

19



Europäisches Patentamt
European Patent Office
Office européen des brevets

11

Publication number:

0 148 571
A2

12

EUROPEAN PATENT APPLICATION

21

Application number: **84307702.5**

51

Int. Cl.4: **B 66 D 1/38**

22

Date of filing: **08.11.84**

30

Priority: **09.11.83 GB 8329844**

71

Applicant: **GQ DEFENCE EQUIPMENT LIMITED,**
Catteshall Lane, Godalming Surrey, GU7 1LH (GB)

43

Date of publication of application: **17.07.85**
Bulletin 85/29

72

Inventor: **Allen, Roger Frederick, 51 South Hill,**
Godalming Surrey (GB)
Inventor: **Campbell, Colin Ian, 17 Tansy Close, Guildford**
Surrey (GB)

84

Designated Contracting States: **BE CH DE FR IT LI NL**
SE

74

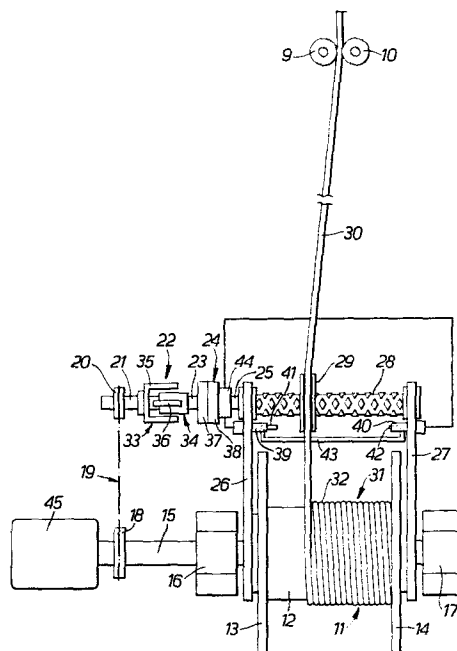
Representative: **Moon, Donald Keith et al, BREWER &**
SON 5-9 Quality Court Chancery Lane, London
WC2A 1HT (GB)

54

Line spooling device.

57

A line spooling device for spooling a line (30) on to a storage spool (11) in a build (31) in which each successive turn (32) of the line (30) on the spool (11) is laid adjacent the preceding turn in a traverse of the spool (11) first in one direction to form a first layer on the spool (11) and then in a traverse of the spool (11) in the opposite direction to form a superposed second layer on the spool (11), comprises a traversing guide pulley (29) for guiding the line (30) on to the spool (11) and a drive mechanism (21, 22, 25, 28) for driving the guide pulley (29) in a traverse of the spool (11) in one direction and then in a traverse in the opposite direction to present the line (30) to the spool (11) at winding on positions corresponding to those for the build (31) thereon of a line of predetermined gauge. The drive mechanism (21, 22, 25, 28) is made responsive to side loading of the guide pulley (29) by the line (30) resulting from a misalignment of the position of the guide pulley (29) with the position at which the line (30) is being wound on the spool (11) to cause a variation in the drive transmitted to the guide pulley (29) in a sense to reduce the misalignment.



LINE SPOOLING DEVICE

The present invention relates to a line spooling device for spooling a line on to a storage spool in a build in which each successive turn of the line on the spool is laid adjacent the preceding turn first in a traverse of the spool in one direction to form a first layer on the spool and then in a traverse of the spool in the opposite direction to form a superposed second layer on the spool.

It is well known to provide in heavy duty hauling winches a guide pulley for guiding the rope on to a driven storage drum and to drive the guide pulley along the length of the drum first in one direction and then in the opposite direction to present the rope to the rotating drum at winding on positions corresponding to those for a natural build thereon of a rope of a predetermined gauge. In one arrangement the guide pulley is mounted on a rotary drive screw arranged in spaced parallel relation to the drum and bearing a helical drive profile which is engaged by the pulley and which advances the pulley along the drive screw. In another arrangement the guide pulley is rotatably mounted on the free end of a support arm the other end of which is pivotably mounted and the rotary drive screw is caused to advance a drive element thereon which drivingly engages the arm and causes it to pivot, thereby to traverse the pulley along the length of the drum.

The winch rope during winding on to the drum tends to follow a natural build in which each turn is laid in

contact with the preceding turn and the guide pulley is driven to present the rope to the drum at winding on positions corresponding to those for the natural build of a new rope. The guide pulley has however been
5 found to lead or lag the natural build when ropes subjected to considerable use, misuse and wear are being wound. Where the misalignment of the guide pulley with the natural winding on position of the rope on the drum becomes excessive the pulley can cause
10 riding up of one turn on another or a spacing of one turn from another and the formation of a defective build.

It is an object of the present invention to provide a
15 rope spooling device for winding a rope on to a winch storage drum in which the use of a traversing guide pulley for the rope is retained but in which the above-mentioned drawback of pulley misalignment is overcome or mitigated.

20 According to the present invention there is provided a line spooling device for spooling a line on to a storage spool in a build in which each successive turn of the line on the spool is laid adjacent the preceding
25 turn in a traverse of the spool first in one direction to form a first layer on the spool and then in a traverse of the spool in the opposite direction to form a superposed second layer on the spool, comprising
30 guide means for guiding the line on to the spool and drive means for driving the guide means in a traverse of the spool in one direction and then in a traverse in the opposite direction to present the line to the spool at winding on positions corresponding to those for the

build thereon of a line of predetermined gauge,
characterised in that the drive means is responsive to
side loading of the guide means by the line resulting
from a misalignment of the position of the guide means
5 with the position at which the line is being wound on
the spool to cause a variation in the drive transmitted
to the guide means in a sense to reduce the
misalignment.

10 Preferably, the drive means includes in the drive to
the guide means a variable transmission device
responsive to the side loading of the guide means to
cause a variation in the drive transmitted to the guide
means. The variable transmission device may
15 comprise a flexible coupling having a driving element
and a driven element connected to the driving element
through a resilient element to provide relative
displacement of the driving and driven elements in
response to variations in the load on the driven
20 element arising from side loading of the guide means by
the line.

In a preferred embodiment of the invention the drive to
the guide means from the flexible coupling includes a
25 clutch mechanism and switch means are provided
momentarily to disengage the clutch mechanism to
restore the coupling to its undisplaced disposition.
Preferably the switch means is made responsive to the
guide means reaching the end of its traverse of the
30 spool in each direction.

In an embodiment of the invention hereinafter to be
described, the drive means includes a rotary drive and

the flexible coupling includes a driving element which drivingly engages a driven element through a resilient element to provide an angular displacement of the driving element relative to the driven element in
5 response to variations in the torsional load applied to the driven element. Preferably, the flexible coupling is such as to limit the angular displacement of the driving element relative to the driven element.

10 Preferably, the drive means includes a rotary drive shaft bearing a helical drive profile and the guide means comprises a guide element mounted on the drive shaft and engageable in the helical profile for advancement thereby along the drive shaft.

15 The switch means may comprise an operating element at each end of the drive shaft and the guide element may be arranged to engage one of the operating elements at the end of a traverse of the drive shaft in one
20 direction to operate the switch means and to engage the other operating element at the end of its traverse of the drive shaft in the opposite direction again to operate the switch means.

25 One embodiment of the invention will now be described by way of example with reference to the accompanying drawing which is a schematic plan view of a part of a winch assembly including a rope storage drum and a rope spooling device in accordance with the invention for
30 spooling the rope on to the drum.

Referring to the drawing, a rope storage drum 11 having a cylindrical body portion 12 and circular end flanges

13 and 14 is fixedly mounted on a drive shaft 15 rotatably mounted in bearings 16 and 17 carried by a support frame (not shown) of the winch assembly. The drive shaft 15 carries a drive pulley 18 which
5 drivingly engages a chain 19 for driving a pulley 20 secured to an input drive shaft 21 of a flexible coupling 22, the output shaft 23 of which is drivingly connected via a clutch 24 to a drive shaft 25 rotatably supported in fixed end frames 26 and 27 and carrying a
10 drive screw 28 rotatable with the drive shaft 25.

A guide pulley 29 is mounted on the drive screw 28 and comprises a grooved outer annular rope-engaging portion rotatably mounted on a non-rotatable boss portion which
15 engages with a helical profile on the drive screw 28 for advancement of the pulley 29 along the screw 28. The guide pulley 29 is arranged to receive a hauling rope 30 from guide rollers 9 and 10 and to present the rope 30 to the drum 11 for winding on in a build 31 as
20 shown in which each successive turn 32 lies adjacent the preceding turn on the body portion 12.

The flexible coupling 22 comprises a driving element 33 and a driven element 34 connected to the element 33
25 through a resilient element (not shown) which yields under loading of the driven element to produce a relative angular displacement between the driving and driven elements 33 and 34. The extent to which the elements 33 and 34 can be angularly displaced relative
30 to each other is limited by fixed arms 35 on the driving element 33 engaging fixed arms 36 on the driven element 34. The clutch 24 includes driving and driven elements 37 and 38 which are brought into and out of

engagement with each other under the control of a clutch control circuit 44 controlled by switches 39 and 40 having operating elements 41 and 42 ganged together by a connecting bar 43.

5

With the rope 30 wound on to the drum 11 to the extent shown in the drawing and the pulley positioned as shown in the drawing, further winding on of the rope on to the drum 11 is carried out by starting up a drive motor 45 for the drive shaft 15. The storage drum 11 commences to rotate and by its rotation draws on turns of the rope 30. The rotary drive to the shaft 15 is transmitted to the input shaft 21 of the flexible coupling 22 which then imparts a rotary drive through the engaged clutch 24 to the drive screw 28. The gear ratios in the drive to the screw 28 and the pitch of the helical drive profile on the drive screw 28 are so chosen that the guide pulley 29 moves along the drive screw 28 as the turns of the rope 30 build up on the body portion 12 of the drum 11, taking up positions along the length of the drum 11 in which it presents the rope to the drum 11 at winding on positions corresponding to those for a natural build of the rope 30 on the drum 11.

25

The gear ratios of the drive to the drive screw 28 and the pitch of the helical drive profile on the screw 28 are chosen for a new rope of predetermined gauge and will present the rope 30 to the drum 11 precisely at the winding on position required for a natural build of the new rope on the drum. Where however the rope 30 becomes worn in use or by misuse and is no longer of the gauge of a new rope, the guide pulley 29 will move

30

out of alignment with the winding on position for a natural build of the rope. It would for example in the case of a worn rope of reduced diameter lead the winding on position and if allowed to remain in a lead position produce an unnatural build in which adjacent turns wind on in spaced relation and upset the correct winding on of turns in the next layer wound on the drum 11. A lead of the pulley 29 however gives rise to a side loading of the pulley 29 by the rope 30, which increases the torsional load on the driven element 34 of the flexible coupling 22. As a result of this additional loading, the driven element 34 of the coupling 22 displaces itself relative to the driving element 33 by the yielding of the resilient element in the coupling. The displacement produced creates a lag in the rotary drive to the drive screw 28 and as a consequence a lag in the advancement of the pulley 29 along the screw 28. In this way the drive pulley 29 is restored to a position corresponding to the winding on position for a natural build of the rope on the drum, the relative displacement of the elements 33 and 34 of the coupling 22 being maintained throughout the traverse of the pulley 29 along the drive screw 28.

At the end of the traverse of the pulley 29 on the screw 28 the pulley 29 engages the operating element 41 of the switch 39 which is thereby operated to energise the clutch control circuit 44 to produce a momentary disengagement of the clutch 24. Upon disengagement of the clutch 24 the driven element 34 of the coupling 22 is relieved from torsional load and returns to its neutral undisplaced position relative to the driving element 33. The drive to the drive shaft 15 continues

and upon re-engagement of the clutch 24 the drive screw 28 recommences rotation. The guide pulley 29 then automatically follows a return helical drive profile on the screw 28 and the rope 30 is wound on to the drum 11 in a traverse in the opposite direction to form a further layer of rope superposed on the layer 32. Any lead of the pulley 29 again gives rise to side loading by the rope 30 and again a displacement of the driven element 34 relative to the driving element 33 of the coupling 22 which restores or tends to restore the pulley 29 to the winding on position for the natural build. At the end of the traverse to the right in the drawing, the pulley 29 engages the operating element 42 of switch 40 causing the switch 40 again to energise the clutch control circuit 44 to produce a momentary disengagement of the clutch 24, restoring the coupling 22 to its undeflected position. The pulley 29 then reverses the direction of its traverse along the screw 28 to guide the rope 30 to the drum 11 for the building of yet another layer on the drum. The operating elements 41 and 42 are ganged together and the switches 39 and 40 are so connected in the clutch control circuit that each switch will cause disengagement of the clutch 24 only following an operation of the other switch.

It will be appreciated that the rope 30 may by use or misuse give rise to winding on in which the pulley 29 tends to lag behind the winding on position of the rope 30 on the drum 11. In this event the side loading of the pulley 29 by the rope 30 tends to reduce the torsional load on the drive screw 28 leading to an angular displacement of the driven element 34 relative

to the driving element 33 of the coupling 22 in an opposite direction to that produced where the pulley 29 leads the winding on position. As a result of a reduction in the torsional load the drive screw 28 is
5 advanced by the relative angular displacement of the elements 33 and 34 of the coupling 22 and restores or tends to restore the pulley 29 to the winding on position for the natural build.

10 In the embodiment of the invention hereinbefore described with reference to the drawing the pulley 29 is mounted on the drive screw 28 for direct engagement with the helical drive profile. It will however be appreciated that the pulley 29 may be driven to
15 traverse the drum 11 in other ways. For example, the guide pulley 29 may be rotatably mounted on the free end of a support arm, the other end of which is pivotably mounted and the drive screw 28 caused to advance a drive element thereon which drivingly engages
20 the pivotal arm.

CLAIMS

1. A line spooling device for spooling a line on
to a storage spool in a build in which each successive
5 turn of the line on the spool is laid adjacent the
preceding turn in a traverse of the spool first in one
direction to form a first layer on the spool and then
in a traverse of the spool in the opposite direction to
form a superposed second layer on the spool, comprising
10 guide means for guiding the line on to the spool and
drive means for driving the guide means in a traverse
of the spool in one direction and then in a traverse in
the opposite direction to present the line to the spool
at winding on positions corresponding to those for the
15 build thereon of a line of predetermined gauge,
characterised in that the drive means is responsive to
side loading of the guide means by the line resulting
from a misalignment of the position of the guide means
with the position at which the line is being wound on
20 the spool to cause a variation in the drive transmitted
to the guide means in a sense to reduce the
misalignment.

2. A device according to claim 1, characterised
25 in that the drive means includes in the drive to the
guide means a variable transmission device responsive
to the side loading of the guide means to cause a
variation in the drive transmitted to the guide means.

30 3. A device according to claim 2, characterised
in that the variable transmission device comprises a
flexible coupling having a driving element and a driven
element connected to the driving element through a

resilient element to provide relative displacement of the driving and driven elements in response to variations in the load on the driven element arising from side loading of the guide means by the line.

5

4. A device according to claim 3, characterised in that the drive to the guide means from the flexible coupling includes a clutch mechanism and switch means are provided momentarily to disengage the clutch mechanism to restore the coupling to its undisplaced disposition.

10

5. A device according to claim 4, characterised in that the switch means is responsive to the guide means reaching a predetermined position in its travel.

15

6. A device according to claim 5, characterised in that the switch means is responsive to the guide means reaching the end of its traverse of the spool in each direction.

20

7. A device according to any of claims 2 to 6, characterised in that the drive means includes a rotary drive and the flexible coupling includes a driving element which drivingly engages a driven element through a resilient element to provide an angular displacement of the driving element relative to the driven element in response to variations in the torsional load applied to the driven element.

25

30

8. A device according to claim 7, characterised in that the flexible coupling is such as to limit the angular displacement of the driving element relative to the driven element.

9. A device according to claim 7 or 8,
characterised in that the drive means includes a rotary
drive shaft bearing a helical drive profile and that
the guide means comprises a guide element mounted on
5 the drive shaft and engageable in the helical profile
for advancement thereby along the drive shaft in a
traverse in one direction.

10. A device according to claim 9, characterised
10 in that the drive shaft comprises a further helical
drive profile for advancing the guide element along the
drive shaft in a traverse in the opposite direction.

11. A device according to claim 9 or 10,
15 characterised in that the switch means comprises an
operating element at each end of the drive shaft and
that the guide element is arranged to engage one of the
operating elements at the end of a traverse of the
drive shaft in one direction to operate the switch
20 means and to engage the other operating element at the
end of its traverse of the drive shaft in the opposite
direction again to operate the switch means.

1/1

0148571

