Claims

1. A drum assembly having a drum arranged to receive a line, and an oscillator device adapted to apply vibrations to the line as the line is being received onto the drum.

2. A drum assembly as claimed in claim 2, including a tensioning device arranged to apply tension to the line as the vibrations are being applied to the line.

3. A drum assembly as claimed in any one of claims 1-2, comprising an oscillator head including the oscillator device, wherein the oscillator head is arranged to contact with the line.

4. A drum assembly as claimed in claim 3 wherein the oscillator head comprises a guide device that diverts the path of the line, and wherein the line is wound around the guide device.

5. A drum assembly as claimed in claim 4, wherein the guide device comprises a roller device rotationally mounted on the oscillator head, and wherein the roller device rotates with the passage of the line over the roller device.

6. A drum assembly as claimed in claim 5, wherein the roller device has a groove, and wherein the cross-sectional profile of the groove is different from the resting cross-sectional profile of the line, and provides differential support for the line in the groove thereby forcing the line to adopt the cross-sectional profile of the line as it leaves the groove and is received by the drum.

7. A drum assembly as claimed in claim 6 wherein the cross sectional profile of the groove has arcuate sides and a bottom that is flatter than the arcuate

sides, whereby the line comes off the roller device in a relatively flattened profile before being received on the drum.

8. A drum assembly as claimed in any one of claims 6-8, wherein the groove on the sheave has a V-shaped profile.

9. A drum assembly as claimed in any one of claims 4-8, wherein the guide device is coated with a high friction surface configured to increase the drag on the portion of the line that engages the guide device.

10. A drum assembly as claimed in any one of claims 5-9 wherein the line is urged against the guide device by a closure device.

11. A drum assembly as claimed in claim 10, wherein the closure device is movable relative to the guide device to adjust the spacing between the guide device and the closure device.

12. A drum assembly as claimed in any one of claims 4-11, wherein the guide assembly incorporates the oscillation device within a roller device.

13. A drum assembly as claimed in any one of claims 1-12, wherein the vibrations are applied to the line in a plane that is perpendicular to the plane of the line, and perpendicular to the axis of the drum.

14. A drum assembly as claimed in any one of claims 1-13, wherein the vibrations are applied in a vertical plane.

15. A drum assembly as claimed in any one of claims 1-14, wherein the vibrations diverge in equal and opposite directions.

16. A drum assembly as claimed in any one of claims 1-15, wherein the frequency of vibrations is in the range of 15Hz - 500Hz, typically 20Hz – 30Hz, more typically 23Hz-26Hz.

17. A drum assembly as claimed in any one of claims 1-16, wherein the oscillator head is pivotally mounted to swing in and out of the path of the line.

18. A drum assembly as claimed in any one of claims 1-17, wherein the oscillator head is pressed into contact with the line to apply the vibrations directly to the line as it is being laid on the drum.

19. A drum assembly as claimed in any one of claims 1-18, wherein the oscillator head comprises more than one oscillator arranged to apply vibrations in more than one direction.

20. A drum assembly as claimed in any one of claim 1-19, wherein the oscillator head incorporates a vibration damper arranged to permit transmission of vibrations to the line but to reduce or prevent the transmission of vibrations to other parts of the drum or assembly.

21. A drum assembly as claimed in claim 20, wherein the vibration damper comprises a resilient device arranged to absorb vibrations and reduce or prevent their transmission past the vibration damper.

22. A drum assembly as claimed in any one of claims 1-21, wherein the assembly includes at least one anti-twisting device to reduce twisting of the line.

23. A drum assembly as claimed in any one of claims 1-22, wherein the line is looped between at least two guide devices, at least one of which is arranged to be vibrated by the oscillator device.

24. A drum assembly as claimed in any one of claims 1-23, wherein the line comprises a fibre rope.

25. A winch comprising a drum assembly as claimed in any one of claims 1-24.

26. A line conditioning device comprising a drum assembly as claimed in any one of claims 1-24.

27. A method of laying a line on a drum, the method comprising applying vibrations to the line from an oscillator device when laying the line on the drum, thereby compacting the line on the drum.

28. A method as claimed in claim 27, including applying tension to the line while the vibrations are being applied to the line.

29. A method as claimed in any one of claims 27-28, wherein the oscillator device has an oscillator head, and wherein the method includes pressing the oscillator head into contact with the line to apply the vibrations direct to the line while the line is being laid on the drum.

30. A method as claimed in claim 29 wherein the oscillator head comprises a guide device that diverts the path of the line, and wherein the method includes passing the line around the guide device.

31. A method as claimed in claim 30, wherein the guide device comprises a roller device, and wherein the method includes passing the line over the roller device before laying it on the drum.

32. A method as claimed in claim 31, wherein the roller device has a groove, and wherein the cross-sectional profile of the groove is different from the resting cross-sectional profile of the line, and provides differential support for the

line in the groove and wherein the method includes changing the cross-sectional profile of the line as it passes over the roller device.

33. A method as claimed in claim 32 including flattening the line before the line is laid on the drum.

34. A method as claimed in any one of claims 30-33, including providing the roller device with a high friction surface, and retarding the passage of the line over the guide device by engaging a portion of the line with the high friction surface.

35. A method as claimed in any one of claims 30-34, including forcing the line into a V-shaped profile on the guide device.

36. A method as claimed in any one of claims 30-35, including pressing the line onto the guide device by pressing a closure device against a portion of the line as it passes over the guide device.

37. A method as claimed in any one of claims 27-36, including applying vibrations to the line in a plane that is perpendicular to the plane of the line, and perpendicular to the axis of the drum.

38. A method as claimed in any one of claims 27-37, including applying the vibrations to the line in a vertical plane.

39. A method as claimed in any one of claims 27-38, including applying the vibrations as a sine wave.

40. A method as claimed in any one of claims 27-39, including applying vibrations in the range of 15Hz - 500Hz, typically 20Hz – 30Hz, more typically 23Hz-26Hz.

41. A method as claimed in any one of claims 27-40, including swinging the oscillator head around a pivot point to swing in and out of the path of the line.

42. A method as claimed in any one of claims 27-41, including applying vibrations to the line from more than one oscillator device.

43. A method as claimed in any one of claims 27-42, including providing a vibration damper on the oscillator head and absorbing vibrations in the vibration damper to reduce or prevent transmission of vibrations past the vibration damper.

44. A method as claimed in any one of claims 27-43, including providing at least one anti-twisting device on the oscillator head and thereby reducing twisting of the line as it is laid on the drum.

45. A method as claimed in any one of claims 27-44, including looping the line is between at least two guide devices, and vibrating at least one of the guide devices by the oscillator device.

46. A method as claimed in any one of claims 27-45, wherein the oscillator device momentarily and sequentially increases and decreases the load on the line as it is being wound onto the drum, causing differential fluctuations in the tension of the line as the line is diverted away in opposite directions from a straight line path to the drum.

47. A method as claimed in any one of claims 27-46, including differentially vibrating the line more than the drum.

48. A method as claimed in any one of claims 27-47, including changing the alignment of the line materials to increase their alignment with the axis of the line.

49. A method as claimed in any one of claims 27-48, including varying the frequency of vibration as the line is being wound onto the drum, and determining the degree of line compaction on the drum as the frequency of vibration changes.

50. A method of treating a line, prior to use, comprising applying vibrations to the line.

51. Apparatus for treating a line, prior to use, comprising an oscillation device configured to apply vibrations to a line.

Claims

1. A drum assembly having a drum (D) arranged to receive a line (L), characterised in that assembly has an oscillator head (200) comprising an oscillator device (17, 27, 37, 47, 57, 67, 77, 87, 97, 107, 117) adapted to generate vibrations, wherein the oscillator head (200) is adapted to engage the line L and to apply vibrations generated by the oscillator device (17, 27, 37, 47, 57, 67, 77, 87, 97, 107, 117) to the line (L) as the line (L) is being received onto the drum (D).

2. A drum assembly as claimed in claim 2, including a tensioning device arranged to apply tension to the line (L) as the vibrations are being applied to the line (L).

3. A drum assembly as claimed in claim 1 or claim 2 wherein the oscillator head (200) comprises a guide device (16, 26, 36, 46, 56, 66, 76, 86, 96, 106, 220) that is adapted to divert the path of the line (L) before the line (L) is laid on the drum (D).

4. A drum assembly as claimed in any one of claims 1-3, wherein the guide device comprises a roller device (16, 26, 36, 46, 76, 86, 106, 220) rotationally mounted on the oscillator head (200), and wherein the roller device rotates with the passage of the line over the roller device (16, 26, 36, 46, 76, 86, 106, 220).

5. A drum assembly as claimed in claim 4, wherein the roller device (16, 26, 36, 46, 76, 86, 106, 220) has a groove, and wherein the cross-sectional profile of the groove is different from the resting cross-sectional profile of the line, and provides differential support for the line (L) in the groove thereby forcing the line (L) to adopt the cross-sectional profile of the line (L) as it leaves the groove and is received by the drum (D).

6. A drum assembly as claimed in any one of claims 3-5, wherein the guide device (16, 26, 36, 46, 56, 66, 76, 86, 96, 106, 220) is coated with a high friction material on a surface of the guide device configured to increase the drag on the portion of the line (L) that engages the surface of the guide device (16, 26, 36, 46, 56, 66, 76, 86, 96, 106, 220).

7. A drum assembly as claimed in any one of claims 3-6 wherein the line (L) is urged against the guide device (16, 26, 36, 46, 56, 66, 76, 86, 96, 106, 220) by a closure device, wherein the closure device is movable relative to the guide device (16, 26, 36, 46, 56, 66, 76, 86, 96, 106, 220) to adjust the spacing between the guide device (16, 26, 36, 46, 56, 66, 76, 86, 96, 106, 220) and the closure device .

8. A drum assembly as claimed in any one of claims 3-7, wherein the oscillator device (17, 27, 37, 47, 57, 67, 77, 87, 97, 107, 117) is disposed within the guide device (16, 26, 36, 46, 56, 66, 76, 86, 96, 106, 220).

9. A drum assembly as claimed in any one of claims 1-8, wherein the oscillator head (200) is pivotally mounted to swing in and out of the path of the line (L).

10. A drum assembly as claimed in any one of claims 1-9, wherein the oscillator head (200) comprises at least first and second oscillator devices (17, 27, 37, 47, 57, 67, 77, 87, 97, 107, 117) and wherein the first and second oscillator devices (17, 27, 37, 47, 57, 67, 77, 87, 97, 107, 117) are arranged to apply vibrations to the line in different directions.

11. A drum assembly as claimed in any one of claim 1-10, wherein the oscillator head (200) incorporates a vibration damper arranged to permit transmission

of vibrations to the line (L) but to reduce or prevent the transmission of vibrations to other parts of the drum (D) or assembly.

12. A drum assembly as claimed in any one of claims 1-11, wherein the assembly includes at least one anti-twisting device to reduce twisting of the line (L) relative to the drum (D).

13. A drum assembly as claimed in any one of claims 1-12, wherein the line (L) is looped between at least two guide devices, at least one of which is arranged to be vibrated by the oscillator device (17, 27, 37, 47, 57, 67, 77, 87, 97, 107, 117).

14. A method of laying a line (L) on a drum (D), characterised by the method comprising generating vibrations from an oscillator device (17, 27, 37, 47, 57, 67, 77, 87, 97, 107, 117) incorporated within an oscillator head (200), contacting the line (L) with the oscillator head (200) and applying the vibrations to the line (L) generated by the oscillator head (200) while the line (L) is being laid on the drum (D).

Are

15. A method as claimed in claim 14, including applying tension to the line (L) while the vibrations are being applied to the line (L).

16. A method as claimed in claim 14 or 15, wherein the oscillator head (200) comprises a guide device (16, 26, 36, 46, 56, 66, 76, 86, 96, 106, 220) , and wherein the method includes diverting the path of the line (L) around the guide device (16, 26, 36, 46, 56, 66, 76, 86, 96, 106, 220).

17. A method as claimed in claim 16, wherein the guide device comprises a roller device (16, 26, 36, 46, 76, 86, 106, 220), and wherein the method includes passing the line over the roller device (16, 26, 36, 46, 76, 86, 106, 220) before laying it on the drum.

18. A method as claimed in claim 17, including providing the roller device (16, 26, 36, 46, 76, 86, 106, 220) with a high friction surface, and retarding the passage of the line (L) over the roller device (16, 26, 36, 46, 76, 86, 106, 220) by engaging a portion of the line (L) with the high friction surface.

19. A method as claimed in any one of claims 14-18, including applying vibrations to the line (L) in a plane that is perpendicular to the plane of the line (L), and perpendicular to the axis of the drum (D).

20. A method as claimed in any one of claims 14-19, including applying vibrations to the line (L) from more than one oscillator device (17, 27, 37, 47, 57, 67, 77, 87, 97, 107, 117).

21. A method as claimed in any one of claims 14-20, wherein the oscillator device (17, 27, 37, 47, 57, 67, 77, 87, 97, 107, 117) momentarily and sequentially increases and decreases the load on the line (L) as it is being wound onto the drum (D), causing differential fluctuations in the tension of the line (L) as the line (L) is diverted away in opposite directions from a straight line path to the drum (D).

22. A method as claimed in any one of claims 14-21, including differentially vibrating the line (L) more than the drum (D).