

Driving device for a cable reel assembly

The present invention is generally related to a method and device for guiding a cable,
5 wire, rope, line, chain, string etc. by winching on to a cable drum, and specially related
to an arrangement of a cable reel assembly for accumulating said cable, wire, rope, line,
chain, string etc. onto said drum by winching according to the appended claim 1.

Accumulating wire, rope, chain etc. onto a cable drum is commonly used for example
10 when loading and unloading cargo from a ship. The wire or rope etc. is usually guided
over a pulley or similar device provided in one end of an arm wherein the cargo may be
fastened to the wire or rope etc. with the help of a hook or similar device. In an opposite
end of the arm, there is a motor driven drum collecting or releasing said wire or rope
etc. thereby providing means for lifting or lowering the cargo. The arm is usually
15 revolving around one or more axis providing a possibility to move the cargo for
example to/from a ship to/from a pier. The cable drum has a certain width and diameter
comprising edges in each end of the drum adjusted to provide enough space for the wire
or rope etc. when fully collected onto the cable drum. The wire or rope must usually be
collected orderly a layered to provide enough space on the cable drum.

20 There will be an angle between the pulley at one end of the arm and the cable drum at
the other end of the arm. To be able to winch the wire or rope orderly and layered on to
the cable drum, there is usually means for guiding the wire or rope on to the cable drum.
The prior art solution is to provide a moving carriage device moving back and forth in
25 front of the receiving end of the cable drum controlling the movement of wound cable
on to the cable drum, thereby providing an orderly and layered winching of the cable.
The moving carriage device is usually electrically or hydraulically driven. The angle
between the cable, wire or rope etc. and the cable drum forms a moment of force that
may be huge when the cargo is heavy. This moment of force will be transferred to the
30 moving carriage. Therefore these arrangements must be solid, and therefore expensive
to manufacture when applied with heavy cargo loads as found with cranes on board
ships etc. The huge moment of force may also provide wear and tear of the arrangement
thereby causing severe maintenance problems and repair costs of the cable reel
assembly.

35 US patent application no. 1,935,585 disclose an arrangement for a bobbin winder
comprising a metal sheet with an appropriate hole in the middle of the sheet providing

guiding means for a cable, wire, rope etc. when being winched on to a drum. The metal sheet is attached movable to an upper and lower guiding beam. The winding movement of the drum is transferred to a reeving movement of the metal sheet via properly arranged cogwheels. The upper and lower guiding reels for the metal sheet picks up the moment of force. US patent application 2,662,703 disclose an aperture provided by rods as the guiding means for the cable, wire, rope etc. in a cable drum assembly. The rods forming the guiding aperture are supported by one single lower guiding reel driven back and forth by an endless chain mechanism. The moment of forces is picked up by the single guiding reel. US patent application no. 5,330,122 discloses a similar cable drum assembly comprising a reeving carriage attached hanging on support wheels on an upper support rail. An endless chain drives the carriage back and forth above the receiving side of the cable drum. The reeving carriage and the support rail picks up the moment of forces.

Figure 1 discloses an example of prior art close to the present invention. A guiding carriage 10 and 16 is arranged with guiding reels 11. As illustrated in figure 1, the cable, wire, rope etc. is entering the arrangement perpendicular to the drawing surface, which is the receiving side of the cable drum assembly, and wherein a cable drum (not shown) is located behind the illustrated guiding carriage assembly, the axis of rotation of the cable drum being orthogonal to the axis of guiding reels 11. An arrangement of chains 14 drives the guiding carriage 10 and 16 along guiding rails 12 and 13. Figure 1b illustrates the guiding carriage 10 and 16 seen from above.

The guiding carriage 10 and 16 picks up the moments of force when winching. The dimension C pointed to by the numeral 18 must have a certain length compared to the height B pointed to by numeral 19. The relation between C and B is that the greater the ratio between B:C, the greater the forces P3 and P4 are, numerals 20, 21, respectively. If the moment of force is too high, the guiding carriage 10, 16 will lock because of the frictional forces between the guiding carriage 10, 16 and the guiding rail 12 and/or the guiding rail 13.

The tractive power in the chain 14 illustrated as the force P2, numeral 23, must be increased to maintain necessary power P1, numeral 24, for winching the wire etc. If the dimension C, numeral 18, is huge the dimension A, numeral 22, must also be increased. It is preferred to have as small a dimension A as possible to provide space for chains moved over a chain wheel or gypsy, for example. Figure 1c, numeral 17, illustrates such an example.

During operation, the cable, wire, rope, chain etc. will be moved by the movement of the guiding reel 11 over the receiving side of the cable drum assembly. As seen from the figure, the cable, wire, rope, chain etc. may be moved along the axis of the guiding reel 11, also. It is therefore possible that a huge moment of force is provided by the distance
5 formed between the point of engagement of the wire on to the guiding reel 11 and the guiding carriage farthest off.

The main problem in the prior art is that the guiding carriage and guiding reels must be strong and solid assemblies to provide for the potentially huge moments of force
10 experienced under lifting and lowering of for example heavy cargo. These arrangements are therefore costly to produce, maintain and repair. In addition, the friction may cause overheating, and individual elements of the cable reel assembly may be pushed out of alignment, which may be a risk for damaging the equipment or the people operating the assembly. To avoid such problems in the prior art, there is a need for extensive
15 maintenance work on the cable drum assembly.

The object of the present invention is to provide a guiding carriage comprising guiding reels that is cheaper to produce, and that is less exposed to moments of force, and therefore cheaper to manufacture and maintain during operation.
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Figure 1a, 1b, and 1c illustrates prior art.

Figure 2 depicts principle working elements of a guiding reel assembly according to the present invention.
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Figure 3 illustrates an example of embodiment of the present invention.

Figure 2 depicts the principal manner of operation of a guiding reel assembly according to the present invention. The assembly is mounted on brackets 1 on each side of the
30 assembly. A guiding reel 2 is mounted to driving lines 3 and 4 on a first and second side of the guiding reel 2, respectively, and is pushed back and forth by a driving unit 5 attached to the driving lines 3 and 4.

The driving lines 3 and 4 may be assembled in different manners comprising chain and
35 gypsy, cogged transmission belt with cog wheels, chain and chain wheel, wire and winching drum etc. In the example of embodiment depicted in figure 2, each drive line is a continuous loop moving around a turning wheel 9 and driving wheel 8. The drive

line 3 is provided in all 4 corners of the assembly while drive line 4 is a loop between the two lower corners provided by the two brackets 1. The drive lines 3 and 4 is coupled together with a mechanical coupling up, for example a common axle 6 such that the upper and lower part of the guiding reel 2 moves in the same manner. In other
 5 embodiments of the present invention, the driving lines 3 and 4 may be assembled in the same manner. The driving line 3 can be a loop arranged between the two upper corners provided by the brackets 1, and the driving line 4 can be arranged as a loop between the two lower corners, or the drive lines may be loops covering all 4 corners of the assembly. In another example of embodiment of the present invention, there is a
 10 separate driving unit for each driving line 3 and 4. These driving units 5 may coordinate the movements of the attached driving lines respectively by means of electronic motor control, for example, as known to a person skilled in the art.

A guiding reel 2 guides a wire, cable, rope etc. 7 to a preferred position on a cable drum (not shown). More than one guiding reel 2 may be attached to the driving lines 3 and 4 in the same cable drum assembly and/or different guiding reels 2 may be located in systems located adjacent to each other in a row.

According to the present invention, the guiding reel 2 is attached to both driving lines 3 and 4. Thereby reducing or eliminating biasing produced by the moments of force, the possibility of overheating due to friction, jamming, wear and tear etc. since the forces are picked up by both drivelines 3 and 4. This will in its turn make it possible to reduce the dimensions of the guiding rails 12 and 13, and make them as simple profiles supporting simple gliding members functioning as a guiding carriage. The picking up of
 25 the forces by the driving lines 3 and 4 provides for a design that can master huge moments of force that otherwise would destroy or cripple the cable reel assembly. Furthermore, the picking up of the forces by the driving lines 3 and 4 makes it possible to produce a simple guiding carrier arranged as simple gliding members, gliding along simple support rails 12 and 13. In this manner, the present invention provides an
 30 improved guiding carrier comprising guiding reels that is simpler in design, easier to manufacture and is simpler to maintain.

Figure 3a depicts an example of embodiment of the present invention wherein two different cables, wires, ropes etc. are winched separately on to separate cable drums.

35 Figure 3b depicts the same arrangement as in figure 1, but viewed from the top. Figure 3c illustrates how the main forces P1, P2 and P3, numerals 30, 31 and 32 is transferred to chains and bearings in each end of the cable drum assembly.

Claims

1. A device for guiding a cable, wire, rope, chain, string etc. via a receiving side of said device for winching orderly and layered said cable, wire, rope, chain, string etc. on
5 to a cable drum, the device comprising:
at least one guiding reel attached to driving lines on a first and second side of said driving reel respectively, and the guiding reel is moved back and forth by the driving lines above said receiving side of said device.
- 10 2. A device according to claim 1, wherein said driving lines is coupled up with a mechanical axle such that said first side and said second side of said guiding reel moves in the same manner.
3. A device according to claim 1 or 2, wherein said driving lines has separate
15 driving units that has provided means for coordinating the movements of each separate driving line.
4. A device according to any one of the preceding claims, wherein said driving lines
20 comprise two driving lines, a first one of said diving lines being arranged the same way as the second one of said driving lines.
5. A device according to any one of the preceding claims, wherein said guiding
reels is supported by a guiding carrier comprising said guiding reels that can be mounted
as a cable reel assembly comprising several of said guiding carriers comprising said
25 guiding reels assembled above each other, in a row, sideways, or in a similar manner.
6. A device for guiding an elongate flexible means to wind onto a drum in an
orderly and layered manner, the device comprising:
at least one guiding reel for guiding the elongate flexible means; and
30 driving means for moving the reel back and forth.
7. A device according to claim 6, wherein the elongate flexible means comprises an

elongate flexible tensioning means.

8. A device according to claim 6 or 7, wherein the elongate flexible means comprises cable, wire, rope, chain, string etc.

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9. A device according to any one of claims 6 to 8, wherein the driving means are attached to opposing ends of the guiding reel.

10. A device according to any one of claims 6 to 9, wherein the driving means
10 comprise driving lines.

11. A device according to claims 9 and 10, wherein the driving means comprise two driving lines, each one attached to an opposing end of the guiding reel.

15 12. A device according to claim 10 or 11, wherein the driving lines extend in two generally opposing directions from each end of the reel in directions with a component substantially orthogonal to the axis of the reel.

13. A device according to any one of claims 10 to 12, wherein the driving lines are
20 arranged in loops.

14. A device according to claim 13, wherein the reel is moved in a first direction by rotating the loop of a first driving line in one direction and rotating the loop of a second driving line in a direction opposing said one direction.

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15. A device according to any one of claims 6 to 12, being operable to guide the elongate flexible means on a receiving side of the drum.

16. A winch device comprising a guiding device as defined in any one of the
30 preceding claims and a drum, the guiding device being mounted on a receiving side of the drum for guiding an elongate flexible means onto the drum in an orderly and layered manner.