipe line 10. Locomotive head 12 acts as a piston and is forced through pipe line 10 upon the application of fluid pressure behind it (in the direction indicated by the arrowed lines in FIG. 1). A cylindrical sheath 13 which contains a spindle 14 is attached to the rear of locomotive head 12 by means of a swivel connection 12a. One or more layers of line 15 are coiled about the spindle 14. One end of line 15 is attached to the unit 11 and the other free end extends to the exterior of pipe line 10.

A typical installation in which the invention may be employed is illustrated in FIG. 2. A pipe line 10 is provided with a closed end 20 which is used as a transmitting or launching point for the line-running unit 11. Pipe line 10 has an upstream branch pipe connection 21 at the launching point 20. A suitable valve 22 is provided on branch pipe connection 21

for permitting and preventing flow of fluid therethrough. A receiving trap 25 is arranged at the other end of pipe line 10 to receive unit 11. Another branch conduit 26 connects into pipe line 10 upstream of receiving trap 25.

In operation, assuming that it is desired to run a line 15 between points 20 and 25, line-running unit 11 with line 15 coiled on spindle 14 within sheath 13 is placed in the launching end 20 of pipe line 10 downstream of the connection between branch pipe connection 21 and pipe line 10. The free end of line 15 extends through a cable seal in the launching end of pipe line 10. During placement of unit 11 in pipe line 10, fluid flow through branch pipe connection 21 is closed off by valve 22. Valve 22 is opened after unit 11 is positioned in pipe line 10 and fluid pressure is applied behind locomotive head 12 to propel unit 11 through pipe line 10 into receiving trap 25. As unit 11 is moved through pipe line 10, line 15 unwinds to lay out a length of line in pipe line 10. After unit 11 has lodged in receiving trap 25, fluid flowing in pipe line 10 passes through branch pipe connection 26. Valve 22 is then closed to close off flow of fluid through pipe line 10 and unit 11 is removed from receiving trap 25. Each end of line 15 may then be connected to suitable equipment located at the opposite ends of pipe line 10. Swivel connection 12a permits locomotive head 12 to remain stationary, although spindle 14 and sheath 13 may rotate as line 15 uncoils.

In FIG. 3, a series of spools of line flexibly connected together are shown. Line-running device or unit 11A is composed of a series of containers 30 connected to a forward locomotive head 31 by means of ball joint 32 and to each other by means of hollow, flexible couplings 32a. A cup piston 31a is arranged on locomotive head 31 to facilitate pumping of unit 11A through a conduit. A spool of coiled line 15A is arranged in each container 30. Each spool is wound or coiled with an open hollow center portion in the same manner a conventional ball of twine is wound. Line 15A extends continuously from one spool to another through flexible couplings 32a. The free end of line 15A passes through a friction means 33 which aids in keeping line 15A taut to prevent snarling or entangling of the line.

Line-running unit 11A is installed and operated in the same manner, as described supra, that line-running unit 11 is installed and operated. However, flexible connection 32 and flexible couplings 32a permit a plurality of spools of line to traverse bends and/or tight places in a conduit. Thus, although in FIG. 2 only a straight pipe line is shown, the invention is also useful in conduits or pipe lines containing bends and curves.

Two or more spools of line of the type shown in FIG. 1 could be linked together by means of flexible, hollow connectors in the same manner the spools of line shown in FIG. 3 are linked together. Also, the manner of winding the line, the friction means and the cup piston type locomotive head illustrated with respect to FIG. 3 could be used with the single spool illustrated in FIG. 1.

Although the line is preferably packaged or wrapped in coils, it may be otherwise wrapped so long as the line is readily unwrapped and laid out in the conduit as the locomotive head is propelled through the conduit. Also, the invention encompasses employing the method and the line-running device in offshore operations in which a line is run through a flowline from a surface installation to subsea apparatus.

Other changes and modifications may be made in the specific embodiment of the invention shown and described herein without departing from the scope of the invention as defined in the appended claims.

We claim:

1. A device for running a line through a conduit comprising: locomotive means arranged in said conduit adapted to be propelled through a said conduit upon the application of fluid pressure behind said locomotive means, said locomotive means including a piston member adapted to substantially close off the bore of said conduit; and

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at least one package of line arranged behind said locomotive means and adapted to unwrap when said locomotive means is propelled through said conduit.

2. A device as recited in claim 1, including a shield adapted to contain said packaged line.

3. A device as recited in claim 2 in which said shield is cylindrical and said line is coiled within said shield.

4. A device as recited in claim 3 including a spindle attached to said locomotive means on which said line is coiled.

5. A device as recited in claim 4 including friction means adapted to engage the free end of said line to aid in preventing said line from becoming snarled.

6. A device as recited in claim 5 in which said line is an electrical conductor cable.

7. A device as recited in claim 1 including a plurality of spools of line flexibly coupled together.

8. A device as recited in claim 7 including a hollow, flexible coupling connecting one spool of line to an adjacent spool of line, said line extending continuously from one spool of line to

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said adjacent spool of line through said hollow, flexible coupling.

9. A device as recited in claim 8 in which said locomotive means includes a piston member adapted to substantially close off the bore of said conduit.

10. A device as recited in claim 9 including a container adapted to contain each of said spools of line.

11. A device as recited in claim 10 in which said container is cylindrical and said line is wound in a spool having an open, hollow center.

12. A device as recited in claim 11 in which said line unspools from the center of each of said spools.

13. A device as recited in claim 12 including friction means adapted to engage the free end of said line to aid in preventing said line from becoming snarled.

14. A device as recited in claim 13 in which said line is an electrical conductor cable.

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