

SPECIFICATION

A winching apparatus for a high-mast lighting column

- 5 The present invention relates to a winching apparatus for a high-mast lighting column.
- One known type of winching apparatus is disclosed in our British Patent No.
- 10 1,390,558. The apparatus disclosed in this prior Patent includes two independently rotatable rope drums, first and second worm gears for driving the respective rope drums to enable the drums to be independently driven
- 15 in either direction, and a gear box which enables the two drums to be driven dependently at the same speed, so that equal lengths of rope are either wound onto or wound off from the two drums simultaneously.
- 20 This type of winching apparatus was developed to cope with the problem of safely supporting a large ring beam carrying the individual lamp units at the top of a high mast such as those used at motorway junctions.
- 25 Each rope was capable of supporting the full weight of the ring beam without breaking. Such a system whilst perfectly satisfactory in normal use, still has certain disadvantages.
- One of the disadvantages concerns the stability of the ring beam particularly under
- 30 strong to gale force winds. In the known system proposed in Patent No. 1,390,558 the ring beam is in fact only supported at two diametrically opposite points. Whilst the ring
- 35 beam is partially protected from winds by the canopy of the high mast, nevertheless under certain wind conditions, the ring beam becomes unstable and performs small oscillations within the canopy. Such oscillations,
- 40 particularly if they become violent are detrimental to the individual lamp units which ultimately may suffer a failure.
- Also, with large arrays of lighting equipment frequently in use today there is additional
- 45 instability during the raising and lowering of the ring beam, when wind is present. As a result, it is frequently necessary to carry out the lowering and raising of the ring beam for maintenance purposes on relatively calm
- 50 days.
- A further disadvantage of the known system is that if one of the ropes breaks, whilst the whole ring beam does not fall, because each rope is capable of maintaining the whole
- 55 weight of the ring beam on its own, nevertheless the ring beam becomes tilted at a very oblique angle which makes lowering it to the ground a difficult problem without causing damage to the individual lamp units which
- 60 may get knocked against the mast itself.
- Finally, with larger masts there is, occasionally the requirement for access around the surface of the mast for painting and inspection. The existing maintenance cage for use
- 65 with the double drum winch has two separate

platforms of limited size immediately below each of the two ropes. Access to portions of the mast away from these points is achieved by reaching, which on a large mast is not only impractical but unsafe.

70 It is therefore an object of the present invention to overcome partially or wholly the above mentioned disadvantage of the winching apparatus disclosed in Patent No. 1,390,558.

According to the present invention there is provided a winching apparatus for use in a high mast lighting column, including: n independently rotatable rope drums, each drum

80 having a grooved surface at least one drum being a mirror image of the others; n worm and wheel gear driving means, the wheel gears being connected to one end of the respective drums, whereby each rope drum

85 may be independently driven in either direction; n ropes having equal lengths and diameters connected at one of their ends to the same ends of respective drums; and means for coupling the n worm gears so that they

90 can all be rotated dependently at the same speed, whereby equal lengths of rope are either wound onto or wound off the n drums simultaneously, n being a positive integer greater than two.

95 Preferably $n = 3$.

In one preferred form the three drums are all arranged on the same spindle.

In an alternative form where there is insufficient room at the base of the high-mast, two

100 drums are provided on the same spindle whilst the third is mounted behind and in parallel with the two drums.

The present invention will now be described in greater detail by way of example with reference to the accompanying drawing, wherein:—

Figure 1 is a plan view with the cover removed of a first preferred form of winching apparatus;

110 Figure 2 is a section on line II-II of Fig. 1, turned through 90°;

Figure 3 is a plan view with the cover removed of a second preferred form of winching apparatus; and

115 Figure 4 is a section on line IV-IV of Fig. 3, turned through 90°.

Referring first to Figs. 1 and 2, the winching apparatus is housed within a generally U-shaped frame 2 having integrally formed two

120 vertical side portions 4 and a vertical back portion 6. Between the side portions 4 is welded a base plate 8, on which stand first and second back pieces 10 and 11 which are bolted by bolts 7 to the back portion 6, and

125 first and second front pieces 12 and 13 which are welded to respective back pieces 10 and 11. In an alternative form the back pieces 10 and 11 as well as the front pieces 12 and 13 may be formed as single pieces respectively.

130 Between the front pieces 12 and 13 and the

back pieces 10 and 11 are welded respective supporting webs 18 and 19 which are parallel to the side portions 4 of the frame 2 and arranged to divide the space into substantially equal thirds.

A horizontal axle 20 is mounted between the side portions 4 of the frame 2, and is retained by split pins 22, at the respective ends. The axle 20 also passes through holes (not shown) in the supporting webs 18 and 19. Three rope drums 14a, 14b and 14c having grooved surfaces are rotatably mounted on the horizontal axle 20. As can be seen from Fig. 1, the rope drum 14a is the mirror image of the other two, so that there is one left hand and two right hand rope drums. Each rope drum 14a, 14b and 14c has respective worm wheels 24a, 24b and 24c secured at one end of the drum and flanges 27a, 27b and 27c secured to the other end. Ropes 28a, 28b and 28c have one of their ends connected to the respective drums 14a, 14b and 14c at the ends of the drums connected to the respective worm wheels 24a, 24b and 24c. As can be seen more clearly from Fig. 2, the end of the rope is provided with a terminal 50 which engages in a socket 52 within the gear wheel 24, a rope extending out of the gear wheel through a slot 54. This ensures that the rope has a smooth transition into the drum being directed on to the end of the grooves by means of the slot 54. The rope then follows the groove to the far flange and is then returned to the starting point and so forth. Engaging with respective worm wheels 24a, 24b and 24c are respective worms 25 which are pinned onto respective shafts 26a, 26b and 26c which extend between the back pieces 10 and 11 and pass through the front pieces 12 and 13.

Associated with the respective shafts 26a, 26b and 26c are locking pawls 40a, 40b and 40c, which are rotatably mounted on the front faces of the front pieces 12 and 13, the first two locking pawls 40a, and 40b being mounted on the front piece 12, whilst the third locking pawl 40c is mounted on the front piece 13. Stops 41a, 41b and 41c are provided on the respective front pieces 12 and 13 against which the respective pawls can rest when they are not in engagement with pins provided on the respective shafts 26a, 26b and 26c for clamping the shafts against rotation.

It will be appreciated from the above brief description that the construction of the triple rope drum winching apparatus is of similar construction to the double rope drum winching apparatus described in our British Patent No. 1,390,558 referred to above. In fact the winching apparatus shown in Fig. 1 may be considered to have two rope drums 14a and 14b of similar arrangement to those described in the double rope drum winching apparatus disclosed in the above numbered Patent with

the addition of a third drum 14c added at the side of the second drum 14b.

The three rope drums 14a and 14b and 14c rotate in similar directions to either raise or lower the ring beam carrying the lamp units.

The winching apparatus also includes a detachable gearbox (not shown) which passes over the forward ends of the shafts 26a, 26b and 26c and contains a pair of meshing gear wheels, the members of each pair being of equal size, which serve to couple the shafts 26a and 26b together so that rotation of the shaft 26a will cause rotation of the shaft 26b in the opposite direction so as to either unwind or wind-up rope from or onto the respective three drums. A third gear wheel for the shaft 26c would be coupled to a fourth gear wheel for the shaft 26a by additional idler gears. Alternatively a chain drive could be used to reach the shaft 26c.

In the second embodiment shown in Figs. 3 and 4, instead of the third rope drum 14c being arranged on the same horizontal axle 20 as the other two rope drums, it is positioned behind the other two drums on a separate horizontal axle 20'. The third rope drum 14c is housed in a separate U-shaped frame 2', the two vertical side portions 4' of which are secured to the back portion 6 of the frame 2 by suitable bolts 5.

The shaft 26c for the third drum 14c passes through a space provided between the worm wheels 24a and 24b the supporting web 18 being partly cut away in order to provide passage for the shaft 26c which passes through appropriate holes provided in the back and front pieces 10 and 12 respectively. All three locking pawls 40, are rotatably mounted on the single front piece 10, together with their associated stops 41 (only the pawl 40c and stop 41c being shown).

The size of the associated gearbox can be smaller as the shafts are nearer together, but its construction will be fundamentally the same, having two pairs of meshing gears as in the first embodiment. This type of winching apparatus is particularly useful where there is insufficient space to fit the three drum arrangement on the same horizontal axle within the base of the lighting column, i.e. in the case where the column has insufficient width to accommodate three drums in side by side arrangement.

It will be appreciated that in either embodiment that as in the case of Patent No. 1,390,558, the rope drums may all rotate in the same direction when either winding-on or winding-off rope, the arrangement of drums and the driving gears may be such as to achieve any possible combination of two drums rotating in the same direction and one drum rotating in the opposite direction at any one time.

The advantage of three rope drums is that

- the ring beam carrying the individual lamp units can now have a three point suspension which means that not only is it far more stable in high or squally wind conditions, but
- 5 the weight carried by the ring beam can be increased for certain applications, i.e. at motorway intersections where a large number of high wattage lamp units are required, and in the event of one of the ropes breaking, the
- 10 lowering of the ring beam is facilitated with the aid of the remaining intact ropes, without the likelihood of causing damage to the lamp units.

15 CLAIMS

1. A winching apparatus for use in a high mast lighting column, including: *n* independently rotatable rope drums, each drum having a grooved surface, at least one drum
- 20 being a mirror image of the others; *n* worm and wheel gear driving means, the wheel gears being connected to one end of the respective drums, whereby each rope drum may be independently driven in either direc-
- 25 tion; *n* ropes having equal lengths and diameters connected at one of their ends to the same ends of respective drums; and means for coupling the *n* worm gears to that they can all be rotated dependently at the same
- 30 speed, whereby equal lengths of rope are either wound onto or wound off the *n* drums simultaneously, *n* being a positive integer greater than two.
2. A winching apparatus according to
- 35 claim 1, wherein $n = 3$.
3. A winching apparatus according to claim 2, wherein the three drums are all arranged on the same spindle.
4. A winching apparatus according to
- 40 claim 2, wherein two drums are provided on the same spindle whilst the third drum is mounted on a separate spindle in parallel with the spindle carrying the other two drums.
5. A winching apparatus according to
- 45 claim 1, wherein the means for coupling the *n* driving means includes a detachable gearbox.
6. A winching apparatus according to claim 1, including *n* locking pawls adapted to abut respective driving means to prevent rota-
- 50 tion thereof when locking is required.
7. A winching apparatus for use in a high-mast lighting column, constructed and arranged to operate substantially as herein described with reference to and as illustrated in
- 55 Figs. 1 and 2 or Figs. 3 and 4 of the accompanying drawings.



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- 25 can all be rotated dependently at the same speed, whereby equal lengths of rope are either wound onto or wound off the *n* drums simultaneously, *n* being a positive integer greater than two.
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- 40 claim 2, wherein two drums are provided on the same spindle whilst the third drum is mounted on a separate spindle in parallel with the spindle carrying the other two drums.
5. A winching apparatus according to
- 45 claim 1, wherein the means for coupling the *n* driving means includes a detachable gearbox.
6. A winching apparatus according to claim 1, including *n* locking pawls adapted to abut respective driving means to prevent rotation thereof when locking is required.
- 50 7. A winching apparatus for use in a high-mast lighting column, constructed and arranged to operate substantially as herein described with reference to and as illustrated in
- 55 Figs. 1 and 2 or Figs. 3 and 4 of the accompanying drawings.