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 MULTIPLE-DRUM STORING WINCH FOR REELING AND UNREELING
 A FLEXIBLE LINE OF GREAT LENGTH
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3,494,374

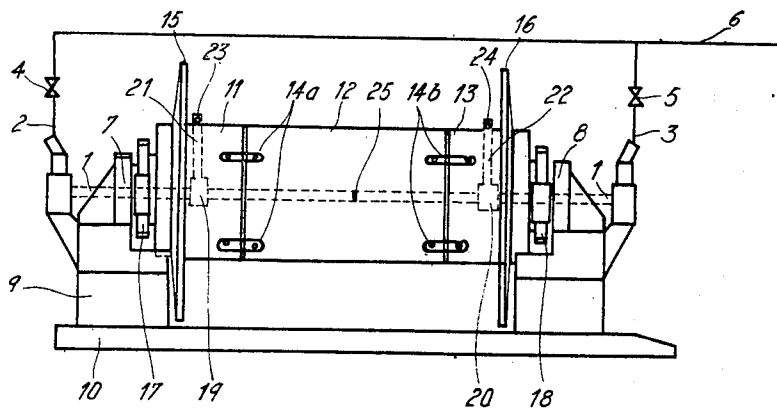


Fig. 1

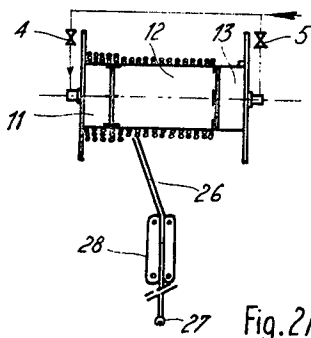


Fig. 2A

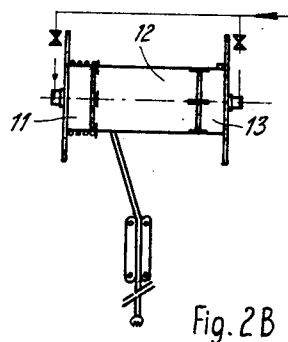


Fig. 2B

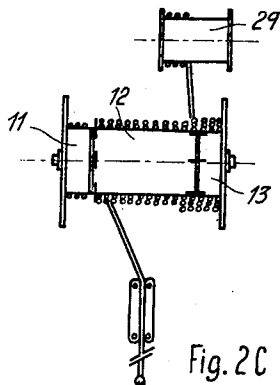


Fig. 2C

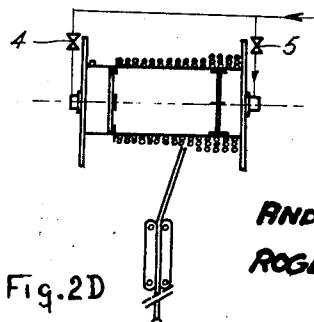


Fig. 2D

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MULTIPLE-DRUM STORING WINCH FOR REELING AND UNREELING A FLEXIBLE LINE OF GREAT LENGTH

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3 Claims

ABSTRACT OF THE DISCLOSURE

A winch for a flexible line made of successive sections connected end to end, including several coaxial drums providing at least two driving drums having means for separate rotation thereof, at least one additional drum which is located between the two driving drums and is provided with means for selectively securing the additional drum to either of said driving drums.

The present invention relates to a storing winch for a flexible line, such as for a fluid supplied flexible pipe, permitting to wind and unreel a length of flexible pipe made of a number of unit-sections, thereby reducing as much as possible the periods of break of the reeling or unreeling operation, and of interruption of the fluid feeding, which are necessary for connecting and uncoupling the unit-sections of the pipe.

The flexible line wound on this winch may also be a cable constituted by successive sections connected end to end.

Such a storing winch is of particular interest in very deep earth drilling using as a drilling stem a flexible pipe at the lower end of which the drill bit is directly coupled to a driving motor which is supplied with electric or hydraulic energy from the surface through this flexible pipe.

Until now such a drilling equipment made use, in association with traction means supporting the weight of the flexible pipe unreeling into the well, of a storing winch on which was reeled from the beginning of the drilling operation the whole necessary length of pipe constituting a single section, this winch having a hollow shaft connected with one end of the flexible pipe and supplied with drilling fluid by means of a swivel coupling.

However in the case of deep drilling operations it is not possible, on grounds of energy-saving in pumping the drilling or flushing fluid, to use from the beginning of these drilling operations, the whole length of drill pipe corresponding to the ultimately reached depth. It is therefore necessary to use, as the drilled well is becoming deeper, an increasing number of unit-sections of flexible pipe, which must be connected end to end to one another, whereby the new pipe section to be added must also be transferred from its storing spool to the winch of the drilling equipment.

The main object of the present invention is to suppress the idle periods necessary for reeling additional pipe sections on the winch and particularly to reduce the duration of the breaks in the drilling fluid supplying.

This object is achieved, according to the invention, by means of a storing winch divided into several coaxial drums which may be independently rotated, these drums including at least two driving drums and at least one additional drum located between said two driving drums and provided with means for making at will said additional drum fast in rotation with any of said driving drums.

In the more specially contemplated embodiment wherein the flexible line which is wound on the storing winch is

a flexible pipe to be supplied with fluid under pressure, the winch will be provided with a hollow shaft for feeding said pipe through swivel coupling. Each of the driving drum will then include a device for separate hydraulic connection of the flexible pipe with said hollow shaft.

The operation of this storing winch according to the invention will comprise the steps of making said additional drum fast with a first of said driving drum, so as to constitute a storing capacity on which a section of flexible line is wound, starting to wind said line around said first driving drum, said section of flexible line being then unreeling until said additional drum is empty, said additional drum being then uncoupled from said first driving drum and made fast in rotation with the second driving drum, so as to constitute therewith a new storing capacity on which a new section of flexible line is wound, starting to wind said new section on said second driving-drum, said winding of said new line section being carried out without interrupting the unreeling of that part of said first line section which remains wound on said first driving-drum.

A non-limitative embodiment of the invention will be described hereinafter, with reference to the attached drawings wherein:

FIGURE 1 is a front view of this embodiment,

FIGURES 2A to 2D diagrammatically illustrate successive steps of the unreeling of a flexible pipe, during a drilling operation.

In FIGURE 1, the reference numeral 1 designates the winch shaft, this shaft being hollow so as to provide for the supply of the pipe stored on this winch with fluid under pressure through pipes 2 and 3 respectively connected with the two ends of this shaft and which are provided with valves 4 and 5. These pipes are connected through the pipe 6 with the outlet of a system for recycling the drilling mud.

The shaft 1 rests at both ends on bearings 7 and 8 carried by a frame 9 which rests upon the ground through a base plate 10.

The winch includes in this embodiment three drums 11, 12, 13 which are normally not integral with one another but may be at will made fast in rotation in pairs or all three simultaneously, by means of any suitable device, such as the latches 14a, for making the drums 11 and 12 fast with each other, and 14b, for the drums 12 and 13, this means for making adjacent drums integral with each other being not limitative and not excluding, in particular devices for coupling or uncoupling the considered drums during their rotation, such as friction or electromagnetic clutches.

The flanges 15 and 16 of the winch are secured to the end drums 11 and 13.

The selected number of the drums may be different from three, provided the number of driving drums 11, 13 is at least equal to two.

The winch is provided with means for separately rotating the drums 11 and 13 around the shaft 1, this means including, for example, the hydraulic motors 17 and 18.

It also includes means for separately supplying drilling fluid through the shaft 1, to pipe sections respectively wound on the driving-drum 11 and on the driving drum 13, this means including swivel coupling 19 and 20, connecting pipes 21 and 22 and connecting mouthpieces 23 and 24 for connection with the flexible pipe.

A separating wall 25 inside the hollow shaft 1, permits to break the hydraulic fluid supply to either the connecting mouthpieces 23 and 24 by simply controlling the corresponding valves 4 or 5.

A way of operating the winch according to the invention shown by FIGURE 1 is diagrammatically illustrated, as an example, by FIGURES 2A to 2D in the case of deep drilling using as a drill pipe a flexible pipe 26 at the

lower end of which is connected a drill bit 27 and the motor for driving the same.

The reference numeral 28 indicates a traction device for the pipe, this device providing in particular for the supporting of the length of pipe 26 unwound into the drilled well. This traction device may, for example, be constituted by one or several traction grabs with endless chains provided with clamping shoes which grip the pipe.

Before starting the drilling operation the drums 11 and 12 are made fast in rotation with each other and the drums 12 and 13 are uncoupled.

A first section of the pipe 26 is reeled on the two drums 11 and 12, this section issuing from non-illustrated spool and being connected with the mouthpiece 23 of the drum 11.

The reeling on the drums 11 and 12 is performed by operating the motor 17 which drives the drum 11 in rotation.

The drilling operation can then be started after the drill bit and its driving motor have been connected with the free end of the flexible pipe 26, the valve 5 being shut and the valve 4 open, so as to provide for the supply of the pipe 26 through the swivel coupling 19 of the drum 11.

The unreeling of the pipe as the drilling proceeds is achieved by operating the traction device which unwinds the pipe, the hydraulic motor 7 being stopped and braking the unreeling.

When the flexible pipe 26 remains wound only on the drum 11, the drilling operation is stopped for a moment so as to uncouple the drums 11 and 12 (this interruption can be avoided by using coupling means which is operable during the rotation of the drums), then, while the drilling operation may proceed, the drums 12 and 13 are made fast with each other (FIG. 2B) and the free end of a new section of pipe issuing from a new spool 29 (FIG. 2C) is connected with the mouthpiece 24 of the drum 13. This new pipe section is reeled at high speed on the drums 12 and 13 by actuating the hydraulic motor 18, without disturbing the drilling operation which proceeds by unreeling at a much lower speed the few convolutions of the first section of flexible pipe which remain wound on the drum 11.

When the end of the unwinding of this first section is reached, the operation of the device 28 is stopped, the valve 4 is shut, then the first pipe section is disconnected from the mouthpiece 23 of the drum 11 (the pipe remains supported in the drilled well by means of the traction device 28).

The end of the first pipe section is then connected with the free end of the second section which has been previously wound on the drums 12 and 13 and the fluid circulation is started again by opening the valve 5 (the valve 4 remaining closed).

The drilling operation is started again at once by actuating the traction device 28 which unreels the pipe at the drilling speed, the hydraulic motor 18 remaining stopped.

The steps which have been described hereinabove with reference to FIGURES 2A to 2C are then successively

repeated, thereby exchanging the functions which have been previously fulfilled by the end drums 11 and 13 of the winch.

We claim:

1. Storing winch for a flexible line constituted of successive sections connected end to end, permitting to reduce the time required by handling operations for unreeling a line section already wound on said winch and inversely for reeling an additional section, said winch including several coaxial drums, said drums comprising at least two driving drums provided with means for separately rotating said driving drums and at least an additional drum located between said driving drums, said additional drum being provided with means for making it at will fast in rotation with any of said driving drums.

2. Storing winch in accordance with claim 1, adapted for storing a flexible pipe and having a hollow shaft for supplying said pipe with fluid under pressure through a swivel coupling, wherein each of said driving drum is provided with a separate means for hydraulically connecting said pipe with said hollow shaft.

3. Method for reeling on a storing winch according to claim 1, a flexible line of great length formed of successive sections and for unreeling said line from said winch, thereby reducing the time required by handling operations for unreeling a section which is already wound on the winch and, inversely, for reeling an additional section on said winch, this method comprising the steps of making said additional drum solid in rotation with a first of said driving drum, so as to constitute a storing capacity, of reeling a section of flexible line on said capacity, starting to wind said line on said first driving drum, of unreeling said section until said additional drum is empty, of uncoupling said additional drum from said first driving drum and making said additional drum fast in rotation with said second driving drum, so as to constitute a new storing capacity, of reeling a new section of flexible line on said new storing capacity, starting to wind said line on said second driving drum, said reeling of a new line section being carried out without interrupting the unreeling of that part of said first line section which remains wound on said first driving drum.

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