

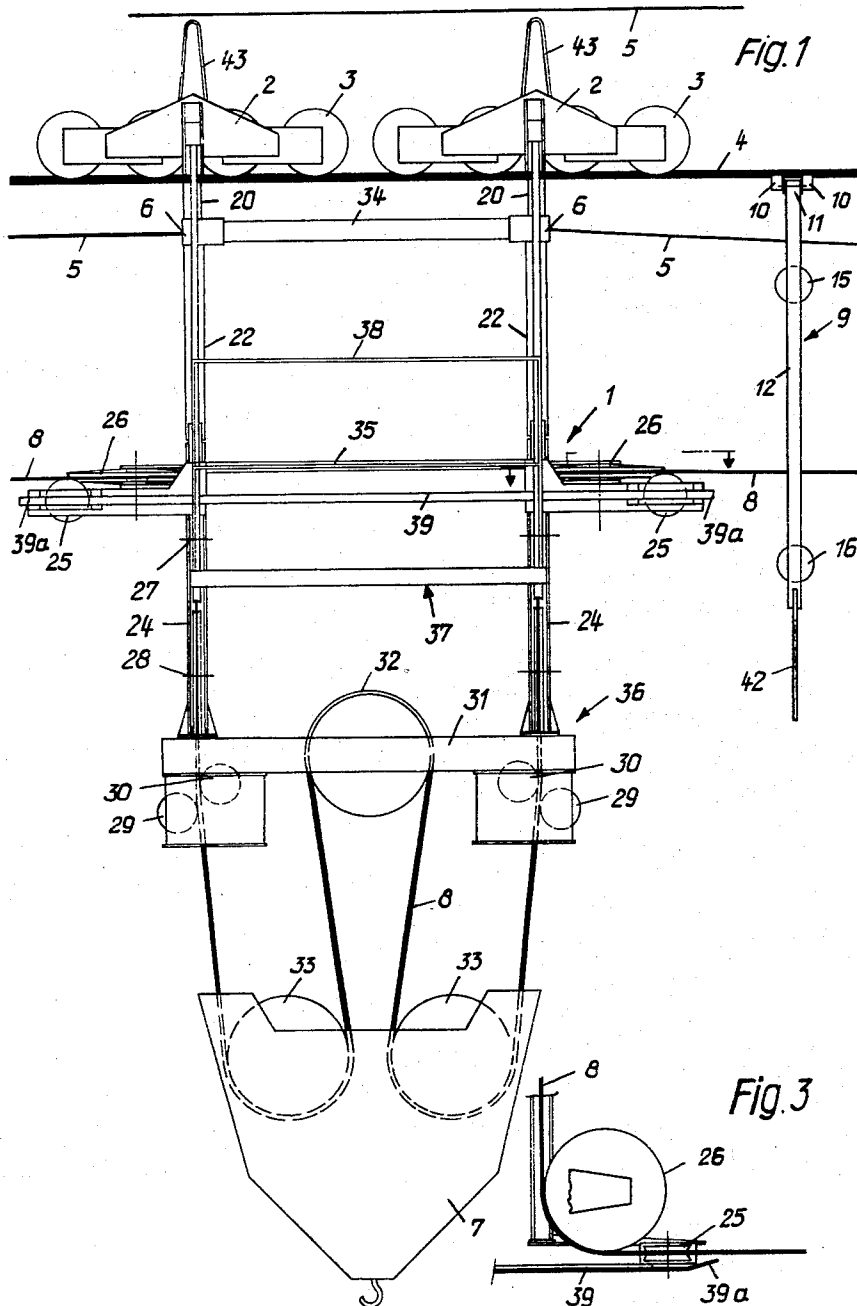
April 12, 1966

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WITH THEIR ROPES DURING PROXIMATE
PASSAGE OF THE HOIST CARRIAGE

3,245,550

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2 Sheets-Sheet 1



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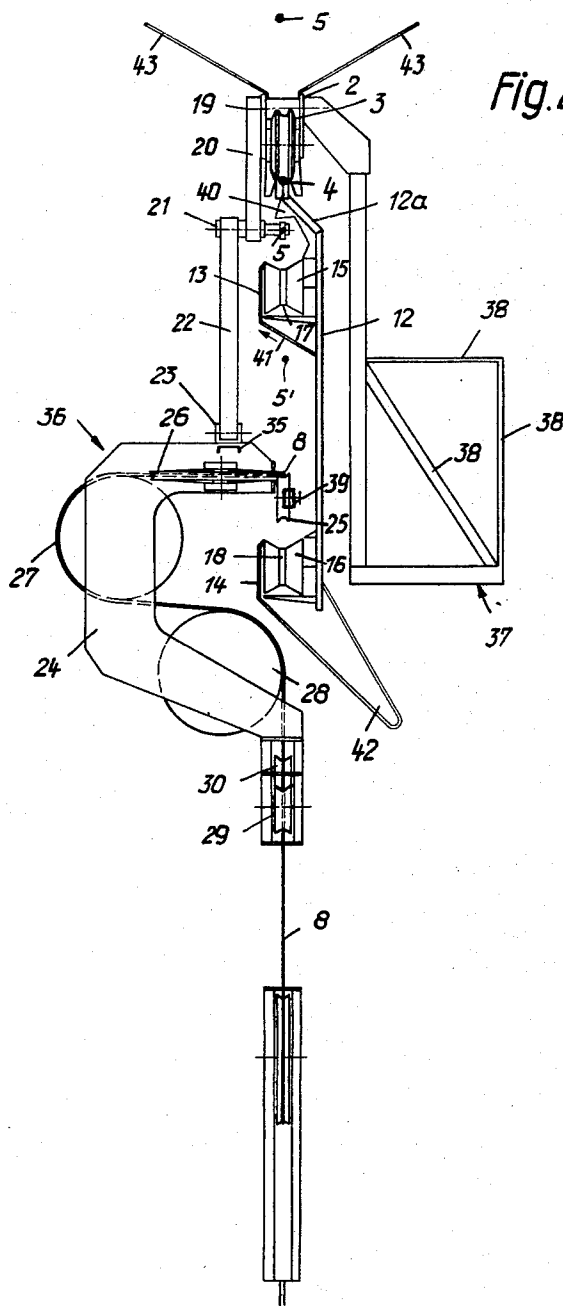
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2 Sheets-Sheet 2



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CABLE CRANES WITH ROPE CARRIERS HAVING FREE DISASSOCIATION WITH THEIR ROPES DURING PROXIMATE PASSAGE OF THE HOIST CARRIAGE

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To avoid excessive sag of the traction rope and hoisting rope of cable cranes, rope carriers are used, which are suspended from the track rope and are provided with supporting pulleys for the traction rope and the hoisting rope. These carriers are usually slidable on the track rope and are successively driven by stops into their operative position as the carriage moves under the action of the traction rope. In these conditions, the number of carriers which must be provided near each tower of the cable crane is the number required to support the traction and hoisting ropes over the entire length of the track rope. Carriers have already been proposed which are secured to the track rope. These carriers are of a tong-like construction and symmetrical with respect to the vertical plane of the track rope; as the carriage approaches they are opened by the carriage to allow the latter to pass and they close again behind it. This construction is very complicated. Parts of the carriage or other stops strike the carriers in either case, so that the speed of travel is limited by the violence of the impacts and the resultant rapid wear. The object of the invention is to obviate these disadvantages. It relates to a cable crane with carriers which are secured to the track rope and which are provided with pulleys to support the traction and hoisting ropes, said ropes at the carriage having a smaller distance from the track rope than the distance between the corresponding supporting pulley and the track rope. The invention is characterized in that the rope carrier has a downwardly extending arm on one side of which are mounted the two supporting pulleys, the latter being freely accessible from the side opposite the arms; and that the cable crane carriage is so constructed that it can travel past the carrier without touching the same, the hoisting rope being deflected in the carriage, at the level of the hoisting rope supporting pulley, out of the track plane towards the opposite side to the said arm.

One example of embodiment of the subject of the invention is illustrated in the drawing, wherein:

FIG. 1 is a side elevation of the carriage and rope carrier of a cable crane;

FIG. 2 is an end view of FIG. 1, and

FIG. 3 is a plan view of a detail.

The carriage 1 of a cable crane comprises two trolleys 2 each with four runner wheels 3 running on a track rope 4 fixed between two towers (not shown). An endless traction rope 5 extends over driving and return pulleys mounted on the towers and its ends situated in the bottom run are secured to the carriage 1 at 6. The top run of the traction rope is normally at a greater distance from the track rope 4 than illustrated in the drawing. A hook block 7 is suspended from the carriage 1 by means of a hoisting rope 8 and one end thereof is secured to one of the towers while its other end is connected to the rope drum of a winch provided at the other tower.

To prevent excessive sag of the traction rope 5 and, more particularly, of the hoisting rope 8, carriers 9 are provided on the track rope 4, only one such carrier being

illustrated in the drawing. The carrier 9 has two rope clips 10 which are clipped to the track rope 4, part of the top of the track rope being left free to avoid obstructing the runner wheels 3. An arm 12 is pivotally connected to the clips 10 at 11 so as to be rockable in a transverse plane and always assume a vertical position. The pivot 11 is required because the towers are conventionally provided with ball and socket joints at their bases and can be luffed to a certain extent in places perpendicular to the track rope 4 to enable the position of the latter to be adjusted laterally. Two supports 13 and 14 are provided on the arm 12 and carry supporting pulleys 15 and 16 for the ropes 5 and 8 respectively. The pulleys 15 and 16 are of double conical construction and are relatively wide to ensure that the ropes 5 and 8 can enter the actual guide grooves 17 and 18 of the said pulleys 15 and 16. To ensure that these guide grooves 17 and 18 are situated in the vertical plane passing through the track rope 4 (hereinafter referred to as the track rope plane) the arm 12 is appropriately cranked at the top at 12a.

The carriage 1 is of a construction such that it can pass the carrier 9 and the traction rope 4 and the hoisting rope 8 outside the carriage 1 are nevertheless always in the vertical plane passing through the track rope 4. To this end, a vertically descending arm 20 is pivotally connected to each of the trolleys 2 at 19 and the bottom end of each such arm is pivotally connected to another vertically descending arm 22 at 21. A frame 24 containing six pulleys 25-30 over which the hoisting rope 8 extends is pivotally connected to the bottom end of the arm 22 at 23. The pulley 25 is situated in the track rope plane, the pulley 26 is situated in a horizontal plane and the pulleys 27 and 28 are situated in a vertical transverse plane. The four pulleys 25 to 28 ensure that the hoisting rope 8 is so guided that it is deflected out of the track rope plane in the region of the carriage 1 and escapes the guide pulley 16. The two pulleys 29 and 30 between which the hoisting rope 8 passes prevent the hoisting rope 8 from jumping out of the rope pulley 28 in the event of any rocking movements of the hook block 7.

At the bottom the two frames 24 are rigidly interconnected by a longitudinal member 31, which consists of two parallel elements and in the centre of which is mounted a sheave 32 situated in the track rope plane. Two sheaves 33 mounted symmetrically in the hook block 7 are also disposed in the same plane and it will be apparent that the entire configuration of the hoisting rope 8 together with the pulleys 25 to 30 mounted in the two frames 24 and with the hook block sheaves 33 is symmetrical with respect to the vertical transverse plane passing through the axis of the sheave 32. It will also be apparent that the sheaves 32 and 33 together with their bearing elements 31 and 7 form a block with a 4:1 power/load transmission ratio.

The bottom ends of the arms 20 are interconnected by a longitudinal member 34 and the bottom ends of the arms 22 are interconnected by a longitudinal member 35. The fastening 6 (not shown in detail) of the ends of the traction rope 5 are situated at the ends of the longitudinal member 34 and in the track rope plane. The pivots 21 and 23 are provided to ensure that the carriage 1 can adjust itself to the track rope local shape which occurs in the zone of the two trolleys 2 so that the same are not situated exactly on a straight line. At the carriage 1 (i.e., at 6) the distance between the bottom run of the traction rope 5 and the track rope 4 is less than the distance between the top periphery of the supporting pulley 15 and the track rope 4. Similarly, at the carriage 1 (i.e., at

the top periphery of the pulley 25) the distance between the hoisting rope 8 and the track rope 4 is less than the distance between the top periphery of the supporting pulley 16 and the track rope 4.

It will be apparent that as the carriage 1 approaches the carrier 9 the ropes 5 and 8 lift away from the supporting pulleys 15 and 16 and as the carriage 1 moves away from the carrier 9 the said ropes drop on the said pulleys again. In the position shown in FIG. 1, the traction rope 5 and the hoisting rope 8 are not yet supported by the pulleys 15 and 16; this occurs only when there is a relatively considerable distance between the carriage 1 and the carrier 9.

Reference 36 denotes the whole device used to fasten the traction rope 5, guide the hoisting rope 8, and suspend the hook block 7. On its side remote from the trolleys 2, a platform 37 is provided, with a guard rail 38. This platform 37 also serves as an approximate counterweight for the device 36 to ensure the normal position of the carriage as illustrated, such position naturally requiring that the four runs of the hoisting rope 8 in the block are situated in the track rope plane.

Various safety precautions are taken to ensure that in the event of improper and jerky operation or any other disturbances, for example the dropping of loads or the like, the ropes 5 and 6 do not co-operate with the supporting pulleys 15 and 16 other than in the manner required, and in order to prevent either rope from skipping one of these supporting pulleys. Firstly, the two frames 24 are interconnected by a longitudinal guide member 39 in addition to the longitudinal member 31, the member 39 projecting beyond the frames 24 on each side and being formed with end portions bent at a slight angle to form edges 39a (see FIG. 3), whose ends are at the largest distance from the vertical plane of the carrier arms 12. It will be apparent that if the carriage is not situated correctly in the track rope plane but too near the carrier 9 as it approaches the carrier, the carrier is pushed away by the edges 39a so that the pulleys 25 cannot be damaged and the hoisting rope 8 subsequently reliably drops on to the supporting pulley 16.

A catcher rib 40 is also provided on the carrier 9 at the place where the arm 12 bent at 12a and in the event of oscillation of the traction rope 5 in the track rope plane or in the event of lateral oscillations towards the arm 12, catches the traction rope 5 and thus holds it in the vicinity of the supporting pulley 15.

A guide device 41 is also provided beneath the support 13 and consists of one or more inclined rods or bars. If the traction rope 5 should for some reason get beneath the supporting pulley 15 of a carrier 9 and, for example, be in the position shown at 5', it slides laterally upwards along the device 41 when the carriage 1 next approaches this carrier 9, as indicated by the arrow, so that it is once again in a position above the supporting pulley 15.

Similarly, an inclined guide device 42 for the hoisting rope 8 is provided beneath the supporting pulley 16.

Finally, at the top of each of the trolleys 2, there are provided two catchers 43 which in cross-section have the form of the arms of a V and which are intended to catch the top run of the traction rope 5 if the latter for some reason is no longer tensioned sufficiently to maintain a normal minimum distance from the track rope.

In comparison with the slidable or tongs-like carriers mentioned in the introduction to this specification, the carriers 9 described have considerable advantages. Not only is there a considerable saving in material and labour for their production so that cost price is reduced, but their wear is also much less in operation while they also permit a higher speed of travel of the carriage. The reduced wear and higher speed of travel are obtained because the violent impacts to which conventional carriers are subjected at high speeds are obviated with the carriers described. In view of these advantages, the

somewhat more complicated construction of the carriage and the hoisting rope guide system are quite unimportant. I claim:

1. A cable crane comprising a track rope, means for supporting said track rope, a carriage movable along said track rope in the vertical plane through said track rope, a traction rope attached to said carriage for moving said carriage along said track rope, a hoisting rope, means on said carriage supporting said hoisting rope, a hook block supported by said hoisting rope, a rope carrier secured to said track rope, a downwardly extending arm on said rope carrier, means on said rope carrier for supporting said traction rope and said hoisting rope, and means on said carriage for deflecting said hoisting rope out of the vertical plane through the track rope at the level of said hoisting rope supporting means on said carriage.

2. A cable crane as claimed in claim 1 in which there is provided at least one sheave in the hook block, and in which the carriage comprises two trolleys running on said track rope, two frames pivotally suspended from said trolleys and disposed to one side of the vertical plane through said track rope, at least one longitudinal member interconnecting said frames and a plurality of pulleys carried in each frame to deflect the hoisting rope out of the vertical plane through the track rope and guide it to the sheave in the hook block.

3. A cable crane as claimed in claim 1 in which there is provided a longitudinally extending guide member on said carriage, the ends of said guide member forming guide edges which in the event of an abnormal inclined position of the carriage run on said rope carrier and thus re-establish the distance required between said carriage and said rope carrier to avoid damage and ensure correct operation of said supporting means on said carrier.

4. A cable crane comprising a track rope, means for supporting said track rope, a carriage movable along said track rope in the vertical plane through said track rope, a traction rope connected to said carriage for moving said carriage along said track rope, a hoisting rope, means on said carriage supporting said hoisting rope, a rope carrier secured to said track rope, a downwardly extending arm on said rope carrier, means suspending said arm so as to be rockable in a transverse plane, pulleys on said rope carrier for supporting said traction rope and said hoisting rope, and means on said carriage at the level of said hoisting rope supporting means on said carriage for deflecting said hoisting rope out of the vertical plane through the track rope.

5. A cable crane as claimed in claim 4 in which guide means are provided beneath said pulleys on said rope carrier so that in the event of a rope passing beneath a supporting pulley as a result of a disturbance the rope is deflected as the carriage approaches and the rope is once again situated above the relevant supporting pulley.

6. A cable crane comprising a track rope, means for supporting said track rope, two trolleys running on said track rope, two frames suspended from said trolleys and disposed to one side of the vertical plane through said track rope, means pivotally suspending each frame from its respective trolley, at least one longitudinal member interconnecting said frames, a counterweight suspended from said trolleys and disposed to the other side of the vertical plane through said track rope, a hoisting rope, means on each frame around which the hoisting rope passes and is deflected out of the vertical plane through the track rope, a traction rope secured to said frames whereby said trolleys and frames may be displaced along the track rope, a rope carrier secured to said track rope, a downwardly extending arm on said rope carrier lying in the vertical plane through said track rope, and means on said rope carrier for supporting said traction rope and means on said rope carrier for supporting the traction rope and hoisting rope.

7. A cable crane as claimed in claim 6 comprising a top arm for each frame, a bottom arm for each frame and a longitudinal member interconnecting the top arms and having the traction rope secured to its ends wherein each frame is pivotally connected to the bottom end of the respective bottom arm which is in turn pivotally connected to the bottom end of the respective top arm which is in turn pivotally connected to the associated trolley.

8. A cable crane as claimed in claim 6, wherein said counterweight is in the form of a platform.

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