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## (54) SETTING UP AERIAL ELECTRIC LINES

(71) We, LUXA A.G., of Kirchenstrasse 1, 9490 Vaduz, Lichtenstein, a body Corporate organised under the laws of the Grand Duchy of Lichtenstein, do hereby  
 5 declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

10 This invention relates to a system and device for simultaneously mechanically stretching out a plurality of wires or traction ropes for aerial electrical lines.

15 As known, when stretching out wires and guide ropes of aerial electrical lines, hitherto the common practice was previously to stretch out by hand, or with the aid of machines or small winches and sometimes even by means of helicopters, as many pilot  
 20 ropes as there were phases of wires and guide ropes to be extended.

This involves substantial outlay, such as supplies of large quantities of cables of various sections, stretching them out over  
 25 obstructions and irregularities in the ground, and with steadily increasing labour costs. It should also be noted that a reduction in forest or scrub clearance is desirable as well as in damage to cultivation than  
 30 involved by known methods.

The present invention provides a method for simultaneously stretching out a plurality of wires or a plurality of traction ropes on  
 35 aerial electrical lines, the method comprising the steps of:—

- (a) stretching out a pilot cord or traction rope over a plurality of spans between supporting poles or towers;  
 40 (b) pulling one end of said traction rope by a winch or like device;  
 (c) coupling a mounting unit having a base carrying member and a cable holder plate provided with individual bearing elements for the single traction ropes of each  
 45 wire or for each wire to be stretched out at the other end of said traction rope;  
 (d) feeding said traction rope along with said mounting unit to the immediate proximity of a pole or a trestle, the end of said  
 50 ropes on the opposite side relative to said winch being at the same time braked;

(e) anchoring said mounting unit when in the immediate proximity of a pole or trestle by means of a tackle which is in turn anchored to the pole or at the pole; 55

(f) providing pulleys at the locations on the pole or trestle where the cables are to be secured, the pulleys having lengths of rope or cable therethrough;

(g) coupling respective ones of said lengths of rope or cable in said pulleys to said ropes or wires engaged on said unit, said lengths being previously pulleyed and pre-arranged on the pole and being capable  
 60 of overrunning the pole on the respective pulleying locations thereof to engage on a further mounting unit mounted on the traction rope beyond said trestle or pole;

(h) allowing the disconnection of the cable holding plate of the first mounting unit which is in front of the pole in the arrival direction, so that all of the previously towed ropes or the like will in turn reach the desired positions on the pole by  
 70 said lengths thus inserted in position;

(i) disconnecting the tackle and then proceeding beyond the trestle or pole to further pull the traction rope and hence the assembly of ropes coupled on the next mounting unit to reach the next pole or trestle in the line and then repeat the same sequence of  
 80 operations.

The invention also provides apparatus for simultaneously mechanically stretching out a plurality of wires or a plurality of traction ropes having a compression sleeve or loop clamping element on an end thereof  
 85 on aerial electrical lines, comprising:—

- (a) a base supporting member engaged on a first traction rope; 90  
 (b) a rope or cable holder plate;  
 (c) connection means for removably connecting said plate to said member so as to be selectively removable therefrom, said removable connection means comprising an  
 95 unthreadable stop pin and a coupling means including a pin attached to said plate and a cooperating recess in said base member for releasably receiving said pin;  
 (d) said member having a sloping surface adjacent said recess for aiding in releasably coupling said member to said plate; 100

(e) said plate including a plurality of holes, and a plurality of stud-like supporting elements secured in said holes and provided with a shaped seat for positioning and engaging further traction ropes or cables, said shaped seat having a shape corresponding to that of the compression sleeve or loop clamping element at the rope ends and extending essentially parallel to said plate.

A preferred embodiment and method according to the present invention will now be further described with reference to the accompanying drawings, in which:—

Fig. 1 is a diagrammatic plan of an assembly of cables being stretched by the method and apparatus of the invention;

Figs. 2 and 3 are perspective views respectively showing a base carrying member and a cable holder plate to be engaged with said member and intended as a whole to make up a unit to be applied for traction between a traction rope and another traction rope or wire;

Figs. 4, 5 and 6 are detailed view showing anchoring studs or blocks for the traction ropes, which studs are provided on the traction plate shown in Fig. 3;

Fig. 7 is a side view showing the unit comprising the elements of Figs. 2 and 3; and

Fig. 8 is a schematic perspective view of said unit with the mounting plate at the position corresponding to Fig. 1, that is at length coupling position.

For a better understanding of the invention, the device according to Figs. 2 to 8 will be first described. Such a device is in the form of a mounting unit and comprises a base carrying member 1 and a rope or cable holder plate 2 intended to be engaged therewith. Member 1 is intended for insertion between a traction rope and another traction rope or wire, whereas plate 2 has a plurality of holes 3, in which blocks or studs 4 are orientably mounted, each of which are better shown in Figs. 4, 5 and 6 and orientable on the seats thereof at plate 2 and intended for coupling of the ropes or cables to be straightened.

The unit comprising said elements 1 and 2 is shown in Fig. 7. As shown, plate 2 is secured on member 1 by a pin inserted, for example, in a fork trunnion 5 in plate 2 and corresponding hole 6 in member 1, the latter in turn having at the top or at the bottom a neck 7 or 7' and an opposite sloping surface on said member 1, so that in the gap between nib 7 and a sloping surface, for example at 8, a pin is seated as inserted in a fork trunnion 91 provided in plate 2. Thus, a removable connection is assured between base member 1 and plate 2. Although not shown in the figures, member 1 is in turn made of adjoining and

articulated sections in the directions of the longitudinal axis in order to pass the race of the pulleys being encountered in its travel with the traction rope.

As above mentioned, the various cables or the like intended to be straightened by pulling are coupled on blocks 4 orientably mounted on plate 2. Such blocks 4 have a nicked seat 9 or 9' with a groove that in section exactly corresponds to the compression sleeve or particular ring-like clamp element which is applied on the cable. Thus, the rope end to be coupled on plate 2 is simply folded as a loop, as shown at 10 on Fig. 8, and then the loop closed with said clamp member or, e.g. peened or swaged, is applied to the plate so that said compression sleeve is brought to position.

In Fig. 8, reference numeral 11 designates the traction rope, the running direction of which is shown by the arrow, as provided by a winch. At the opposite end of member 1, reference numeral 12 designates a rope which can be reeved on a pulley 18 on the pylon 15, and continuous with line 11 of a further similar mounting unit on the other side of the pylon. In order not to further complicate the illustration, only three ropes or cables 13 are shown in Fig. 8, that is the simplest example of electrical line has been chosen, nevertheless it is apparent from the foregoing consideration that the system and device according to the invention are applicable, with still greater advantages in high-voltage and heavy current lines both with single and multi-core cables, wherein in addition to the cables guide ropes also are stretched.

Fig. 8 shows the device according to the invention at the position corresponding to the general schematic plan view of Fig. 1, that is at the position in which the unit comprising elements 1 and 2 along with the cable being pulled has arrived adjacent a pole or trestle. Still in Fig. 8, reference numeral 14 designates as a whole a tackle anchored to the trestle for anchoring and momentarily holding stationary said rope holder plate 2, after the latter has arrived adjacent said trestle.

Referring now to Fig. 1, reference numeral 15 denotes as a whole a trestle, having anchored thereon a tackle schematically shown at 14. A winch located after the trestle or after a determined plurality of trestles is here shown at 17. Assuming that initially the pilot cord already has been stretched out and that accordingly positioning already has been provided for traction rope 11 with the individual cables 13 arranged on said plate 2, as shown in Fig. 8, thereupon operation of winch 17 said member 1 and plate 2 carried thereon, and hence the assembly of traction ropes 13, will have reached the position shown in Fig. 1,

that is the position in front of a trestle or a pole, on which elements 13 are now stretched out for them proceeding to the operation on the other side of said trestle

5 15. To this end, on the trestle for each of the incoming elements 13 a previously reeved length 16 is preset. When the traction unit 1, 2 arrives adjacent the pole, the operator 10 on the trestle will disconnect plate 2 through operation of tackle 4, which, after unthreading of pin 5, will cause pin 9 to slide along the chute with disconnection thereof from the proper holding nib 7 or 7'. The operator 15 will also provide for coupling loops 10 on the ends of cables 13 and corresponding loops 10' on cables 16, which can be inserted on corresponding elements or blocks 4' of a plate 2' similar to plate 2, which 20 will then be mounted on said support 1 so that the latter, after being cleared of plate 2, as above mentioned, is moved to the other side of trestle 15 by short operation of winch 17.

25 When this has been done for all of the individual cable elements 16, and the pin has been inserted between plate 2' and member 1 in the above described hole 6 or 6', this plate 2' is now held on member 1, and 30 by re-operating winch 17 stretching to the next pole is carried out. In turn elements 13 are inserted on blocks 4' when on the other side of the pole and pulling is continued by winch 17, which while at the 35 same time loosening the anchorage provided by the tackle, will move out of blocks 4 and, due to loops 10 which are now connected on one side with said elements 13 and on the other side with blocks 4' on the 40 other plate 2' on the other side of trestle 15, will automatically move them to their positions provided on the trestle, or will project out of the blocks 4 of plate 2 which, as above mentioned, is in turn completely disconnected from table 14. Therefore, at 45 the position preceding the trestle just passed, that is at the bottom of Fig. 1 said cables 13 will no longer converge to the centre, where they were anchored on blocks 4 of plate 2, but will be aligned already at the various positions provided on the pole. The straightening action will now continue 50 on the other side of the pole to reach a next trestle, where the above described operations will be carried out: that is at this new pole the new plate 2' will be disconnected and hence the separation of the plate and removal of the cables from blocks 4' will occur with a resulting automatic 60 insertion in the positions provided on the other pole owing to the provision of further lengths similar to lengths 16 previously sequentially arranged from time to time on each of the trestles. Thus the process is 65 continued until stretching out has been

effected on the entire line or line section. It should particularly be noted that, as above stated, an individual member 1 remaining on the traction rope can, owing to its configuration and articulated sections 70 not shown in the figures, by-pass the several pulleys being encountered in its travel, while plate 2 or 2' is time by time disconnected in front of each trestle or pole and the other plate is immediately mounted again 75 beyond said pole.

Although the invention has been here described with reference to electrical single core cables, the system and device according to the invention are applicable to any 80 type of suspended grid networks whether telephone wires, power transmission cables, video signal transfer links or other aerial electric lines.

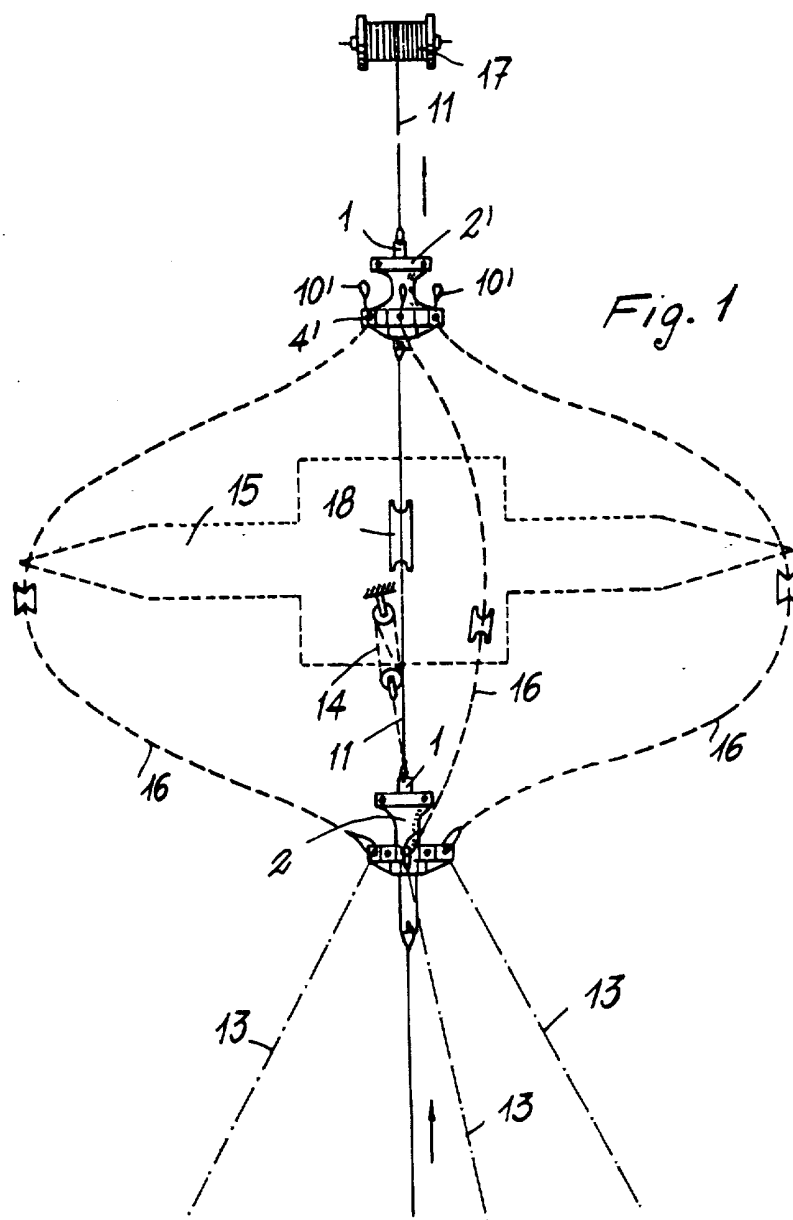
In particular, as above mentioned, not 85 only by the system described in Fig. 1, said plate 2 also can be disconnected from member 1 by a tackle that, passing through mounting pulleys prearranged at the top or at the bottom of the sliding plane for 90 pulley 18—depending on whether said plate 2 has been applied at the top or at the bottom to member 1—has its anchoring locations on said plate 2 and on a suitable 95 coupling as previously inserted on the traction rope 11 at a distance of 3-4 metres from mounting member 1. These two systems would allow ready disconnection of 100 plate 2 from mounting member 1, would not cause any stress to the support and would allow said mounting member 1 to move beyond pulley 18 by momentarily loosening said tackle, which is to be done just after the connections of lengths 16 to 105 traction ropes 13 and said disconnection of plate 2 from the mounting member, all of the other operations being left unaltered; in practice: such disconnection would not be necessary in the absence of the interfering circumstances, i.e. barring, skidding 110 operatives and/or faulty parts and fittings.

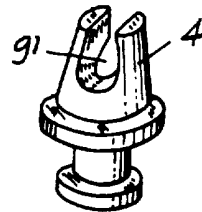
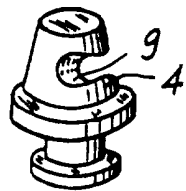
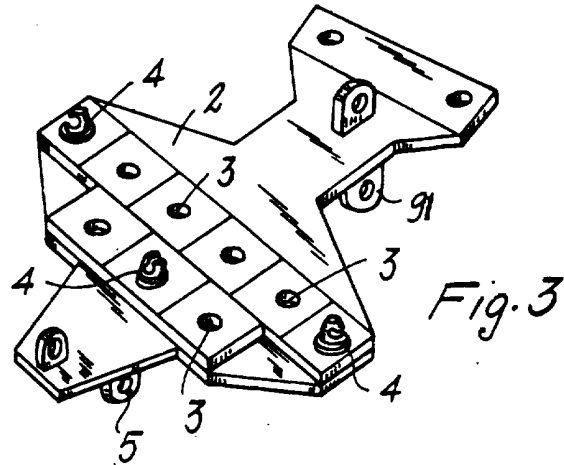
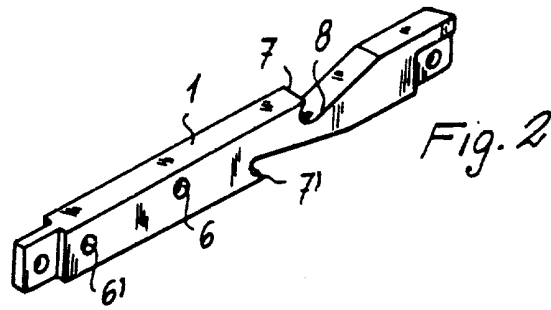
#### WHAT WE CLAIM IS

1. A method for simultaneously mechanically stretching out a plurality of wires or 115 a plurality of traction ropes on aerial electrical lines, the method comprising the steps of:—

- (a) stretching out a pilot cord or traction rope over a plurality of spans 120 between supporting poles or towers;
- (b) pulling one end of said traction rope by a winch or like device;
- (c) coupling a mounting unit having a 125 base carrying means and an individual holder plate providing individual bearing elements for the single traction ropes of each wire or for each wire to be stretched out at the other end of said traction rope;

- (d) feeding said traction rope along with said mounting unit to the immediate proximity of a pole or a trestle, the end of said ropes on the opposite side relative to said winch being at the same time braked;
- (e) anchoring said mounting unit when in the immediate proximity of a pole or trestle by means of a tackle which is in turn anchored to the pole or at the pole;
- (f) providing pulleys at the locations on the pole or trestle where the cables are to be secured, the pulleys having lengths of rope or cable there-through;
- (g) coupling respective ones of said lengths of rope or cable in said pulleys to said ropes or wires engaged on said unit, said lengths being previously pulleyed and prearranged on the pole and being capable of over-running the pole on the respective pulleying locations thereof to engage on a further mounting unit mounted on the traction rope beyond said trestle or pole;
- (h) allowing the disconnection of the cable holding plate of the first mounting unit which is in front of the pole in the arrival direction, so that all of the previously towed ropes or the like will in turn reach the desired positions on the pole by said lengths thus inserted in position;
- (i) disconnecting the tackle and then proceeding beyond the trestle or pole to further pull the traction rope and hence the assembly of ropes coupled on the next mounting unit to reach the next pole or trestle in the line and then repeat the same sequence of operations.
2. A method according to Claim 1, wherein said ropes or cables have the ends thereof in a loop fashion, in which each of the loops in the running or traction direction are inserted on orientable supporting elements provided in said unit and projecting therefrom.
3. A method according to Claim 2, wherein said lengths prearranged on each of the poles or trestles have the two ends thereof in a loop fashion, in which the end of each of the lengths facing the side of the incoming mounting unit is coupled with its loop to the projecting loop of the ropes or cables inserted on the supporting elements of the incoming mounting unit, whereas the end of each of the lengths on the opposite side of the trestle in the outgoing direction is inserted on corresponding orientable supporting blocks provided in a corresponding mounting unit.
4. A method for simultaneously mechanically stretching a plurality of wires substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.
5. Apparatus for simultaneously mechanically stretching out a plurality of wires or a plurality of traction ropes each having a compression sleeve or loop clamping element on an end thereof on aerial electrical lines, comprising:—
- a base supporting member engaged on a first traction rope;
  - a rope or cable holder plate;
  - connection means for removably connecting said plate to said member so as to be selectively removable therefrom, said removable connection means comprising an unthreaded stop pin and a coupling means including a pin attached to said plate and a cooperating recess in said base member for releasably receiving said pin;
  - said member having a sloping surface adjacent said recess for aiding in releasably coupling said member to said plate;
  - said plate including a plurality of holes, and a plurality of stud-like supporting elements secured in said holes and provided with a shaped seat for positioning and engaging further traction ropes or cables, said shaped seat having a shape corresponding to that of the compression sleeve or loop clamping element at the rope ends and extending essentially parallel to said plate.
6. Apparatus according to Claim 5, wherein said base supporting member is made with elements for upper and lower disconnection of said cable holder plate.
7. Apparatus according to Claim 5, wherein said base supporting member has a plurality of articulated sections in its longitudinal direction, whereby said supporting member can pass through the grooves of pulleys.
8. Apparatus for mechanically and simultaneously stretching a plurality of wires substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.
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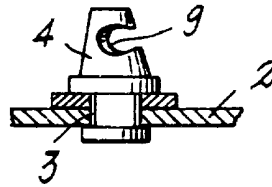


Fig. 6

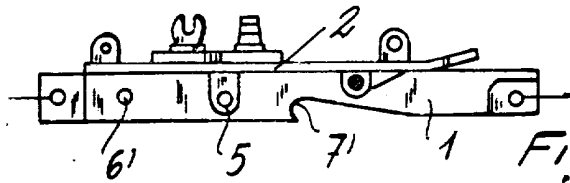


Fig. 7

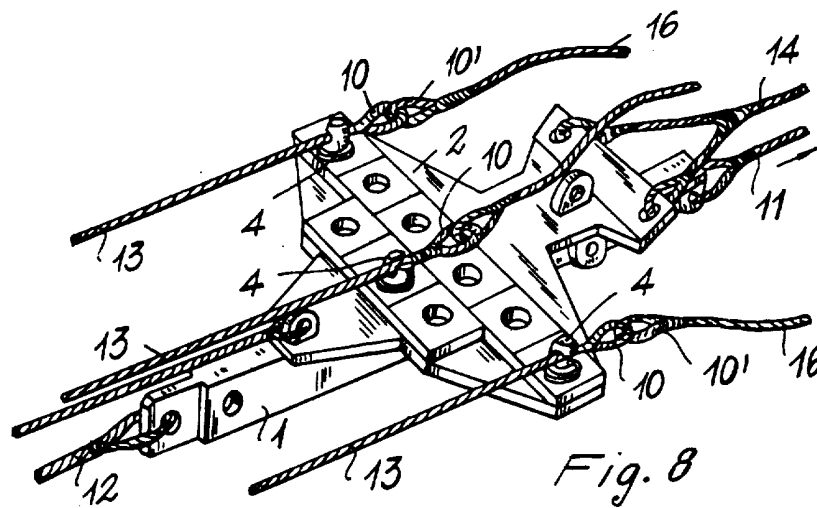


Fig. 8