

(19)



Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number:

0 009 958
B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication of patent specification: **01.02.84**

(51) Int. Cl.³: **B 66 C 23/06**, B 66 D 1/39,
B 65 H 54/28

(21) Application number: **79302068.6**

(22) Date of filing: **01.10.79**

(54) **Combination crane.**

(30) Priority: **06.10.78 NO 783388**
18.07.79 NO 792376
06.08.79 NO 792578

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(43) Date of publication of application:
16.04.80 Bulletin 80/8

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(45) Publication of the grant of the patent:
01.02.84 Bulletin 84/5

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(84) Designated Contracting States:
DE FR GB NL SE

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Courier Press, Leamington Spa, England.

EP 0 009 958 B1

Combination crane

The present invention relates to a combination crane comprising two jib cranes which are separately rotatable about a common vertical stationary crane tower and pivotable at their bases about horizontal journals respectively mounted on separate vertically adjacent slewing annular base parts which consist of rings coaxially mounted on the tower by means of annular bearings, said crane tower supporting rotatable top pieces carrying rope pulleys for the luffing ropes and the hoisting ropes.

From Swedish printed publication No. 384 196 there is known a combination crane comprising two crane jibs, each of which at their lower end is affixed to a rotatable supporting ring. Between each supporting ring and the top of the crane tower there is arranged a rigid vertically extending beam, and each rigid beam carries rope winches for the lifting and luffing operation of the individual jibs.

The present invention aims for a crane structure in which the rigid vertically extending beams are eliminated, and in which the wires for lifting and luffing operations are not exposed to weather along the crane tower.

From GB—A—334 396 there is known a crane with two jibs and further comprising a common gear ring attached to the crane tower. The individual externally mounted slewing means for the two jibs are mounted on individual supporting rings for engagement with the common gear ring for slewing operation of each crane jib, the two supporting rings being separated by the gear ring which is fixed to the crane tower. This arrangement is not likely to be efficient when the two jibs are to work in tandem, since an irregular synchronization during tandem operation may result in all side forces being adopted by one jib only, the crane jibs therefor having to be designed for a double maximum side load compared to the side load of one crane only. Besides, this known arrangement suffers from the disadvantage of requiring a separate foundation for each supporting ring, thereby making assembly and disassembly more difficult.

A somewhat similar arrangement, presenting similar problems, is shown in GB—A—1 233 419.

FR—A—1 577 034 and DE—A—1556466 disclose double cranes which do not allow passing of the various ropes through the crane mast, whereas US—A—3 446 362 and DE—A—1556461 disclose hoisting devices having a single boom only.

An object of the present invention is to provide a combination crane in which the structures to be slewed are simplified compared with previously known cranes of this type. In a combination crane as mentioned in the preamble, this object is, in accordance with the in-

vention, achieved in that each of the annular base parts is mounted on the upper side of a separate rolling bearing, the rolling bearing of the upper base part resting directly on the lower base part which through its rolling bearing rests on an annular foundation attached to the stationary crane tower.

The operation of such a combination crane is very flexible since each of the crane jibs may sweep across a large area, the two jib cranes in a very simple manner allowing co-operation for lifting twice as heavy loads as the rating of the individual jib cranes. Such a tandem operation of the jib cranes can be carried out either by suitable individual control of the respective cranes or with the agency of suitable mechanical devices holding the annular base parts together in the position in which the cranes are to work in tandem. The respective driving machineries for hoisting and luffing can then suitably be connected together mechanically for tandem operation.

When the two jib cranes are to operate in tandem, for example via a hoisting yoke, they will adopt parallel positions, the individual hoisting hooks being hooked onto each end of the hoisting yoke. However, during co-lifting between the two load jibs, the two jibs will generally not be loaded equally, and in that case the individual top pieces carrying the rope pulleys will be loaded unequally, so that a torque is imparted to the rotating element. If the rotating element is freely mounted it will rotate due to the unequal load, and the top piece carrying the ropes having the greatest load will be moved towards the crane jibs, whereas the other top piece will be moved in opposite direction. Due to the skew loading the top pieces will move so much that the ropes of the first jib crane will come in conflict with the ropes of the other crane. This condition will also be prevalent in those cases in which there is used more than one top piece for each jib crane, for example, one top piece for hoisting rope and one for luffing rope.

A further feature of the invention is therefore to the effect that the crane comprises means which force a rotating element which is mounted on the crane tower and carries rotatable top pieces having rope pulleys for luffing ropes and hoisting ropes to take a locked position relative to the crane jibs when these are adapted for tandem operation, so that the rotating element in the locked relative position is rotated synchronously with the slewing movement of the crane jibs about the crane tower.

The mentioned means may comprise a mechanical connection between the rotating element and one of the rotatable base parts, possibly a driving means therefor.

Alternatively, the means may comprise a separate driving unit for the driving element, which for example is controlled by the rotation of one of the base parts.

Other embodiments of the means may comprise elements serving to balance the forces which produce a torque on the rotating element.

Still another feature of the invention is to the fact that the ropes of the crane are connected to rope drums located on the outside of the crane tower, each of said rope drums comprising means serving to displace the rope drum itself in pace with the spooling on and spooling off of the associated rope, so that the rope path between the crane tower and the rope drum will be so to speak unchanged during the hoisting operations.

By means of such an arrangement every form of spooling apparatus is made superfluous, a fact which entails that the rope path onto the drum will be so to say unchanged. In other words the rope will in the area of the rope drum only be subjected to insignificant lateral movements relative to the predetermined guiding path, a fact which includes the advantage that the rope in this area so to speak will not be subjected to forces transversely to the spooling direction.

In connection with cranes comprising a hollow crane tower the rope drums or winches designed in accordance with the present invention, may be finished at the production plant with the hoisting machinery and rope winches mounted on the base portion of the crane tower, i.e. close to the crane tower. Accordingly, the complete crane may be delivered as a compact unit, which involves simplified assembly at the location or on the vessel where the crane is to be used.

In the following the invention will be further described, reference being had to the drawing, which illustrates embodiments of the combination crane according to the invention.

Figure 1 is a side view of a combination crane according to the invention.

Figure 2 is a top view of the crane in Fig. 1.

Figure 3 is a schematical section through a part of the crane tower of a variant of a combination crane, including means for controlling the movement of the rotating element.

Figure 4 is a schematical view of a prior art arrangement in a rope drum.

Figure 5 is a schematical view of an embodiment of a rope drum arrangement according to the present invention.

In Figures 1 and 2 there is schematically illustrated two jib cranes generally designated with 1 and 2, respectively, and which are connected to a vertical, hollow, stationary crane tower 3. The jib crane 1 comprises a jib 4 which at its lower end branches out in two end portions 5a, 5b, each of which is so attached to an attachment part 6 that the jib 4 can only be raised and lowered relative thereto. At the upper end of the jib 4 there is provided a top element

7 carrying first rope pulleys 8 over which luffing ropes 9 for raising and lowering of the jib 4 are passed. The top ropes 9 are also passed over rope pulleys 10 attached to a top piece 11 rotatably mounted at the top of the crane tower 3. From the rope pulleys 10 the luffing ropes 9 are passed down through the hollow crane tower 3 and to a not illustrated driving machinery serving to lengthen or shorten the luffing ropes 9, so that the jib 4 can be tilted about the attachment parts 6 to various raised or lowered positions. Between the horizontal and fully raised position of the jib it may cover an area of approximately 80°.

From other not illustrated driving means there are through the hollow crane tower 3 passed hoisting ropes 12 which are guided over rope pulleys 13 in the top piece 11 and via other rope pulleys 14 in the top element 7 at the upper end of the jib 4. From the rope pulleys 14 in the top element 7 the hoisting ropes 12 extend via freely depending rope pulleys 15, a load carrier formed as a hook 16 being attached to the rope pulleys 15 in the area thereof.

The second jib crane 2 is designed in so to speak the same manner as the jib crane 1, the jib crane 2 comprising the hitherto described parts included in the jib crane 1. In other words the jib crane 2 comprises a jib 4' having branched end portions 5a' and 5b' attached to attachment parts 6'. Further, the jib crane 2 comprises a top element 7' at the upper end of the jib 4' as well as a top piece 11' provided at the top of the crane tower 3 and being rotatably arranged at the top of the crane tower 3 and carrying rope pulleys 11' and 13' for luffing ropes 9' and hoisting ropes 12', respectively, which are passed over rope pulleys 8' and 14', respectively, in the top element 7'. Via a rope pulley 15' the hoisting rope 12' carries a hook 16'.

The attachment parts 6 and 6' to which the individual jibs 4 and 4' are connected at their lower end portions 5a, 5b, and 5a', 5b', respectively, are each welded to a base part 17 and 17', respectively, each of which is rotatably mounted about the stationary hollow crane tower 3. The base parts 17 and 17' are preferably designed as annular bodies mounted at various close levels and close to the base of the common crane tower 3, the lower base part 17' being attached to a ball ring 19' for thereby allowing rotation on an annular foundation 18 attached to the stationary crane tower 3. On the lower annular base part 17' there is provided a ball ring 19 on which the upper base part 17 is mounted for relative movement not only relative to the tower 3, but also relative to the lower base part 17'. The operation of the respective ball rings 19, 19' takes place by machineries which are mounted in the stationary hollow crane tower, each ball ring being equipped with an inner toothing with which a driving wheel of the driving machinery is in engagement through a not illustrated slot in the crane tower 3.

The upper part of the hollow crane tower 3 carries a rotating element 20 carrying the rotatably arranged top pieces 11, 11' and being mounted on the tower, for example with the agency of a suitable annular roller bearing. Thus, the top pieces 11, 11' can rotate not only about its own axis 11a and 11a', respectively, but also together with the rotating element 20 about the axis 3' of the crane tower.

During operation the two jib cranes 1, 2 can work in positions which are opposite to each other, as this is illustrated by solid lines in Figs. 1 and 2. In this working position each of the crane jibs may sweep across the base in an area covering approximately 360°, this area being limited only to the degree the hoisting ropes 12, 12' and luffing ropes 9, 9' can be twisted together in the hollow tower 3 without impeding a normal hoisting operation.

However, the two jib cranes 1, 2 can also be swung together to a mutually parallel position, as this is indicated with dotted lines for the jib 4" in Fig. 2. This parallel position may be adopted by the cranes by first swinging one of the jibs approximately 90° in clock-wise direction and the other jib 90° in a counter clock-wise direction. When the cranes have taken a mutually parallel position they may be locked in this position with the agency of suitable mechanical means. Thereafter, the two jibs 4, 4' may be slewed simultaneously approximately 360°, and the top pieces 11, 11' will during such a tandem swinging movement when the hoisting wires are not loaded, practically speaking not rotate about their own axes 11a and 11', respectively, but only together with the rotating element 20 at the top of the tower 3.

In this locked position the two jibs 4, 4' can work in tandem, for example over a common, not illustrated hoisting yoke, so that the nominal load relative to the individual jib cranes 1 and 2, respectively, can be increased to the double. It is to be understood that the hoisting machinery for the individual jib cranes can then be connected together for operation in tandem, an operation which may be carried out by the operator in a simple manner. Further, it is to be understood that the crane slewing machineries also work in tandem to produce twice as large slewing force as a single crane. A reconnection from individual operation to tandem operation may be to the effect of mechanically connecting together the two ball rings 19, 19' by the agency of simple mechanical means, for example by bolts passed through corresponding holes in the ball rings.

The above described combination crane is not only very versatile during operation, but also excels in having simple components which are easy to assemble and possibly replace. Thus, the foundation 18, the lower ball ring 19', the base part 17 and the upper ball ring 19 can in a simple manner be threaded onto the tower 3 during assembly, only the lowermost foundation

18 being attached to the very crane tower 3.

When the two jib cranes are to operate in tandem and take a mutual parallel position, the situation may arise that the two jibs during a co-lifting operation will be unequally loaded. In that case the respective top pieces 11, 11' carrying the rope pulley will be loaded unequally, so that a torque is imparted to the rotating element 20 at the top of the tower 3. If the rotating element 20 is freely mounted, it will rotate due to the unequal loading, and the top piece being subjected to the largest load will be moved towards the jib cranes, whereas the other top piece will move in the opposite direction. In the most unfavourable case the top pieces 11, 11' will move so much that the wires of the first crane jib will come in conflict with the wires of the other crane jib.

To avoid that such a conflict situation should occur, the combination crane comprises means which force the rotating element 20 to take a locked position relative to the crane jibs 4, 4' when these are adapted for tandem operation, and which means serve to rotate the rotating element 20 in this locked position synchronously with the slewing of the two crane jibs 4, 4'.

Such means for driving the rotating element synchronously with the slewing of the tandem connected jibs may be implemented in a series of various manners.

A mechanical connection between the rotating element and one of the base parts may be used, the mechanical connection being effective when the jibs are adapted for tandem operation.

Alternatively, the mentioned means may comprise a separate driving device for the rotating element. Such a driving device may be of hydraulic, pneumatic or electric type, and may be so connected that it is driven synchronously with the rotation of for example one of the base parts.

Possibly, the locked position of the rotating element relative to the tandem connected crane jibs may be achieved with the agency of elements serving to balance the unequal loads imparted to the top pieces carrying the rope pulleys during tandem operation. Such a balancing may for example be implemented with the agency of a connection which senses the unequal loading on the rotating element and which is so adapted that it shifts the point of attack of the loading forces, so that the torque imparted to the rotating element will become so small that the rotating element so to speak keeps a locked position relative to the crane jibs when these are adapted for tandem operation.

Referring to Fig. 3, there will in the following be described a non-limiting embodiment of a variant of a combination crane comprising means for mechanical connection between the top piece and the base parts.

In Fig. 3 there is schematically illustrated a section through a part of a crane tower 3a,

which at the top carries a rotatable rotating element 20a which in turn carries four rotatably arranged top pieces 20b, 20c, 20d and 20e with respective rope pulleys and rope guides.

Further, in Fig. 3 there is schematically indicated an upper ring 17a and a lower ring 17b corresponding to the above-discussed annular base parts 17 and 17' respectively.

In the illustrated embodiment the upper ring 17a is provided with toothings 21a which engage a gear wheel 22a attached to a shaft 23a.

During rotation of the upper ring 17a the shaft 23a will rotate synchronously therewith, said shaft being passed into a coupling which generally is designated with 24, and which serves to transfer the rotating movement of the shaft 23a to a vertical shaft 25. This extends from the coupling 24 via a gear 26 to a gear wheel 27 which engages a toothed ring 28 provided around the circumference of the rotating element 20a.

Preferably the coupling may be so designed that it is effective when the crane jibs are re-coupled from individual operation to tandem operation, the coupling being ineffective when the tandem operation terminates.

Possibly, the coupling 24 may be so designed that the power transfer to the shaft 25 may take place either from the upper ring 17a or the lower ring 17b, depending on which crane is chosen to be the master crane. In Fig. 3 this alternative is shown with broken lines indicating a shaft 23b extending from the coupling 24 and via a gear wheel 22b engaging a toothing 21b on the lower ring 17b.

The coupling 24 can for example be controlled from one or both driver's cabins and may be of electric, mechanical, hydraulic, pneumatic or other suitable type.

Alternatively the coupling 24 may be designed as a differentiation coupling which preferably is effective when the crane jibs are adapted for tandem operation.

The crane according to the present invention also comprises an arrangement wherein any spooling apparatus for the rope drums are made superfluous. In the following and with reference to Figs. 4 and 5 a prior art rope drum arrangement and a rope drum arrangement according to the invention, respectively, will be discussed.

In Figure 4 which schematically depicts a prior art arrangement in a rope drum, the drum itself or the winch is designated with 101, onto which is spooled a rope 102 which via pulleys 103 on a hydraulic spooling apparatus 104 is passed through a slot-shaped opening 105 in a crane tower 106. The drum 101 is driven via a gear 107 by for example a hydraulic or electric motor 108.

The spooling apparatus 104, which for example may comprise a hydraulic cylinder, serves for the guiding of the rope 102 when this is spooled onto or off the drum 101 for in this manner to utilize the total extension of the rope

drum. In connection with rope loads of several tons the stresses on such a spooling apparatus will, however, be very large, the pulleys 103 of the spooling apparatus and the remaining construction having to be dimensioned for adopting forces corresponding to the maximum rope load. Besides, such a lateral displacement reduces the life-time of the rope considerably, and the opening 105 in the crane tower 106 must be made very large to give room for the lateral movement of the rope. However, a large opening will weaken the crane tower structure, and the latter must in worst case be provided with suitable reinforcing means.

Differently from the arrangement illustrated in Fig. 4, the arrangement according to the invention, which is illustrated in Fig. 5, is not provided with any form of spooling apparatus. In this case, the rope drum or the winch is designated with 110, and the rope 111 is here shown spooled onto the one half of the drum 110, the rope 111 being guided through a small slot-shaped opening 112 in a hollow crane tower 113. The rotating movement of the drum is produced by a suitable driving means 114, for example a hydraulic, pneumatic or electric motor, connected to the drum 110 via a gear 115.

Differently from the drum 101 illustrated in Fig. 4, the drum 110 illustrated in Fig. 5 and designed in accordance with the present invention, is provided with means serving to displace the rope drum itself in pace with the spooling on and spooling off of the rope 111. The very means serving for the displacement of the rope drum in a direction substantially transversal to the guiding path of the rope through the opening 112, as this is indicated with the double arrow 116 in Fig. 2, may preferably comprise suitable not illustrated driving means serving to displace the drum 110 with its driving aggregate 114, 115 along rails 117. Such rails may for example be adapted for wheel operation or they may be indented bars for gear wheel operation. Possibly, the displacement of the rope drum 110 may take place by screw operation, all of which being synchronized with the spooling on and spooling off speed of the rope 111.

As mentioned above the arrangement illustrated in Fig. 5 is implemented without a spooling apparatus, since the displacement of the rope drum 110 itself entails the spooling of the rope along the total extent of the drum.

Because the rope 110 is only subjected to insignificant sideways movement relative to the predetermined guiding path between the drum 110 and the opening 112 in the crane tower 113, the rope in the area of the drum 110 will so to speak not be influenced in the lateral direction. This entails a prolonged lifetime of the rope, the opening 112 in the crane tower 113 being made very small compared with the opening 105 in the crane tower 106 illustrated in Fig. 4.

A rope drum comprising the arrangement according to the invention also entails the advantage of having the crane constructed on the production site with hoisting machinery and rope winches assembled on the base part of the crane tower, i.e. close to the crane tower, a fact which involves the delivery of the crane as a compact unit for simple and rapid assembly on the place of application.

Claims

1. A combination crane comprising two jib cranes (1, 2) which are separately rotatable about a common vertical stationary crane tower (3) and pivotable at their bases about horizontal journals respectively mounted on separate vertically adjacent slewing annular base parts (17, 17') which consists of rings coaxially mounted on the tower by means of annular bearings (19, 19'), said crane tower (3) supporting rotatable top pieces (11, 11'; 20b—20e) carrying rope pulleys (10, 10', 13, 13') for the luffing ropes (9, 9') and the hoisting ropes (12, 12') characterised in that each of the annular base parts (17, 17') is mounted on the upper side of a separate rolling annular bearing (19 resp. 19'), the rolling bearing (19) of the upper base part (17) resting directly on the lower base part (17') which through its rolling bearing (19') rests on an annular foundation (18) attached to the stationary crane tower (3).

2. A crane as claimed in claim 1, in which the rotatable top pieces (11, 11') carrying rope pulleys (10, 10', 13, 13') for the luffing ropes (9, 9') and the hoisting ropes (12, 12') for the crane jibs (4, 4') are mounted on a common rotating element (20) for rotating therewith about a common axis (3'), characterised in that the rotating element (20, 20a) which is mounted on top of the crane tower (3; 3a), and which carries rotatable top pieces (11, 11'; 20b, 20c, 20d, 20e) having rope pulleys for luffing ropes and hoisting ropes is engageable with means which force the rotating element (20, 20a) to take a locked position relative to the crane jibs (4, 4') when these are adapted for tandem operation, so that the rotating element (20, 20a) in the locked relative position is rotated synchronously with the slewing motion of the two crane jibs about the crane tower (3).

3. A crane as claimed in claim 2, characterised in that the means comprise a mechanical connection between the rotating element (20, 20a) and one of the base parts (17, 17'), or driving means for the rotating element (20, 20a).

4. A crane as claimed in claim 2 or 3 characterised in that the means comprise a separate controllable driving device for the rotating element (20; 20a).

5. A crane as claimed in any of claims 2 to 4 characterised in that the means comprise a coupling (24) which is effective when the crane jibs (4, 4') are recoupled from individual opera-

tion to tandem operation and which is disconnected when the tandem operation terminates, and that the coupling (24) is remotely controlled from one or both driver's cabins.

6. A crane as claimed in any of the preceding claims, characterised in that the ropes (111, Fig. 5) of the crane are connected to rope drums (110) located on the outside of the crane tower (3), each of said rope drums (110) comprising means serving to displace the rope drum (110) itself in pace with the spooling on and spooling off of the associated rope (111), so that the rope path between the crane tower (3) and the rope drum (110) will be effectively unchanged during the hoisting operations.

Revendications

1. Grue combinée comprenant deux grues à flèche (1, 2) qui peuvent tourner séparément autour d'une tour (3) de grue commune stationnaire verticale et peuvent tourillonner à leurs bases autour de paliers horizontaux respectivement montés sur des parties de base (17, 17') annulaires de pivotement séparées, verticalement adjacentes qui sont constituées par des anneaux montés coaxialement sur la tour au moyen de roulements (19, 19') annulaires, ladite tour (3) de grue supportant à son sommet des pièces rotatives (11, 11'; 20b—20e) portant des poulies de câbles (10, 10', 13, 13') pour les câbles (9, 9') d'érection des flèches et les câbles (12, 12') de levage, caractérisée en ce que chacune des parties de base (17, 17') annulaires est montée sur la face de dessus d'un roulement annulaire séparé (19 et respectivement 19'), le roulement (19) de la partie de base supérieure (17) reposant directement sur la partie de base inférieure (17') qui repose, par l'intermédiaire de son roulement (19'), sur une assise annulaire (18) fixée à la tour (3) de grue stationnaire.

2. Grue selon la revendication 1, dans laquelle les pièces de sommet (11, 11') rotatives, portant des poulies de câbles (10, 10', 13, 13') pour les câbles d'érection (9, 9') et les câbles de levage (12, 12') des flèches (4, 4') de grue sont montées sur un élément rotatif commun (20) pour tourner avec celui-ci autour d'un axe commun (3'), caractérisée en ce que l'élément rotatif (20, 20a) qui est monté au sommet de la tour (3, 3a) de grue, et qui porte à rotation des pièces de sommet (11, 11'; 20b, 20c, 20d, 20e) munies de poulies de câbles pour les câbles d'érection et les câbles de levage, peut venir s'engager avec un moyen qui force l'élément de rotation (20, 20a) à prendre une position verrouillée par rapport aux flèches (4, 4') de grue lorsque celles-ci sont adaptées pour fonctionner en tandem, de façon que l'élément rotatif (20, 20a) tourne, en position relative verrouillée, en synchronisme avec le mouvement de pivotement des deux flèches de grue autour de la tour (3) de grue.

3. Grue selon la revendication 2, caracté-

térisée en ce que le moyen de verrouillage comprend un liaison mécanique entre l'élément rotatif (20, 20a) et l'une des pièces de base (17, 17'), ou un moyen d'entraînement de l'élément rotatif (20, 20a).

4. Grue selon la revendication 2 ou 3, caractérisée en ce que le moyen de verrouillage comprend un dispositif séparé d'entraînement pouvant être commandé pour l'entraînement de l'élément rotatif (20; 20a).

5. Grue selon l'une quelconque des revendications 2 à 4, caractérisée en ce que le moyen de verrouillage comprend un accouplement (24) qui est effectif lorsque les flèches (4, 4') de grue sont réaccouplées à partir d'un fonctionnement individuel pour fonctionner en tandem, et qui se déconnecte lorsque le fonctionnement en tandem est achevé, et en ce que l'accouplement (24) est commandé à distance depuis l'une ou les deux cabines de conduite.

6. Grue selon l'une quelconque des revendications précédentes, caractérisée en ce que les câbles (111, Figure 5) de la grue sont reliés à des tambours (110) de câble situés à l'extérieur de la tour (3) de grue, chacun desdits tambours (110) de câble comprenant un moyen servant à déplacer le tambour (110) de câble lui-même en cadence avec le bobinage et le déroulement du câble (111) associé, de façon que le chemin du câble entre la tour (3) de grue et le tambour (110) de câble demeure effectivement inchangé pendant les opérations de levage.

Patentansprüche

1. Doppeldrehkran mit zwei Auslegerkränen (1, 2), die gesondert um einen gemeinsamen vertikalen ortsfesten Kranturm (3) drehbar und an ihren Sockeln um horizontale Lagerzapfen schwenkbar sind, die jeweils an gesonderten, in vertikaler Richtung aneinandergrenzenden, ringförmigen Sockeldrehteilen (17, 17') angebracht sind, die aus mittels Ringlagern (19, 19') koaxial am Turm angebrachten Ringen bestehen, wobei der Kranturm (3) drehbare Kopfstücke (11, 11'; 20b—20e) abstützt, die Seilrollen (10, 10', 13, 13') für die Einziehseile (9, 9') und die Hebezugseile (12, 12') tragen, dadurch gekennzeichnet, daß die ringförmigen Sockelteile (17, 17') jeweils auf der Oberseite eines gesonderten Ringwälzlagers (19 bzw. 19') gelagert sind und das Wälzlager (19) des oberen Sockelteils (17)

unmittelbar auf dem unteren Sockelteil (17') ruht, das über sein Wälzlager (19') auf einem am ortsfesten Kranturm (3) angebrachten ringförmigen Tragteil (18) ruht.

2. Kran nach Anspruch 1, bei dem die die Seilrollen (10, 10', 13, 13') für die Einziehseile (9, 9') und die Hebezugseile (12, 12') für die Ausleger (4, 4') tragenden drehbaren Kopfstücke (11, 11') an einem gemeinsamen Drehteil (20) für eine Drehbewegung um eine gemeinsame Achse (3') mit diesem angebracht sind, dadurch gekennzeichnet, daß das oben auf dem Kranturm (3, 3') angebrachte und drehbare Kopfstücke (11, 11'; 20b, 20c, 20d, 20e) mit Seilrollen für Einzieh- und Hebezugseile aufweisende Drehteil (20, 20a) mit Mitteln in Eingriff bringbar ist, die das Drehteil (20, 20a) in eine feste Stellung relativ zu den Auslegern (4, 4') bringen, wenn diese auf Tandembetrieb umgestellt sind, so daß das Drehteil (20, 20a) in der festgesetzten Relativstellung synchron mit der Drehbewegung der beiden Ausleger um den Kranturm (3) gedreht wird.

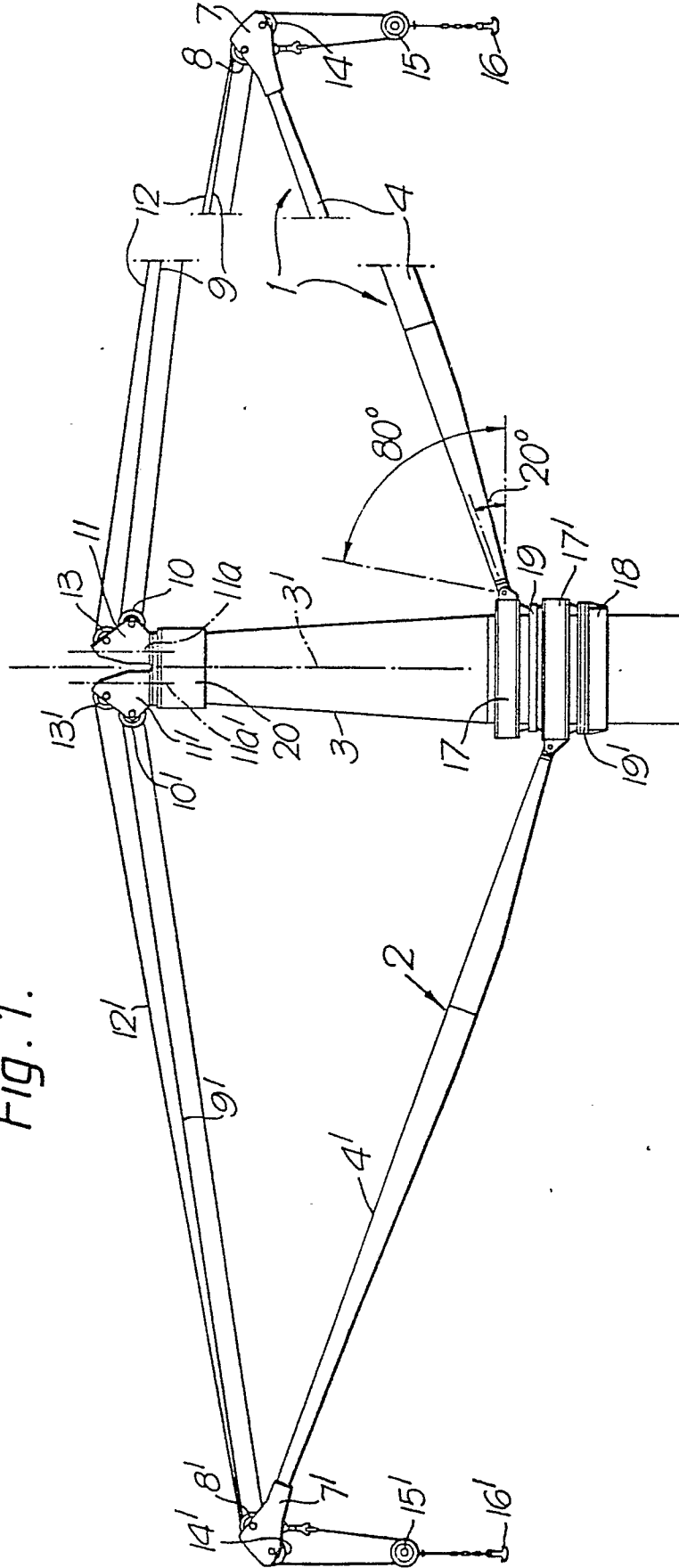
3. Kran nach Anspruch 2, dadurch gekennzeichnet, daß die Mittel eine mechanische Verbindung zwischen dem Drehteil (20, 20a) und einem der Sockelteile (17, 17') oder Antriebsmittel für das Drehteil (20, 20a) umfassen.

4. Kran nach Anspruch 2 oder 3, dadurch gekennzeichnet, daß die Mittel eine gesondert steuerbare Antriebsvorrichtung für das Drehteil (20; 20a) umfassen.

5. Kran nach einem der Ansprüche 2 bis 4, dadurch gekennzeichnet, daß die Mittel eine Kupplung (24) umfassen, die beim Wiedereinkuppeln der Ausleger (4, 4') von Einzel- auf Tandembetrieb wirksam und bei Beendigung des Tandembetriebs ausgekuppelt ist, und daß die Kupplung (24) von einem oder beiden Führerhäusern aus ferngesteuert ist.

6. Kran nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß die Seile (111, Fig. 5) des Krans mit außen am Kranturm (3) angeordneten Seiltrommeln (110) verbunden sind und jede Seiltrommel (110) Mittel zum Verlagern der Seiltrommel (110) selbst im Gleichschritt mit dem Aufspulen und Abspulen des zugehörigen Seils (111) aufweist, derart, daß der Weg des Seils zwischen dem Kranturm (3) und der Seiltrommel (110) während des Hebebetriebs praktisch unverändert bleibt.

Fig. 1.



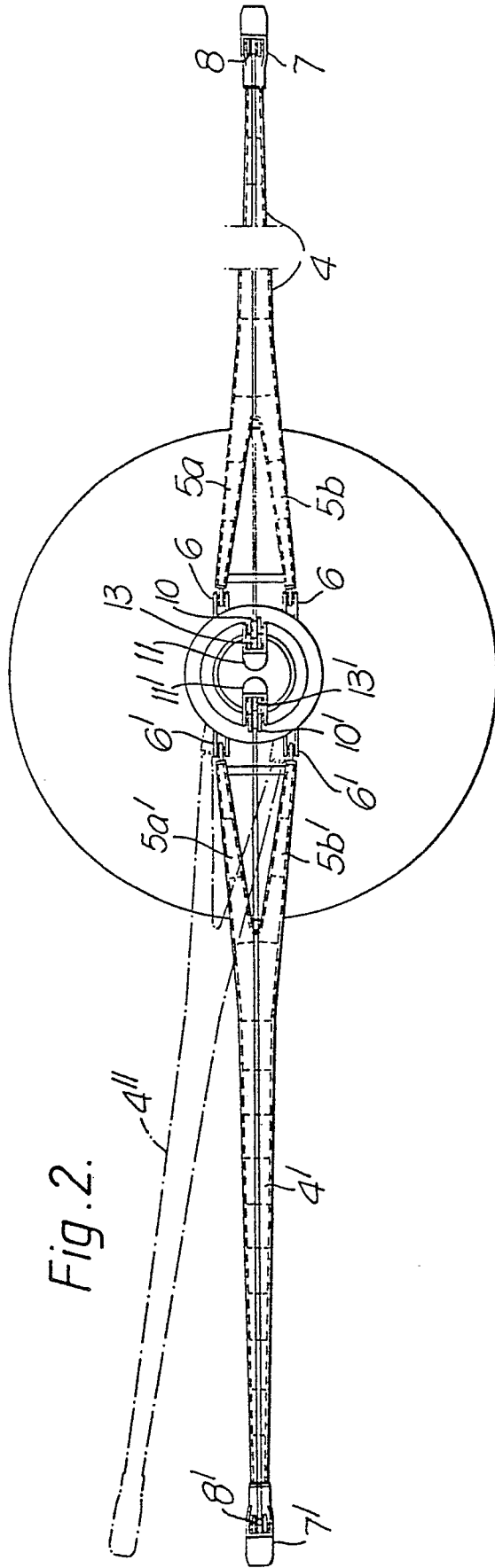


Fig. 5.

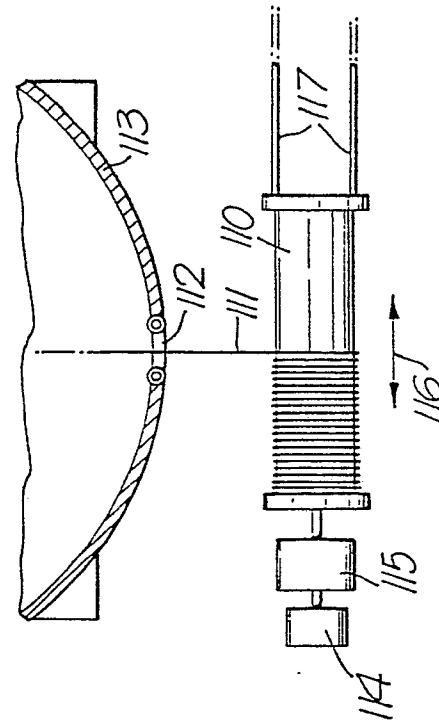


Fig. 4.

