(19) NL Octrooicentrum

(11) **2007189**

(12) A **OCTROOIAANVRAAG**

(21) Aanvraagnummer: **2007189**

(22) Aanvraag ingediend: **28.07.2011**

(51) Int.Cl.:
B66C 23/68 (2006.01) ***B66C 23/70*** (2006.01)

(30) Voorrang:
06.08.2010 DE 202010011131

(41) Aanvraag ingeschreven:
07.02.2012

(43) Aanvraag gepubliceerd:
15.02.2012

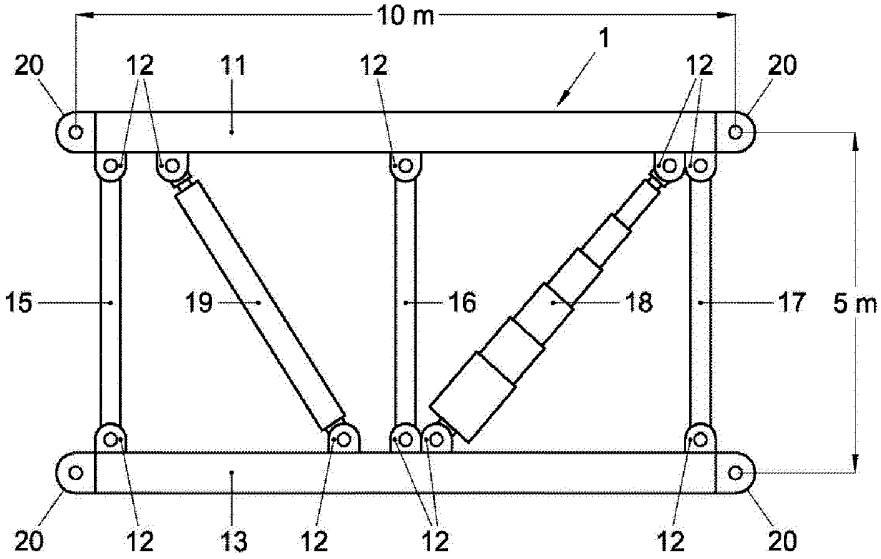
(71) Aanvrager(s):
Liebherr-Werk Ehingen GmbH te Ehingen/Donau, BONDSREPUBLIEK DUITSLAND (DE).

(72) Uitvinder(s):
Hans-Dieter Willim te Ulm-Unterweiler (DE).

(74) Gemachtigde:
ir. C.M. Jansen c.s. te Den Haag.

(54) **Lattice Piece and Crane.**

(57) The present invention relates to a lattice piece for a crane consisting of four corner posts and of null bars and diagonal bars connecting the same, wherein at least a part of the null and diagonal bars are foldably articulated to at least one corner post, and at least one adjusting unit is provided for performing the folding movement, wherein at least one drive is connected or connectable with at least one adjusting unit.



NL A 2007189

Title: Lattice Piece and Crane

The invention relates to a lattice piece for a crane and to a crane with such lattice piece.

Cranes, in particular large mobile cranes, are transported to the respective sites of use on public roads. Here, the rules of public road traffic are applicable, for example in Germany the rules of the Road Traffic Regulations. In these regulations, the maximum admissible weights and also dimensions of the crane to be transported are defined. In other countries similar regulations apply correspondingly.

These regulations lead to the fact that the dimension of the parts to be transported is limited, whereby the total size of the mobile crane and therefore the maximum achievable lifting capacity is limited.

Different approaches are already known from the present state of the art, in order to comply with the limitations during transport of the crane without having the reduce the achievable lifting capacity to an unnecessary extent.

It is proposed, for example, to completely demount the body of the crane, in particular the lattice boom of a lattice crane, and separately move the separated individual parts. However, the dimension of an individual lattice piece already can exceed the admissible transport size.

In DE 10 2006 060 347 A1 it is proposed to design the individual lattice piece so as to be foldable, in order to comply with the admissible transport dimensions. Such crane boom first is dismantled into its individual lattice pieces, wherein the same subsequently are folded and transported in this dismantled form.

A disadvantage of the above suggestion, however, consists in that the folding operation of the lattice piece must be effected manually. The larger the physical dimension of the lattice piece, the more force must be applied for the corresponding folding operation of the corresponding lattice piece. The potential size of manually foldable lattice pieces is limited thereby.

As proposed in DE 10 2006 060 347 A1, an auxiliary crane possibly is provided for erecting the foldable lattice piece, since the weight forces to be overcome are too high for manually erecting the lattice piece without machine force.

It is the object of the present invention to create a lattice piece which despite its large dimension remains suitable for road transport, wherein the folding operation of the lattice piece is simplified. In particular, a corresponding auxiliary crane should remain usable for other tasks or not be required at all.

In accordance with the invention, this object is solved by a lattice piece with the features of claim 1.

Accordingly, a lattice piece for a crane consists of four corner posts and of null bars and diagonal bars connecting the same. At least a part of the null and diagonal bars are foldably articulated to at least one corner post, wherein at least one adjusting unit is provided for performing the folding movement or the folding process. This provides for a lattice piece with a much larger dimension. The admissible transport dimension must only be taken care of in the folded condition.

Furthermore, at least one drive is provided in accordance with the invention, which is connected or connectable with at least one adjusting unit. Accordingly, the folding operation is accomplished automatically by means of

the drive. The expenditure of force is handled by the drive, so that distinctly larger foldable lattice pieces can be realized.

Preferably, for example, a lattice piece is proposed, which in use of the crane has a length of 10 m and a height of 5 m. The width of the lattice piece approximately is designed in the order of the height, wherein the same possibly can also be designed larger or smaller. In the folded condition, a height of about 3 m is achieved, whereby the relevant rules of the Road Traffic Regulations are maintained.

A plurality of such lattice pieces then form a lattice boom, in particular a main boom, a fly jib or also a derrick boom.

While the length of the lattice pieces can be chosen such that the length can be maintained during transport, the adjusting unit or the folding mechanism preferably is chosen such that a reduction of the height of the lattice piece is effected. The folding mechanism can of course also be used for reducing the lattice piece width, possibly in combination with the reduction in height.

Advantageous aspects of the invention can be taken from the sub-claims following the main claim.

Accordingly, the adjusting unit preferably comprises at least one partly telescopable diagonal bar. By telescoping at least one diagonal bar in and out, the lattice piece is folded from the crane operating position into the collapsed form for the transport.

Preferably, the telescopable diagonal bar comprises a hydraulically driveable hydraulic cylinder. The drive according to the invention, in particular a hydraulic pump with corresponding hydraulic lines, is connected with the

hydraulically driveable hydraulic cylinder or is designed to be connectable with the same. The drive is connected with the adjusting unit or with the hydraulically driveable hydraulic cylinder only on demand and effects either a retraction or an extension of the cylinder.

It is imaginable, for example, that the hydraulic cylinder is pressurized with hydraulic pressure by the drive. As drive means or hydraulic means a hydraulic oil preferably is provided. After removing the drive from the hydraulic cylinder, the same is maintained in the current position by the drive means, in particular by the hydraulic oil.

Furthermore, the lattice pieces advantageously can include corner posts which have fork-finger connections at their ends. Individual lattice pieces can be connected with each other by means of these connections to form lattice booms. To each corner post six null bars and four diagonal bars can be articulated.

In addition, at least a part of the null bars likewise can be designed telescopable, for example by using a hydraulically driveable cylinder. The adjustability of the null bars possibly can be driveable by a drive. For adjusting the null bars either the same or an additional drive can be used.

Particularly advantageously, the telescopable diagonal bars and/or the telescopable null bars each can be fixed in their end position via bolt connections, i.e. in the crane operating position or in collapsed form.

The invention furthermore relates to a drive, in particular to a Powerpack, which is connected or connectable with a lattice piece according to any of the preceding embodiments. For assembly or disassembly, the drive is connected with the adjusting unit of the lattice piece. During the crane work, the drive is separated from the lattice piece. An advantage consists in that for designing a

lattice boom only one single drive is required, which is connected with the lattice pieces one after the other. The drive provides the necessary energy for assembly or disassembly of the lattice pieces, i.e. for actuating the folding mechanism.

Furthermore, the invention is directed to a crane, in particular to a mobile crane or crawler crane, with at least one lattice piece according to any of the preceding embodiments. Furthermore, the crane preferably provides a drive, in particular a Powerpack for assembly or disassembly, i.e. for actuating the folding mechanism, of the individual lattice pieces.

Advantageous aspects of the invention can be taken from the embodiments illustrated in the drawings, in which:

Figure 1: shows a lateral representation of the lattice piece according to the invention in the erected form, and

Figure 2: shows a lateral representation of the lattice piece according to the invention in the collapsed form.

It is noted that the figures are only schematic representations of embodiments of the invention that are given by way of non-limiting examples. In the figures, the same or corresponding parts are designated with the same reference numerals.

Figure 1 shows a lattice piece 1 according to the invention in a side view. This foldable lattice piece 1 consists of four corner posts 11, 13, wherein only the corner posts 11, 13 located at the front in the drawing plane can be seen. Furthermore, a larger number of null bars 15, 16, 17 and diagonals 18, 19 are provided. Thus, four side faces are obtained for the lattice piece 1, of which two side faces located one behind the other each are constructed identically.

All connections between the corner posts 11, 13 and the null bars 15, 16, 17 or the diagonal bars 18, 19 are hinged about swivel axes 12. The swivel axes 12 are formed by bolts in a known manner.

The illustrated side face of the lattice piece 1 of the invention as shown in Figure 1 reveals the two corner posts 11, 13 extending parallel to each other, which are connected with each other via the null bars 15, 16, 17. Furthermore, the two diagonal bars 18, 19 extend to the opposite corner post 11 proceeding from the connecting point of the middle null bar 16 at the corner post 13. The side face of the lattice piece 1 located behind the same in parallel is constructed identically.

The lattice piece 1, as it is shown in Figures 1, 2, for example has a length of 10 m and a height of 5 m in the non-folded form. The width of the lattice piece 1 approximately lies in the order of the height.

To be able to transport this lattice piece on the road, it can be folded together due to the pivotal connection between the corner posts 11, 13 and the corner posts of the side face located behind the same. The collapsed form is shown in Figure 2.

The stability of the lattice piece 1 is achieved by the diagonally stretched-out diagonal bars 18, 19. The same prevent that the respective corner posts 11 opposite the corner posts 13 are folded into the collapsed position. In the illustrated embodiment, the diagonal bar 18 is designed to be actively variable in its length by means of the hydraulically driven cylinder unit. In the extended condition of the driven cylinder, the lattice piece 1 is erected and ready for the crane operation.

For folding together, the diagonal bar 18, i.e. the hydraulically driveable cylinder, is retracted. The retracting movement of the hydraulic cylinder effects a swivel movement of the upper side wall of the lattice piece 1 with the corner posts 11 to the left, wherein the null bars 15, 16, 17 swivel about their bearing points 12 at the corresponding corner posts 11, 13. The second illustrated diagonal bar 19 is telescoped out as a result of the swivel movement. For stabilizing the lattice piece 1 in the collapsed form, the telescopable diagonal bars 18, 19 are bolted in their corresponding end position.

Other than in the illustrated embodiment, it would be possible to likewise design the second diagonal bar 19 in the active form and as a hydraulically driveable cylinder. This would ensure synchronism of both sides or of the diagonal bars 18, 19.

To perform the swivel movement, an externally arranged Powerpack is provided, which on demand can be connected with the active diagonal bar 18 of the lattice piece 1. By means of the Powerpack, the hydraulically driveable cylinder of the diagonal bar 18 is pressurized with a corresponding hydraulic pressure which effects the corresponding folding movement of the lattice piece 1. After the assembly or disassembly of the lattice piece, the Powerpack is separated from the lattice piece 1. In particular, this offers the advantage that only one single Powerpack is required for mounting or demounting individual lattice pieces of a mobile crane one after the other.

Due to the folding mechanism explained, the lattice piece 1 according to the invention can reduce its height from 5 m to 3 m during operation of the crane. Since always only two directly adjacent corner posts 11, 13 are connected with each other, not only the height, but also the width of the lattice piece 1 could be reduced according to the same principle.

The lattice boom of a crane is composed of a plurality of the presented lattice pieces 1. The individual lattice pieces 1 are connected with each other via the fork-finger connections 20.

5

The invention is not limited to the embodiments described. Many variants will be apparent to the person skilled in the art. All variants are understood to be comprised within the scope of the invention as defined in the following claims.

Conclusies

1. Een vakwerkstuk voor een kraan bestaande uit vier hoekpalen en uit nulstaven en diagonale staven om hetzelfde te verbinden, waarbij ten minste een gedeelte van de nulstaven en diagonale staven vouwbaar zijn gearticuleerd aan ten minste één hoekpaal, en ten minste één steleenheid is voorzien voor het uitvoeren van de vouwbeweging, met het kenmerk dat ten minste één aandrijving is verbonden of verbindbaar is met ten minste één steleenheid.

2. Het vakwerkstuk volgens conclusie 1, met het kenmerk dat de steleenheid ten minste één gedeeltelijk telescoopbare diagonale staaf omvat.

3. Het vakwerkstuk volgens conclusie 2, met het kenmerk dat de telescoopbare staaf een hydraulisch aandrijfbare hydraulische cilinder omvat, die is verbonden of verbindbaar is met de aandrijving.

4. Het vakwerkstuk volgens conclusie 3, met het kenmerk dat de hydraulische cilinder door de aandrijfmiddelen in positie wordt gehouden, in het bijzonder door de hydraulische olie.

5. Het vakwerkstuk volgens één der voorgaande conclusies, met het kenmerk dat zes nulstaven en vier diagonale staven zijn gearticuleerd aan elke hoekpaal.

6. Het vakwerkstuk volgens één der voorgaande conclusies, met het kenmerk dat de nulstaven ten minste gedeeltelijk telescoopbaar en mogelijk aandrijfbaar zijn door de of een additionele aandrijving.

7. Het vakwerkstuk volgens één der voorgaande conclusies, met het kenmerk dat de telescoopbare diagonale staven en/of nulstaven elk kunnen worden vastgezet in hun eindpositie via boutverbindingen.

8. Het vakwerkstuk volgens één der voorgaande conclusies, met het kenmerk dat de verbinding tussen de hoekpalen en de diagonale staven en nulstaven ten minste gedeeltelijk flexuurbaar rigide zijn.

9. Een aandrijving, in het bijzonder een Powerpack, die is verbonden of verbindbaar is met een vakwerkstuk volgens één der conclusies 1 - 8.

10. Een kraan, in het bijzonder een mobiele kraan, met ten minste één vakwerkstuk volgens één der conclusies 1 - 8 en/of een aandrijving volgens conclusie 9.

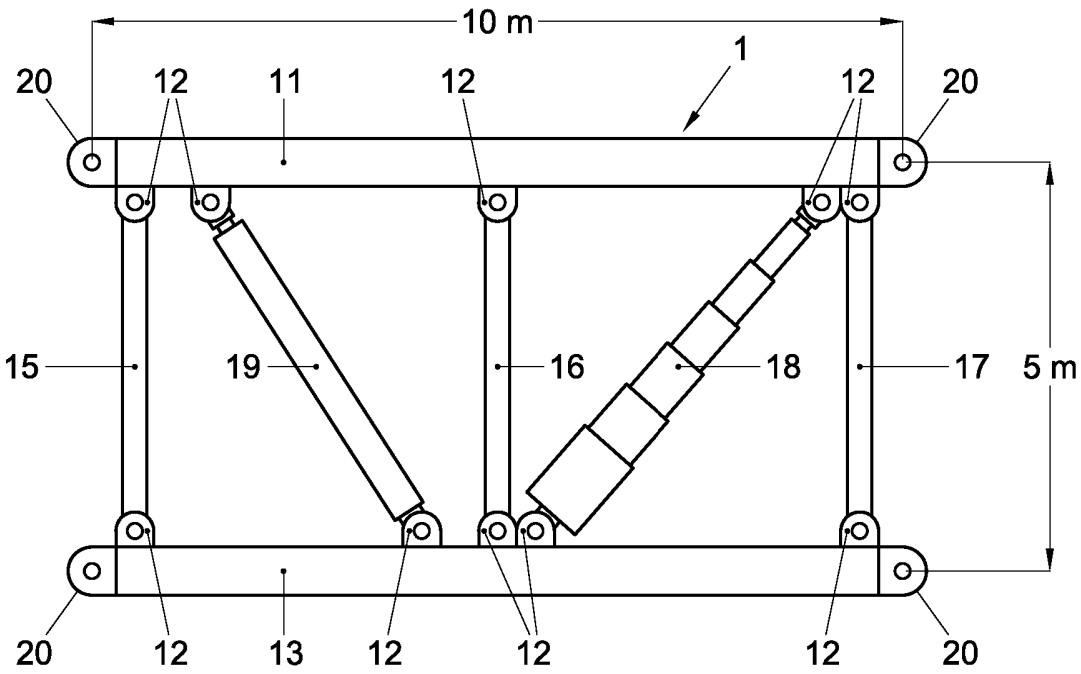

10 m
1
20
12
11
12
12
20
15
19
16
18
17
5 m
20
12
13
12
12
12
20

Fig. 1

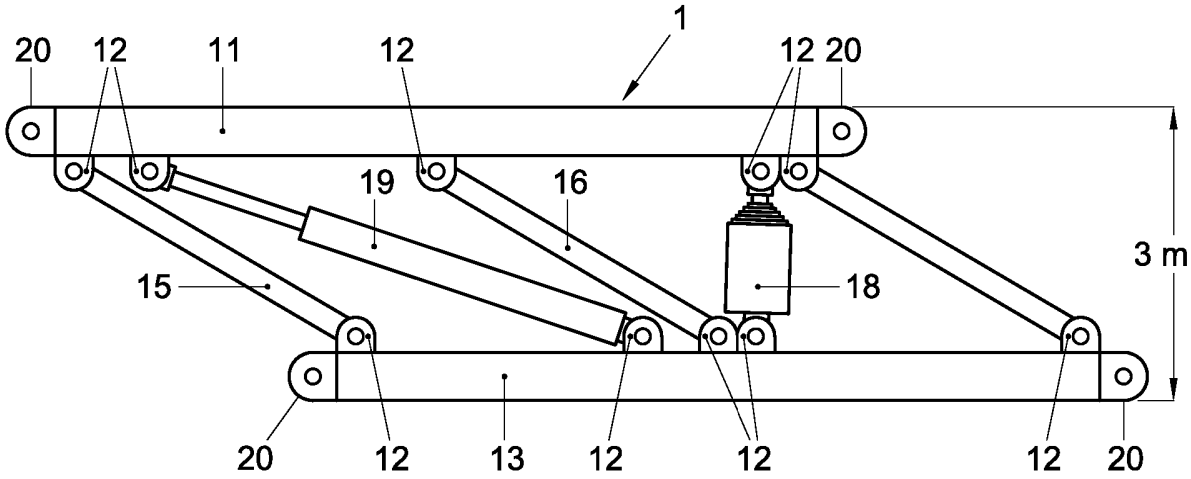

1
20
12
11
12
12
20
19
16
15
18
3 m
20
12
13
12
12
12
20

Fig. 2