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(54) MOBILE CRANE SYSTEM COMPRISING A MOBILE CRANE AND AN AUXILIARY DEVICE FOR ASSEMBLY OF A BRACING DEVICE

EINEN MOBILKRAN UND EINE HILFSVORRICHTUNG ZUR MONTAGE EINER VERSTREBUNGSVORRICHTUNG UMFASSENDES MOBILKRANSYSTEM

SYSTEME DE GRUE MOBILE COMPRENANT UNE GRUE MOBILE ET UN DISPOSITIF AUXILIAIRE POUR LE MONTAGE D'UN DISPOSITIF DE HAUBANAGE

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(73) Proprietor: **Terex Demag GmbH**
66482 Zweibrücken (DE)

(72) Inventors:
- **IRSCH, Michael**
  66822 Lebach (DE)
- **BACKES, Bernd**
  66649 Oberthal (DE)

(74) Representative: **Meissner, Peter E.**
Meissner & Meissner
Patentanwaltsbüro
Postfach 33 01 30
14171 Berlin (DE)

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US-A- 6 089 388

EP 1 735 233 B1

Description

TECHNICAL FIELD

[0001] The present invention relates to a mobile crane system. Such a mobile crane has a boom which can be erected in various luffing positions. A mobile crane of the mobile crane system according to the present invention is also equipped with a guying assembly adapted for the guying of the crane boom. Moreover, an attachment means is present on the boom with the aid of which the guying assembly can be releasably mounted on the mobile crane boom.

[0002] The invention also relates to a guying assembly of a crane boom of a mobile crane adapted for performing the mounting or removing without the aid of an auxiliary crane.

[0003] The present invention also relates to a mobile transportation apparatus which in turn is intended for the transport of a guying assembly form mobile crane and on the other hand is adapted for the mounting or the removing of the guying assembly without the aid of an auxiliary crane on or from the boom of the mobile crane to be guyed.

[0004] Finally, the invention relates to both a method for mounting and a method for removing a guying assembly of a mobile crane.

BACKGROUND OF THE INVENTION

[0005] It has been known for a long time that installing a guying assembly on the base section of the main boom of the telescopic boom crane, also known as "superlift", will increase the bearing load and reduce the bending of an extended telescopic boom of a telescopic boom crane. This well known arrangement comprises a gantry to be folded against the base section, wherein the gantry is connected, for example, to the foot section of the main boom via a guying means (boom stops) which is almost invariable in length, and with the head or collar of one of the inside telescopic sections via anther guying means (the boom pendants) variable in length. This type of guying, which reduces bending in the luffing plane, may be applied to a telescopic boom crane alone, but it may also be applied in the context of the arrangement of an additional fly jib mounted on the telescopic boom, such as a rigid or luffing latticework fly jib. Such a guying assembly with a gantry is shown, for example, in the prospectus by Mannesmann Demag Fördertechnik, Demac AC 1600; 04/06, pp. 5, 17 and 27 or in DE 31 13 763 A1.

[0006] However, the above described superlift guying assembly only reduces bending in the luffing plane of the crane boom, i.e. that plane which is formed by the boom pin the various steep positions. Terex-Demag GmbH & Co. KG / Germany has developed the above described guying assembly in such a way that now the boom is also made rigid with respect to lateral deformations, which helps to achieve considerable increases in bearing load, in particular in steep positions of the boom of the telescopic boom crane. The guying assembly, which is an entirely new development, has two separate guying arms that can be brought into a laterally protruding operational position, in particular, into a "V" position. This is to say that the guying arms, in their operational position, form an angle of between 0° and 90° to the luffing plane. Such a guying assembly is described, for example, in EP 1 065 166 A1. The references DE 200 23 223 U1 and DE 200 22 790 U1 also show such guying assemblies.

[0007] As has been mentioned, guying assemblies having laterally protruding guying arms can achieve considerable increases in the hearing load, in particular in steep positions of a boom of a telescopic boom crane when compared with the guying assemblies, as explained above, using a gantry. Moreover, such SSL guying assemblies can also function as a gantry when the guying arms have an essentially 0° position with respect to the luffing plane. This is why in due course, modifications of this guying assembly have been developed such as described in DE 202 03 443 U1 or EP 1 342 692 A2.

[0008] Both the guying assemblies having a gantry and guying assemblies having two separate guying arms which can be brought into laterally protruding positions can be mounted on the boom of a mobile crane as separate guying assemblies. For example, the initially mentioned Demag ΛC 1600 telescopic boom crane has a guying assembly wherein a frame can be removed from the boom together with the gantry. To do this, it is necessary, however, to use an additional crane for removal or mounting in order to mount or to remove the guying assembly with the gantry on or from the boom of the telescopic boom crane. One of the exemplary embodiments of a guying assembly with guying arms which can be brought into laterally protruding positions according to REP 1 065 166 A2 comprises a frame with the guying arms pivotably arranged thereon. This frame can be bolted to the telescopic boom in a releasable manner. In either case, for mounting or removing of the guying assembly, an auxiliary crane is necessary, which involves additional cost and also increases rigging times for such modern telescopic boom cranes with lateral guying. Finally, it must be noted that a hook block or the hoist line must be offset since otherwise the mounting of such prior art guying assemblies is not possible. After the completed mounting of this guying assembly on the buxom, the hoist line must be passed over it to the head of the boom.

[0009] In the above mentioned EP 1 342 692 A2, this problem has been recognized, but the alleged solution proposed therein involves extensive structural changes with respect to the above embodiments. It is proposed, for example, that the separate guying arms are placed, not mounted on a common frame, at first on consoles or comparable supports while the boom is lowered, and that they be released from the telescopic boom. The consoles or supports are arranged next to the telescopic boom at the mobile crane. Then the telescopic boom is luffed into an upper position without the guying arms. The guying

arms are then picked up by the telescopic boom itself from their intermediate storage on the consoles and then loaded onto a low bed truck or the like. For the purposes of mounting, the sequence of steps is reversed. The guying arms lying on a low bed truck or the like are lifted by the telescopic boom on which they arc to be mounted itself and placed on consoles arranged by the telescopic boom crane or its carrier in predetermined positions. Then the telescopic boom is lowered so that it lies between the guying arms positioned on the consoles. Then the guying arms are mounted on the telescopic boom.

[0010] While with the above approach a separate auxiliary crane could be eliminated, the entire guying assembly had to be structurally changed. Moreover, the rigging is time-consuming since various rigging steps have to be carried out involving a plurality of lifting processes of the mobile crane, since each individual guying arm has to be picked up from the transportation apparatus and placed on the consoles. Moreover with the arrangement according to the EP 1342 692 A2, a plurality of hydraulic connections tor hydraulic cylinders associated with the individual guying arms have to be connected to their corresponding counterparts on the telescopic boom crane, which also increases rigging times.

[0011] For sake of completeness the following documents are referred to. FR 2 759 040 A1 shows a crane of which the boom is mounted to a chassis unit, hinged about a point. A trailer carries a transit frame. For mounting and dismounting the boom, the frame and the chassis unit are connected at release points, and hinged arms are connected to the boom and the trailer bed. To dismount the boom, it is released at the point and a jack is extended, causing the boom to move on the hinged arms to rise and then drop onto the transit frame, with assistance from the jack. A guying assembly for a telescopic boom is not provided.

[0012] In US 5,484,069 a method and apparatus for self-assembling and self-disassembling a large capacity crawler crane are disclosed. The method uses the load hoist line of a crane to remove an equalizer from the boom. The method also uses a hydraulic cylinder to support, raise and lower the boom after the equalizer has been removed from the boom. Finally, the boom butt can be disassembled into several parts.

[0013] A mobile crane comprising a detachable telescopic boom is shown in DE 101 36 263 A1 (corresponds to US 2002027118 A). A part of the telescopic boom rests on a semitrailer and can be connected with a base portion of the telescope boom of the mobile crane by lifting it with the mobile crane boom itself. A guying assembly to be mounted on the telescopic boom is not provided.

[0014] US 5,642,821 shows a mobile crane including an undercarriage or lower crane carrying chassis, an upper load lifting and carrying chassis pivotally mounted on the lower chassis, a cab located on the upper chassis for operating the crane, a base section that can be swivelled about a horizontal axis, and a separate boom attachable to a free or operating end of the base section. The base section has a special construction such that with it alone especially crane operations can be performed. Attachment devices for attaching the separate boom are provided on the free end of the base section. The telescopic boom sections can be deposited on a semitrailer.

[0015] Finally, DE 200 02 748 U1 discloses a mobile crane comprising a guying assembly consisting of at least two guying elements. The two guying elements are connected to each other by a hinged cross member. The guying assembly can be turned over such that it rests on the telescopic boom during transportation. Such a guying assembly cannot be dismounted from the telescopic boom.

[0016] DE 28 33 535 shows a mobile crane comprising two independent mobile transport units which can be combined with each other. One mobile transport unit comprises at least one removable boom. The other mobile transport unit comprises a mobile crane chassis with a rotating deck arranged thereon. The boom can be removably mounted on the rotating deck.

[0017] US 6,089,388 discloses a mobile crane with a rotating deck supported on the vehicle chassis with a hoist mechanism on which rotating deck the fulcrum part of a telescoping jib which can be swivelled by hydraulic rams is supported. A counter-jib is provided on which ballast can be hung. To intall the counter-jib, it is placed by an auxiliary crane onto the retracted telescope jib lowered onto the vehicle in such a way that a supporting frame of the counter jib can be bolted to the rotating deck at a connecting point located on the rotating deck in the area of fulcrum of the fulcrum part of the telescoping jib.

[0018] In US 4,660,731 a telescope crane for heavy loads is shown comprising a telescopic boom, which is adapted to be coupled to a revolving superstructure and to be detaches from it for transporting. The boom vehicle is provided in its forward portion with a coupling structure for retaining a telescopically extensible part of the telescopic boom, and is provided in its rear portion with a lifting structure for supporting the boom. The lifting structure is so arranged that when it has been longitudinally aligned with the revolving superstructure, a coupling yoke, provided at the lower end of the telescopic boom, is adapted to be displaced by expending and retracting cylinders along tracks provided on the revolving superstructure to a position in which bearing eyes of the telescopic beam register with bearing bores oft he revolving superstructure. The revolving superstructure is provided with a pivot pin for coupling the boom to the revolving superstructure.

[0019] AT-B-334220 discloses a mounting assistance apparatus for removable assemblies of trucks, trailers or semi-trailers.

SUMMARY OF THE INVENTION

[0020] According to a first aspect of the present invention, a mobile crane system is proposed, comprising a mobile crane. In this mobile crane system, the mobile

crane has a crane boom, a guying assembly with at least one guying element for guying the crane boom and an attachment means on the crane boom with the aid of which the guying assembly can be mounted on the crane boom in a releasable manner.

[0021] The invention is based upon the idea of mounting the guying assembly as a whole on the crane boom in a releasable manner, but to hold the entire guying assembly in a mounting height by means of a mounting assistance apparatus so that the crane boom itself may be introduced underneath it in order to be connected to or released from it. This means that by using the system according to the present invention the entire guying assembly can be lifted to the desired mounting height in a single lifting operation and supported in this position by the mounting assistance apparatus so that the mounting of the guying assembly on the boom can be carried out quickly.

[0022] A guying assembly can be one of the various embodiments mentioned above. This means that a guying assembly for a mobile crane System according to the present invention, can be a gantry. However, a guying assembly may also be used with two guying elements in the form of the two individual guying arms. In an exemplary embodiment of the present invention, the guying assembly in either variant may comprise all the hydraulic cylinders for erecting the guying elements and/or the electrical or control elements necessary for the Operation of the guying assembly. An advantage of the latter exemplary embodiment of the present invention with two guying arms is that, unlike the EP 1 342 692 A2, each guying arm does not have to be individually mounted, but that the two may be commonly mounted on or removed from the boom in one rigging step. It must also be noted that a boom of a mobile crane for the mobile crane system according to the present Invention may either he a telescopic boom or a lattice boom of a mobile crane.

[0023] Another aspect of the present invention relates to a method of mounting a guying assembly on a boom of a mobile crane. Such a method according to the present invention can comprise, for example, the following process steps. The guying assembly is lifted on a hoist line to a mounting height by means of the same mobile crane on the boom of which the guying assembly is to be mounted. The guying assembly being lifted to the mounting height is held at this height by means of struts. The guying assembly is then released by the hoist line of the mobile crane and the boom introduced underneath the guying assembly. Then the guying assembly is connected to the boom.

[0024] Another exemplary embodiment of the method according to the present invention provides that the struts are pivoted from a transportation position into the supporting position after the guying assembly has been raised.

[0025] Another exemplary embodiment of the method according to the present invention provides that the struts are mounted on the guying assembly after it has been raised.

[0026] Another exemplary embodiment of the method according to the present invention provides that the guying assembly is attached at at least three spaced suspension points. For example, the suspension points are positioned in such a way that the guying assembly can be lifted in an essentially horizontal position. As an alternative it is conceivable, however, that the guying assembly assumes an inclined position and that it is supported in this inclined position.

[0027] Another exemplary embodiment of a mounting method according to the present invention provides that the guying assembly is lifted to a mounting height by means of a lifting unit arranged on a mobile transportation apparatus. Then the boom of the mobile crane is introduced underneath the guying assembly held by the lifting unit. After this the guying assembly can be connected to the boom, for example, by bolting.

[0028] Another aspect of the present invention relates to a method of removing a guying assembly from a boom of a mobile crane. Such a method according to the present invention can comprise, for example, the following process steps. The boom is brought into an essentially horizontal luffing position. The guying assembly is brought into a transportation position, and the boom is introduced underneath the mounting assistance apparatus while the guying assembly is in the transportation position. Then the guying assembly is released from the boom and the boom is removed from under the mounting assistance apparatus.

[0029] Another exemplary embodiment of the removing method according to the present invention provides that the guying assembly is lifted with the aid of the same mobile crane and is placed on the mobile transportation apparatus.

[0030] Another exemplary embodiment of the removing method according to the present invention provides that the guying assembly has two guying arms which can be brought into at least one laterally protruding guying position and that the guying arms are folded back into the transportation position.

[0031] As already mentioned, according to an exemplary embodiment of the mounting method, the guying assembly can be lifted into an essentially horizontal or inclined position and be supported there. The same also applies to the removing method.

[0032] Another exemplary embodiment of the removing method according to the present invention provides that the guying assembly is lifted to the mounting height by means of a lifting means provided on and attached to a mobile transportation apparatus.

[0033] Basically with respect to both the mounting and the removing method, the guying assembly can be lifted to the mounting height by the same mobile crane on which the guying assembly is to be mounted. As an alternative, in can be raised to the mounting height by a lifting means present on the transportation apparatus.

[0034] For completeness, it should finally be noted that in the present case a boom can principally be a telescopic boom and a lattice boom. A telescopic boom comprises a base section arranged on the superstructure of a mobile crane with telescopic sections extensible from and retractable into said base section. A lattice boom can consist of a plurality of lattice sections which, mounted one after the other, form the boom. Both a telescopic boom and a lattice boom can be extended by a fly jib. The fly jib is in turn attachable on the boom in a rigid or luffable manner.

BRIEF DESCRIPTION OF THE DRAWINGS

[0035] For further explanation and for a better understanding of the present invention, a number of exemplary embodiments will be described in the following with reference to the accompanying drawings, in which:

Fig. 1 is a schematic perspective view diagonally from the top of a mobile crane with a telescopic boom in the process of lifting a guying assembly off a semitrailer;

Fig. 2 is a schematic view of the guying assembly as shown in Fig. 1 with the struts folded down;

Fig. 3 is a schematic elevational view of the guying assembly shown in Fig. 2 with the struts folded down;

Fig. 4 is a detailed perspective view of the process step shown in Fig. 1;

Fig. 5 is an enlarged view of the arrangements shown in Figs. 2 and 3;

Fig. 6 is a perspective view diagonally from the top of a mobile crane with a lowered telescopic boom being introduced underneath the supported guying assembly;

Fig. 7 is a perspective view similar to the one of Fig. 6 with the guying assembly mounted on the base section of the telescopic boom of the mobile crane;

Fig. 8 is a perspective view similar to the one of Fig. 7 with the guying arms erected;

Fig. 9 is a perspective view similar to the one of Figs. 7 and 8 with an extended telescopic boom;

Fig. 10 is a plan view of a mobile crane having a guying assembly according to Figs. 7 to 9, with the guying arms protruding laterally, i.e. extended in a V-like configuration;

Fig. 11 is a schematic elevational view of a semitrailer on which a lifting means is mounted on which in turn a guying assembly lies in a transportation position;

Fig. 12 is an elevational view corresponding to the one of Fig. 11, wherein the lifting means 4 is shown in a mounting position in which the guying assembly is raised; and

Fig. 13 is an elevational view similar to the one of Fig. 12, wherein the boom of a mobile crane is introduced underneath the guying assembly raised with the aid of the lifting means.

DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENTS OF THE PRESENT INVENTION

[0036] With reference to Figs. 1 to 10, a first group of various exemplary embodiments of the present invention will be described in more detail. In the perspective view shown in Fig. 1, two or more counterweights 3 are on a semitrailer 1 which are to be mounted on a superstructure 5 of a mobile crane 7. A guying assembly 9 is transported on the counterweights 3, which will be described in more detail with reference to the other figures below. The semitrailer 1 is transported to the desired worksite of the mobile crane 7 with the aid of a truck 2.

[0037] The mobile crane 7 shown here basically comprises a carrier 11 and the superstructure 5 already mentioned, which can be slewed about a vertical axis D. On the superstructure 5, a telescopic boom 13 is luffable into various steep positions about an essentially horizontal axis. The telescopic boom 13 comprises a base section 15 attached on the superstructure 5 to be pivoted about the horizontal axis, and a plurality of telescopic sections 17 extensibly and retractably supported at the base section 15. In the configuration shown here, the entire mobile crane 7 is supported via hydraulic supporting elements 19 known per se.

[0038] With the exemplary embodiment of the present invention shown here, an attachment means for guying assembly 9 is present at base section 15 of telescopic boom 13 of mobile crane 7. They may be, for example, four spaced bolting points 21, schematically shown in Fig. 6, however only on one side of base section 15. The two other bolting points 21 are symmetrically arranged with respect to the longitudinal axis of boom 13 and thus hidden.

[0039] Guying assembly 9 comprises a frame 9a on which two guying arms 9b are erectable about a transverse axis Q, and which, as will be shown below, are laterally pivotable with respect to the luffing plane. The hydraulic cylinders 9c and 9d necessary for erecting and laterally protruding the guying arms 9b are arranged on frame 9a. Four eyes 9e are also provided on the frame as attachment points. With the aid of these attachment points, the guying assembly is raised, as shown in Figs.

1 to 3, from semitrailer 1, for example, in a position which is essentially horizontal so that struts 23 may be extended and folded down as shown in Figs. 2 and 3. As an alternative, the mounting assistance apparatus of struts 23 may also be formed as an independent frame onto which guying assembly 9 is placed.

[0040] With the embodiment shown here, struts 23 are arranged at guying assembly 9 and can be pivoted back and forth between transportation and mounting positions.

[0041] The individual technical details can be seen even better from the perspective view in Fig. 4. A hoist 25 is fixed to the four attachment points 9e suspended from a load hook 27. Load hook 27 can be raised and lowered by means of a hoist line 29 of mobile crane 7.

[0042] With reference to Fig. 6, guying assembly 9 is placed on struts 23. Boom 13 of mobile crane 7 is lowered in an essentially horizontal position and is in the process of being introduced underneath guying assembly 9. The introduction process is carried out until the front bolting points 21 on base section 15 come into registration with the corresponding bolting points 29a. Then the front bolting points 29a and 21 on base section 15 are bolted on to the other. By slightly luffing up boom 13, the rear bolting points 29b on guying assembly 9 are brought into registration with the corresponding bolting points 21 at base section 15 of boom 13, and also bolted. By further luffing up the boom, struts 23 are lifted off the ground and can either be removed or folded back. Then boom 13 and guying assembly 9 now attached thereto by means of bolts is completely prepared for further rigging. All that remains is that the hydraulic and electrical connections (not shown) of guying assembly 9 be connected to the corresponding connections on mobile crane 7.

[0043] The condition in which guying assembly 9 is bolted to base section 15 is also shown in Fig. 7 in an enlarged view. From the basic position as shown in Fig. 7, after connecting the hydraulic connections, the two guying arms 9b are pivoted into an essentially vertical position by means of hydraulic cylinders 9d. Guy ropes or back hitches 30, which are either connected to superstructure 5 or guying assembly 9, are pulled up. The free ends of guying arms 9b are connected to back hitches 30. For example, back hitches 30 can have pivot links 31.

[0044] As also shown in Fig. 8, the guying assembly 9 shown here also comprises further hydraulic cylinders 9c serving to pivot guying arms 9b to the outside, i.e. into a V-like configuration, as shown in Fig. 10.

[0045] Once the position according to Fig. 8 has been assumed, guy ropes 32 connected to the free ends of guying arms 9b are connected to the front end of innermost telescopic section 17, and the telescopic sections are extended. This is followed by the lateral extension of the two guying arms 9b, as shown in Fig. 10.

[0046] As already mentioned, it is also common to configure guying assembly 9 without struts 23. Then the mounting assistance apparatus comprises two struts 23 and a separate frame (not shown) on which the struts 23 are laterally pivotable and perhaps also laterally extensible. The lateral extension can also be provided when struts 23 are integrated in guying assembly 9. The mounting assistance apparatus with struts 23 and the frame is then transported on the semitrailer together with the guying assembly.

[0047] It makes sense for the mounting assistance apparatus also to be placed on guying assembly 9. It is then raised in a similar way as shown in Fig. 1 and placed on struts 23. Then the guying assembly is placed on the mounting assistance apparatus with the aid of mobile crane 7. Otherwise the mounting method is carried out as shown in Figs. 2 to 10.

[0048] Another exemplary embodiment of the present invention is shown in Figs. 11 to 13. Here, a semitrailer 50 is shown in an elevational view, on which a lifting means 51 is mounted. Lifting means 51 comprises two spaced pillars 52. Guying assembly 9 can be raised from the transportation position as shown in Fig. 11 into the mounting position as shown in Fig. 12 by means of a hydraulic cylinder 53. It should be noted that the counterweights 3 also to be transported are not shown in Fig. 11. Guying assembly 9 additionally rests on these counterweights 3. The additional weights are only shown in phantom in Fig. 11.

[0049] The two pillars 52 are pivotable about a pivot axis 54. The pillars 52 have rest surfaces 58 which are not in abutment with guying assembly 9 in the position shown in Fig. 11, but serve as resting surfaces for guying assembly 9 in the supporting position, as shown in Fig. 12. Rods 57 are linked to pillars 52 which can be bolted to base section 55. For this purpose, rods 54 are bolted to base section 55 by means of bolts 56. This serves to fix pillars 52 in the mounting position as shown in Fig. 12. Guying assembly 9 has two support points or support forks 60 spaced from each other and resting on a support bolt 61 which forms a rotating support of the guying assembly about an essentially horizontal axis.

[0050] An exemplary variant of the embodiment of a transportation apparatus 50 according to the present invention can be that guying assembly 9 rests on pillars 52 rotatably, but also fixed in height. For this purpose, a releasable fixing means is present for fixing guying assembly 9 on pillars 52 (for example a transverse bolting in each of forks 60 so that support bolts 61 are locked in forks 60). By lifting guying assembly 9 by means of the mobile crane (similar to the one shown in Fig. 1), guying assembly 9 is brought from the transportation position as shown in Fig. 11 into the mounting position of Fig. 12 and then fixed there. Then the hoist is released from guying assembly 9, and finally the introduction position as shown in Fig. 13 is assumed. This exemplary embodiment has the advantage that for bringing the guying assembly from the transportation position into the mounting or removing position, hydraulic cylinders or the like are not necessary, which saves costs.

[0051] In Fig. 13, again, the front bolting is carried out first, then the boom is slightly raised and the rear bolting is carried out. Then the entire guying assembly which is

now bolted to telescopic boom 13 can be lifted off pillars 52. Then, again, only the hydraulic lines and/or electrical components need be connected, after which rigging can be continued.

[0052] As has been made obvious from the explanations of the various exemplary embodiments of the present invention, the removal can be done by carrying out the process steps in reversed order.

Claims

1. A mobile crane system, comprising

- a mobile crane (7), having:
- a crane boom (13),
- a guying assembly (9) with at least one guying element (9b) for guying said crane boom (13),
- an attachment means (21) on the crane boom (13) with the aid of which said guying assembly (9) is releasably attachable on the crane boom (13),

characterized by

- a mounting assistance apparatus (23) adapted for holding said guying assembly (9) in a state apart from the crane boom (13) in a mounting position making it possible for the crane boom (13) to be introduced underneath the guying assembly (9), wherein said mounting assistance apparatus and said guying assembly (9) are configured as a structural unit which can be mounted on or removed from the crane boom (13).

2. The mobile crane system according to claim 1, wherein said mounting assistance apparatus and said guying assembly (9) are separate structural units and only said guying assembly (9) is adapted to be mounted and removed.

3. The mobile crane system according to claim 2, wherein said mounting assistance apparatus (52) is arranged on a mobile transportation apparatus (50).

4. The mobile crane system according to any one of the preceding claims, wherein said mounting assistance apparatus has a plurality of spaced struts (23).

5. The mobile crane system according to claim 4, wherein said struts (23) can be brought from a transportation position into a supporting position.

6. The mobile crane system according to claim 4 or claim 5, wherein said struts (23) are pivotable at said mounting assistance apparatus (9a).

7. The mobile crane system according to any one of claims 1 to 5, wherein said mounting assistance apparatus comprises a frame on which said struts (23) can be brought from a transportation position into a supporting position.

8. The mobile crane system according to any one of the preceding claims, wherein said mounting assistance apparatus bas a resting means on which said guying assembly (9) can be placed.

9. The mobile crane system according to any one of the preceding claims, wherein said mounting assistance apparatus comprises a pick-up means (9e) at which said mounting assistance apparatus can be raised.

10. The mobile crane system according to any one of claims 1 to 9,
wherein the crane boom is a telescopic crane boom (13) having a base section (15) and a plurality of telescopic sections (17) retractable and extensible in it.

11. The mobile crane system according to any one of claims 1 to 9, wherein said crane boom is a lattice boom.

12. The mobile crane system according to any one of claims 1 to 11, wherein said guying assembly (9) has two guying arms (9b) which can be brought from the transportation position into at least one guying position laterally protruding from said boom (13).

13. The mobile crane system according to any one of claims 1 to 11, wherein said guying assembly (9) comprises a gantry which can be brought from a transportation position into at least one guying position.

14. The mobile crane system according to claim 3 wherein said mounting assistance apparatus comprises a lifting means (52, 53) which is mounted on said mobile transportation apparatus (50).

15. The mobile crane system according to claim 14, wherein said lifting means comprises two spaced adjustable-height pillars (52) which arc mounted on the mobile transportation apparatus (50).

16. The mobile crane system according to any one of the preceding claims, wherein the guying assembly (9) is equipped with the mounting assistance apparatus in form of a support means adapted to hold the guying assembly (9) in a mounting position apart from the crane boom (13) and making it possible for the crane boom (13) to be introduced underneath the guying assembly (9).

17. The mobile crane system according to claim 16, wherein the support means comprises a plurality of spaced struts (23).

18. The mobile crane system according to claim 16 or claim 17, wherein said struts (23) can be brought from a transportation position into a supporting position.

19. The mobile crane system according to claim 16 or claim 17, wherein said struts (23) are releasably attachable at the guying assembly (9).

20. The mobile crane system according to claim 17 or claim 18, wherein said struts (23) are pivotable at said guying assembly (9).

21. The mobile crane system according to any one of claims 16 to 20, wherein said guying assembly (9) comprises a pick-up means (9e) by which said guying assembly (9) can be raised.

22. The mobile crane system according to claim 4, wherein said struts (23) are pivotable at the guying assembly (9).

23. A method for mounting a guying assembly (9) on a boom (13) of a mobile crane (7), comprising the steps of:

a) raising the guying assembly (9) to a mounting height by a hoist line (29) with the aid of the same mobile crane (7) which has the boom (13) on which the guying assembly is to be mounted;
b) holding, at the mounting height, by means of struts (23), the guying assembly (9) lifted to said mounting height;
c) releasing the guying assembly (9) from the hoist line (29) of the mobile crane (7);
d) introducing the boom (13) of the mobile crane (7) underneath the guying assembly (9);
e) connecting the guying assembly (9) to the boom (13).

24. The method according to claim 23, wherein the struts (23) are pivoted from a transportation position into the supporting position after the guying assembly (9) has been raised.

25. The method according to claim 23, wherein said struts (23) are attached to the guying assembly (9) after it has been raised.

26. The method according to any one of claims 23 to 25, wherein the guying assembly (9) is raised while it is held at, at least, three spaced suspension points (9e) in an essentially horizontal position.

27. A method of mounting a guying assembly (9) on a boom (13) of a mobile crane (7), comprising the steps of:

a) lifting the guying assembly (9) to a mounting height with the aid of a lifting unit (52, 53) arranged on a mobile transportation apparatus (50);
b) introducing the boom (13) of the mobile crane (7) underneath the guying assembly (9) held by the lifting unit (52, 53);
c) connecting the guying assembly (9) to the boom.

28. A method of mounting a guying assembly (9) on a boom (13) of a mobile crane (7), comprising the steps of:

a) lifting to a mounting height the guying assembly (9) and the lifting unit (52) coupled to it, which are arranged on a mobile transportation apparatus (50), with the aid of the mobile crane (7);
b) introducing the boom (13) of the mobile crane (7) underneath the guying assembly, (9) held by the lifting unit (52) fixed at said height;
c) connecting the guying assembly (9) to the boom (13) and releasing the coupling between the guying assembly (9) and the lifting unit (52).

29. A method for removing a guying assembly (9) mounted on a boom (13) of a mobile crane (7), comprising the steps of:

a) bringing the boom (13) into an essentially horizontal luffing position;
b) bringing the guying assembly (9) into a transportation position;
c) introducing the boom (13) with the guying assembly (9) in the transportation position underneath a mounting assistance apparatus (23);
d) releasing the guying assembly (9) from the boom (13);
e) removing the boom (13) from under the mounting assistance apparatus (23).

30. The method according to claim 29, wherein after step e) the guying assembly (9) is raised with the aid of the same mobile crane (7) and placed on a mobile transportation apparatus (50).

31. The method according to claim 29 or claim 30, wherein the guying assembly comprise two guying arms (9b) which can be brought into at least one laterally protruding guying position, and wherein said guying arms (9b) are brought into the transportation position before step c).

32. The method according to any one of claims 29 to 31,

wherein the guying assembly (9) is picked up by at least three spaced suspension points (9e) in an essentially horizontal position.

Patentansprüche

1. Ein mobiles Kransystem, bestehend aus:

- einem Kran (7), mit:
- einem Kranausleger (13)
- Seilabspannungsanordnung (9) mit mindestens einem Spannelement (9b) zum Abspannen des vorgenannten Kranauslegers (13) unter zu Hilfenahme der vorgenannten Seilabspannanordnung (9), welche lösbar mit dem Kranausleger (13) verbunden ist,

dadurch gekennzeichnet, dass

- eine Befestigungshilfsvorrichtung (9a) angepasst, um die vorgenannte Seilabspannanordnung (9) zu dem Zeitpunkt, zu dem der Kranausleger (13) sich von dieser entfernt in einer Zusammenbauposition befindet und es dem Kranausleger (13) ermöglich ist unterhalb der Seilabspannanordnung (9) eingeführt zu werden, wobei der die vorgenannte Befestigungshilfsvorrichtung (23) und die vorgenannte Seilabspannanordnung (9) derart ausgebildet sind, als eine strukturelle Einheit ausgebildet sind, die an den Kranausleger (13) angebaut oder von diesem wieder abgebaut werden kann.

2. Das mobile Kransystem nach Anspruch 1, wobei die vorgenannte Befestigungshilfsvorrichtung (23) und die vorgenannte Seilabspannanordnung (9) voneinander getrennte strukturelle Einheiten sind und nur die die vorgenannte Seilabspannanordnung (9) so angepasst ist, dass diese montierbar und entfernbar ist.

3. Das mobile Kransystem nach Anspruch 1, wobei die vorgenannte Befestigungshilfsvorrichtung (52) einer mobilen Transportvorrichtung (50) zugeordnet ist.

4. Das mobile Kransystem nach einem der vorangehenden Ansprüche, wobei der vorgenannte Befestigungshilfsvorrichtung eine Vielzahl von Stützen (23) zugeordnet sind.

5. Das mobile Kransystem nach Anspruch 4, wobei die vorgenannten Stützen (23) aus einer Transportstellung in eine Abstützstellung bringbar sind.

6. Das mobile Kransystem nach Anspruch 4 oder Anspruch 5, wobei die vorgenannten Stützen (23) verschwenkbar gegenüber der Befestigungshilfsvorrichtung (9a) ausgebildet sind.

7. Das mobile Kransystem nach einem der vorangehenden Ansprüche 1 bis 5, wobei die vorgenannte Befestigungshilfsvorrichtung (9a) einen Rahmen umfasst, an dem die vorgenannten Stützen (23) aus einer Transportstellung in eine Abstützstellung bringbar sind.

8. Das mobile Kransystem nach einem der vorangehenden Ansprüche, wobei die vorgenannte Befestigungshilfsvorrichtung Lagermittel aufweist, in der die vorgenannte Seilabspannanordnung anordbar ist.

9. Das mobile Kransystem nach einem der vorangehenden Ansprüche, wobei der vorgenannte Befestigungshilfsvorrichtung Aufnahmemittel (9e) zugeordnet sind, an der die Befestigungshilfsvorrichtung anhebbar ist.

10. Das mobile Kransystem nach einem der vorangehenden Ansprüche 1 bis 9, wobei der Kranausleger ein Teleskopkranausleger (13) ist, der einem Basisabschnitt (15) und eine Vielzahl von teleskopischen Abschnitten (17) besteht, die zueinander einfahrbar und ausfahrbar sind.

11. Das mobile Kransystem nach einem der vorangehenden Ansprüche 1 bis 9, wobei der vorgenannte Kranausleger ein Gitterkranausleger ist.

12. Das mobile Kransystem nach einem der vorangehenden Ansprüchen 1 bis 11, wobei der Seilabspannanordnung(9) zwei Spannarme (9b) zugeordnet sind, die aus einer Transportstellung in eine zum vorgenannten Kranausleger (13) seitlich ausladende Abstützstellung bringbar sind.

13. Das mobile Kransystem nach einem der vorgehenden Ansprüche 1 bis 11, wobei die vorgenannte Seilabspannanordnung (9) ein Kranportal, das aus einer Transportstellung in eine Abstützstellung bringbar ist.

14. Das mobile Kransystem nach Anspruch 3, wobei die Befestigungshilfsvorrichtung ein Hebemittel (52, 53) umfasst, das der vorgenannten mobilen Transportvorrichtung (50) zugeordnet ist.

15. Das mobile Kransystem nach Anspruch 14, wobei das vorgenannte Hebemittel zwei, beabstandete höheneinstellbare Stützen (52) umfasst und die der mobilen Transportvorrichtung (50) zugeordnet sind.

16. Das mobile Kransystem nach einem der vorhergehenden Ansprüche, wobei die Seilabspannvorrichtung (9) mit der Befestigungshilfsvorrichtung ausge-

rüstet ist und zwar, in der Art eines Unterstützungsmittels, das ausgelegt ist, die Seilabspannvorrichtung (9) in einer Zusammenbauposition, die entfernt von dem Kranausleger ist, zu halten und die es ermöglicht, dass der Kranausleger (13) unterhalb der Seilabspannvorrichtung einführbar ist.

17. Das mobile Kransystem nach Anspruch 16, wobei die Abstützmittel eine Vielzahl von voneinander beabstandeter Stützen (23) umfasst.

18. Das mobile Kransystem nach Anspruch 16 oder Anspruch 17, wobei die vorgenannten Sützen (23) aus einer Transportposition in eine Abstützposition bringbar sind.

19. Das mobile Kransystem nach Anspruch 16 oder Anspruch 17, wobei die vorgenannten Stützen (23) lösbar mit der Seilabspannanordnung (9) verbunden sind.

20. Das mobile Kransystem nach Anspruch 17 oder Anspruch 18, wobei die vorgenannten Stützen (23) schwenkbar mit der vorgenannten Seilabspannanordnung (9) verbunden sind.

21. Das mobile Kransystem nach einem der vorangehenden Ansprüche 16 bis 20, wobei die Seilabspannanordnung (9) ein Hebemittel (9e) umfasst, mit der die vorgenannte Seilabspannanordnung (9) aufbaubar ist.

22. Das mobile Kransystem nach Anspruch 4, wobei die vorgenannten Stützen (23) schwenkbar mit der Seilabspannanordnung (9) verbunden sind.

23. Ein Verfahren für den Zusammenbau einer Seilabspannvorrichtung (9) an einem Kranausleger (13) eines mobilen Kranes (7), mit den Schritten:

a) Heben der Seilabspannanordnung (9) bis zu einer Zusammenbauhöhe mit Hilfe der Trosse einer Hebezugwinde (29) mit Unterstützung des selben mobilen Kranes (7), der den Kranausleger (13) zugeordnet ist, an dem auch die in Zusammenbauhöhe befestigt ist,
b) Halten in Zusammenbauhöhe über die Stützen (23), anheben der Seilabspannanordnung in Zusammenbauhöhe,
c) Anheben der Seilabspannanordnung (9) durch Trosse der Hebezugwinde (29) des mobilen Kranes (7),
d) Einführen des Kranauslegers (13) des mobilen Kranes (7) unterhalb der Seilabspannanordnung (9),
e) Verbinden der Seilabspannanordnung (9)mit dem Kranausleger (13).

24. Das Verfahren nach Anspruch 23, wobei die Stützen (23) aus der Transportstellung in die Abstützstellung geschwenkt werden, nach dem die Seilabspannanordnung (9) angehoben worden ist.

25. Das verfahren nach Anspruch 23, wobei die vorgenannten Stützen (23) mit der Seilabspannanordnung (9) verbunden werden, nachdem diese angehoben worden ist.

26. Das Verfahren nach einem der vorangehenden Ansprüche 23 bis 25, wobei die Seilabspannanordnung (9) angehoben, während diese an mindestens drei voneinander beabstandeten und gefederten Punkten (9e) in einer wesentlichen horizontalen Position gehalten wird.

27. Ein Verfahren für den Aufbau einer Seilabspannanordnung (9) an einem Kranausleger (13) eines mobilen Kranes (7), mit den Schritten:

a) Anheben der Seilabspannanordnung (9) bis zu einer Zusammenbauhöhe mit Hilfe der Hebeeinrichtung (52, 53), die auf einem mobilen Transportvorrichtung (50) angeordnet ist,
b) Einführen des Kranauslegers (13) des mobilen Kranes (7) unterhalb der Seilabspannanordnung (9), die von der Hebeeinrichtung (52, 53) gehalten wird,
c) Verbinden Seilabspannanordnung (9)mit dem Kranausleger.

28. Ein Verfahren für den Aufbau einer Seilabspannanordnung (9) an einem Kranausleger (13), mit den Schritten:

a) Anheben der Seilabspannanordnung (9) bis zu einer Zusammenbauhöhe und Verbinden der Hebeeinrichtung (52) mit dieser, die auf einer mobilen Transportvorrichtung (50) angeordnet ist, mit Hilfedes mobilen Kranes (7),
b) Einführen des Kranauslegers (13) des mobilen Krans (7) unterhalb der Seilabspannanordnung (9), gehalten durch die Hebeeinrichtung (52), festgelegt in der vorgenannten Höhe,
c) Verbinden der Seilabspannanordnung (9) mit dem Kranausleger (13) und Lösen der Verbindung zwischen der Seilabspannanordnung (9) und der Hebeeinrichtung (52).

29. Ein Verfahren für den Abbau einer Seilabspannanordnung (9), die an einem Kranausleger (13 befestigt ist, mit den Schritten:

a) den Kranausleger (13) in einen im wesentliche horizontalen wippenden Position bringen,
b) die Seilabspannanordnung (9) in eine Transportstellung bringen,

c) Einführen des Auslegers (13) und der Seilabspannanordnung (9) in die Transportstellung unterhalb einer Befestigungshilfsvorrichtung (9a),
d) Lösen der Seilabspannanordnung (9) von dem Kranausleger (13),
e) Entfernen des Kranauslegers (13) unterhalb der Befestigungshilfsvorrichtung (9a).

30. Das Verfahren nach Anspruch 29, wobei nach dem Schritt e) die Seilabspannanordnung (9) mit Hilfe des gelben Krans mobilen Krans (7) angehoben wird und auf einer mobilen Transportvorrichtung platziert wird.

31. Das Verfahren nach Anspruch 29 oder Anspruch 30, wobei die Seilabspannanordnung (9) zwei Spannarme (9b) umfasst, die mindestens in eine seitliche, hinausragende Spannposition bringbar sind und wobei die vorgenannten Spannarme (9b) vor Schritt c) in eine Transportstellung gebracht werden.

32. Das Verfahren nach einem der Ansprüche 29 bis 31, wobei die Seilabspannanordnung (9) an mindestens drei voneinander beabstandeten, gefederten Punkten (9e) in einer im wesentlichen horizontalen Lage angehoben wird.

Revendications

1. Système de grue mobile comprenant :

- une grue mobile (7), ayant :
- une flèche de grue (13),
- un assemblage d'haubanage (9) avec au moins un élément d'haubanage (9b) pour haubaner ladite flèche de grue (13),
- un moyen de fixation (21) sur la flèche de grue (13) à l'aide duquel ledit assemblage d'haubanage (9) peut être fixé de manière amovible sur la flèche de grue (13),

caractérisé par

- un appareil d'assistance au montage (23) adapté pour supporter ledit assemblage d'haubanage (9) dans un état séparé de la flèche de grue (13) en position de montage, ce qui permet l'introduction de la flèche de grue (13) en dessous de l'assemblage d'haubanage (9), dans lequel ledit appareil d'assistance au montage et ledit assemblage d'haubanage (9) sont configurés comme une unité structurelle que l'on peut monter sur la flèche de grue (13) ou l'en retirer.

2. Système de grue mobile selon la revendication 1, dans lequel ledit appareil d'assistance au montage et ledit assemblage d'haubanage (9) sont des unités structurelles séparées et seul ledit assemblage d'haubanage (9) est adapté pour être monté et retiré.

3. Système de grue mobile selon la revendication 2, dans lequel ledit appareil d'assistance au montage (52) est aménagé sur un appareil de transport mobile (50).

4. Système de grue mobile selon l'une quelconque des revendications précédentes, dans lequel ledit appareil d'assistance au montage a une pluralité d'entretoises espacées (23).

5. Système de grue mobile selon la revendication 4, dans lequel lesdites entretoises (23) peuvent être amenées d'une position de transport à une position de support.

6. Système de grue mobile selon la revendication 4 ou la revendication 5, dans lequel lesdites entretoises (23) peuvent pivoter sur ledit appareil d'assistance au montage (9a).

7. Système de grue mobile selon l'une quelconque des revendications 1 à 5, dans lequel ledit appareil d'assistance au montage comprend un châssis sur lequel lesdites entretoises (23) peuvent être amenées d'une position de transport à une position de support.

8. Système de grue mobile selon l'une quelconque des revendications précédentes, dans lequel ledit appareil d'assistance au montage a un moyen de repos sur lequel ledit assemblage d'haubanage (9) peut être placé.

9. Système de grue mobile selon l'une quelconque des revendications précédentes, dans lequel ledit appareil d'assistance au montage comprend un moyen récepteur (9e) sur lequel ledit appareil d'assistance au montage peut être dressé.

10. Système de grue mobile selon l'une quelconque des revendications 1 à 9, dans lequel la flèche de grue est une flèche de grue télescopique (13) ayant une section de base (15) et une pluralité de sections télescopiques (17) rétractables et extensibles à l'intérieur de celle-ci.

11. Système de grue mobile selon l'une quelconque des revendications 1 à 9, dans lequel ladite flèche de grue est une flèche en treillis.

12. Système de grue mobile selon l'une quelconque des revendications 1 à 11, dans lequel ledit assemblage d'haubanage (9) a deux bras d'haubanage (9b) qui peuvent être amenés de la position de transport à

au moins une position d'haubanage faisant latéralement saillie de ladite flèche (13).

13. Système de grue mobile selon l'une quelconque des revendications 1 à 11, dans lequel ledit assemblage d'haubanage (9) comprend un portique qui peut être amené d'une position de transport à au moins une position d'haubanage.

14. Système de grue mobile selon la revendication 3, dans lequel ledit appareil d'assistance au montage comprend un moyen élévateur (52, 53) qui est monté sur ledit appareil de transport mobile (50).

15. Système de grue mobile selon la revendication 14, dans lequel ledit moyen élévateur comprend deux piliers espacés à hauteur ajustable (52) qui sont montés sur l'appareil de transport mobile (50).

16. Système de grue mobile selon l'une quelconque des revendications précédentes, dans lequel l'assemblage d'haubanage (9) est équipé de l'appareil d'assistance au montage sous la forme d'un moyen de support adapté pour supporter l'assemblage d'haubanage (9) en position de montage séparément de la flèche de grue (13) et permettant l'introduction de la flèche de grue (13) en dessous de l'assemblage d'haubanage (9).

17. Système de grue mobile selon la revendication 16, dans lequel le moyen de support comprend une pluralité d'entretoises espacées (23).

18. Système de grue mobile selon la revendication 16 ou la revendication 17, dans lequel lesdites entretoises (23) peuvent être amenées d'une position de transport à une position de support.

19. Système de grue mobile selon la revendication 16 ou la revendication 17, dans lequel lesdites entretoises (23,) peuvent être fixées de manière amovible sur l'assemblage d'haubanage (9).

20. Système de grue mobile selon la revendication 17 ou la revendication 18, dans lequel lesdites entretoises (23) peuvent pivoter sur ledit assemblage d'haubanage (9).

21. Système de grue mobile selon l'une quelconque des revendications 16 à 20, dans lequel ledit assemblage d'haubanage (9) comprend un moyen récepteur (9e) par lequel ledit assemblage d'haubanage (9) peut être dressé.

22. Système de grue mobile selon la revendication 4, dans lequel lesdites entretoises (23) peuvent pivoter sur l'assemblage d'haubanage (9).

23. Procédé pour monter un assemblage d'haubanage (y) sur une flèche (13) d'une grue mobile (7), comprenant les étapes consistant à

a) dresser l'assemblage d'haubanage (9) à une hauteur de montage par un câble de hissage (29) à l'aide de la même grue mobile (7) qui a la flèche (13) sur laquelle l'assemblage d'haubanage doit être monté ;
b) supporter, à la hauteur de montage, à l'aide d'entretoises (23), l'assemblage d'haubanage (9) soulevé à ladite hauteur de montage ;
c) libérer l'assemblage d'haubanage (9) du câble de hissage (29) de la grue mobile (7) ;
d) introduire la flèche (13) de la grue mobile (7) en dessous de l'assemblage d'haubanage(9) ; et
e) raccorder l'assemblage d'haubanage (9) à la flèche (13).

24. Procédé selon la revendication 23, dans lequel on fait pivoter les entretoises (23) d'une position de transport à une position de support après que l'assemblage d'haubanage (9) a été dressé.

25. Procédé selon la revendication 23, dans lequel lesdites entretoises (23) sont fixées à l'assemblage d'haubanage (9) après qu'il a été dressé.

26. Procédé selon l'une quelconque des revendications 23 à 25, dans lequel l'assemblage d'haubanage (9) est dressé tandis qu'il est maintenu en au moins trois points de suspension espacés (9e) en position essentiellement horizontale.

27. Procédé de montage d'un assemblage d'haubanage (9) sur une flèche (13) d'une grue mobile (7), comprenant les étapes consistant à :

a) soulever l'assemblage d'haubanage (9) à une hauteur de montage à l'aide d'une unité élévatrice (52, 53) aménagée sur un appareil de transport mobile (50) ;
b) introduire la flèche (13) de la grue mobile (7).en dessous de l'assemblage d'haubanage (9) soutenu par l'unité élévatrice (52, 53) ; et
c) raccorder l'assemblage d'haubanage (9) à la flèche.

28. Procédé de montage d'un assemblage d'haubanage (9) sur une flèche (13) d'une grue mobile (7), comprenant les étapes consistant à :

a) soulever à une hauteur de montage l'assemblage d'haubanage (9) et l'unité élévatrice (52) couplée à celui-ci, qui sont aménagés sur un appareil de transport mobile (50), à l'aide de la grue mobile (7) ;

b) introduire la flèche (13) de la grue mobile (7) en dessous de l'assemblage d'haubanage (9) maintenu par l'unité élévatrice (52) fixée à ladite hauteur ; et
c) raccorder l'assemblage d'haubanage (9) à la flèche (13) et libérer le couplage entre l'assemblage d'haubanage (9) et l'unité élévatrice (52).

29. Procédé pour retirer un assemblage d'haubanage (9) monté sur une flèche (13) d'une grue mobile (7), comprenant les étapes consistant à :

a) amener la flèche (13) en position de relevage essentiellement horizontale ;
b) amener l'assemblage d'haubanage (9) en position de transport ;
c) introduire la flèche (13) avec l'assemblage d'haubanage (9) en position de transport en dessous d'un appareil d'assistance au montage (23) ;
d) libérer l'assemblage d'haubanage (9) de la flèche (13) ; et
e) retirer la flèche (13) d'en dessous de l'appareil d'assistance au montage (23).

30. Procédé selon la revendication 29, dans lequel, après l'étape e), l'assemblage d'haubanage (9) est dressé à l'aide de la même grue mobile (7) et placé sur un appareil de transport mobile (50).

31. Procédé selon la revendication 29 ou la revendication 30, dans lequel l'assemblage d'haubanage comprend deux bras d'haubanage (9b) qui peuvent être amenés dans au moins une position d'haubanage faisant latéralement saillie et dans lequel lesdits bras d'haubanage (9b) sont amenés en position de transport avant l'étape c).

32. Procédé selon l'une quelconque des revendications 29 à 31, dans lequel l'assemblage d'haubanage (9) est reçu par au moins trois points de suspension espacés (9e) en position essentiellement horizontale.

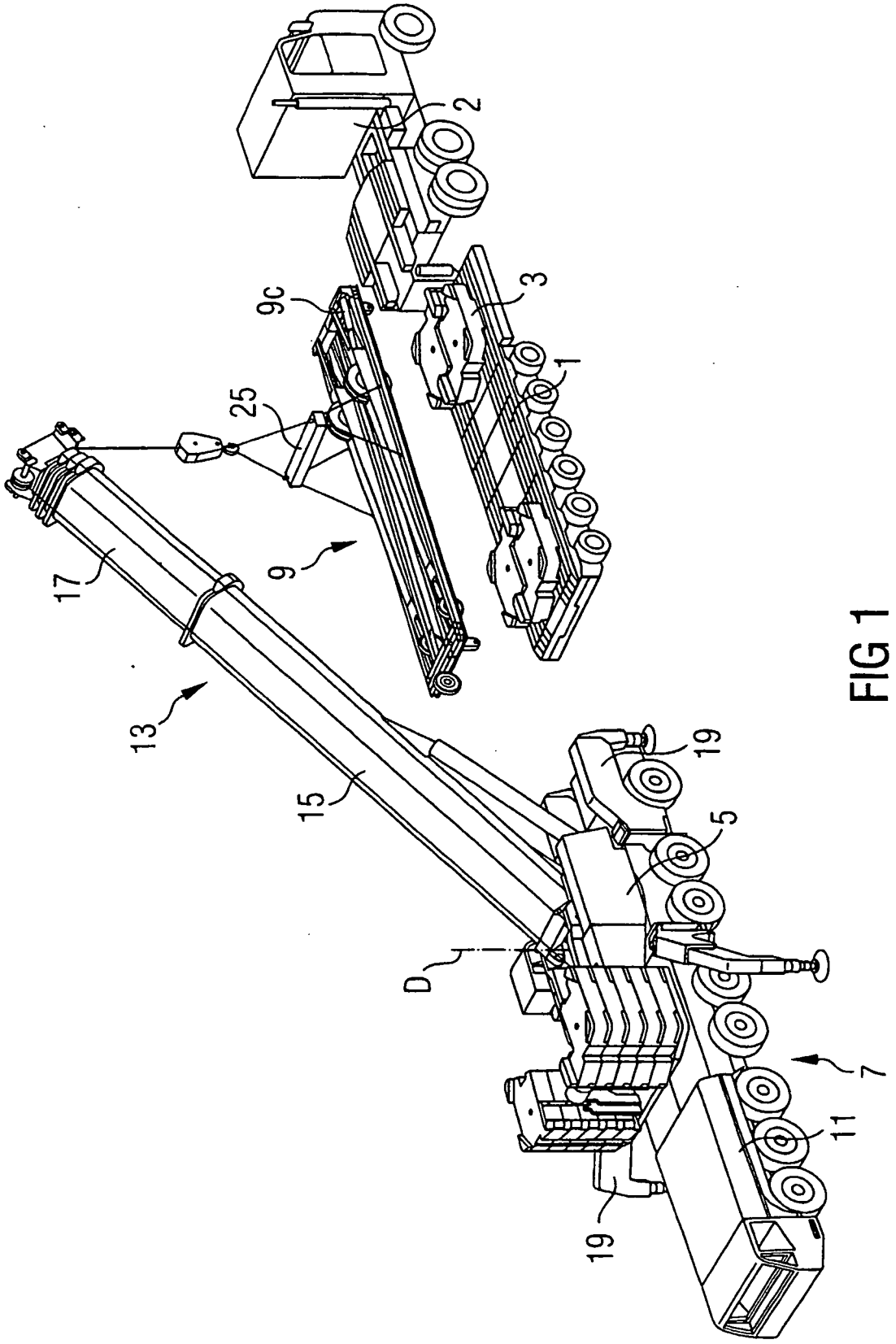

FIG 1

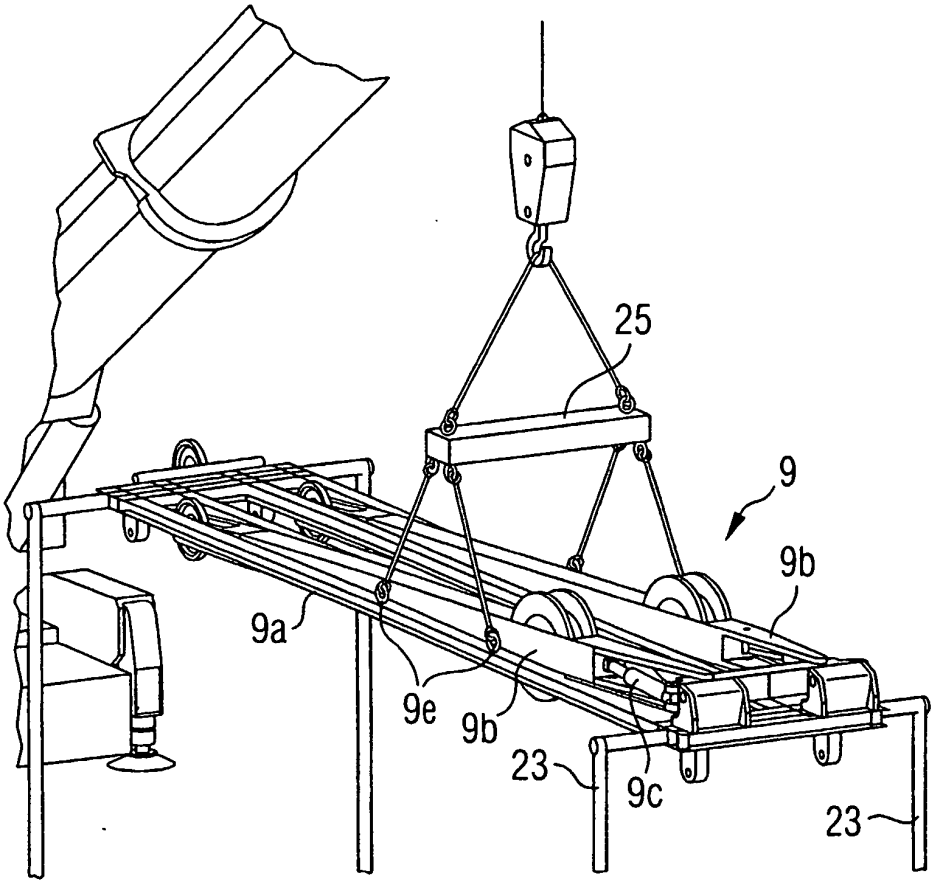

FIG 2

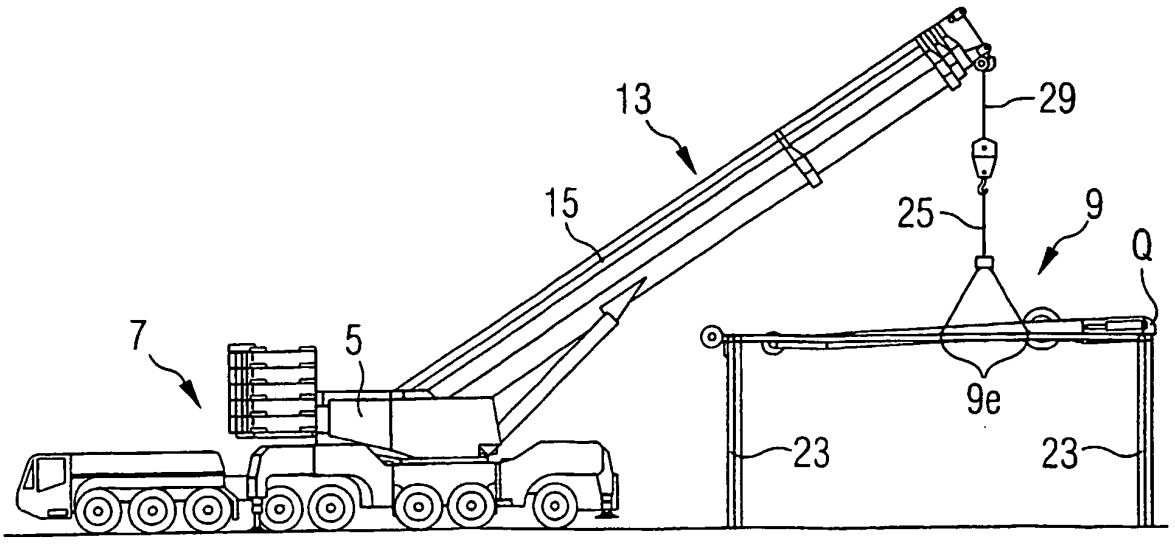

FIG 3

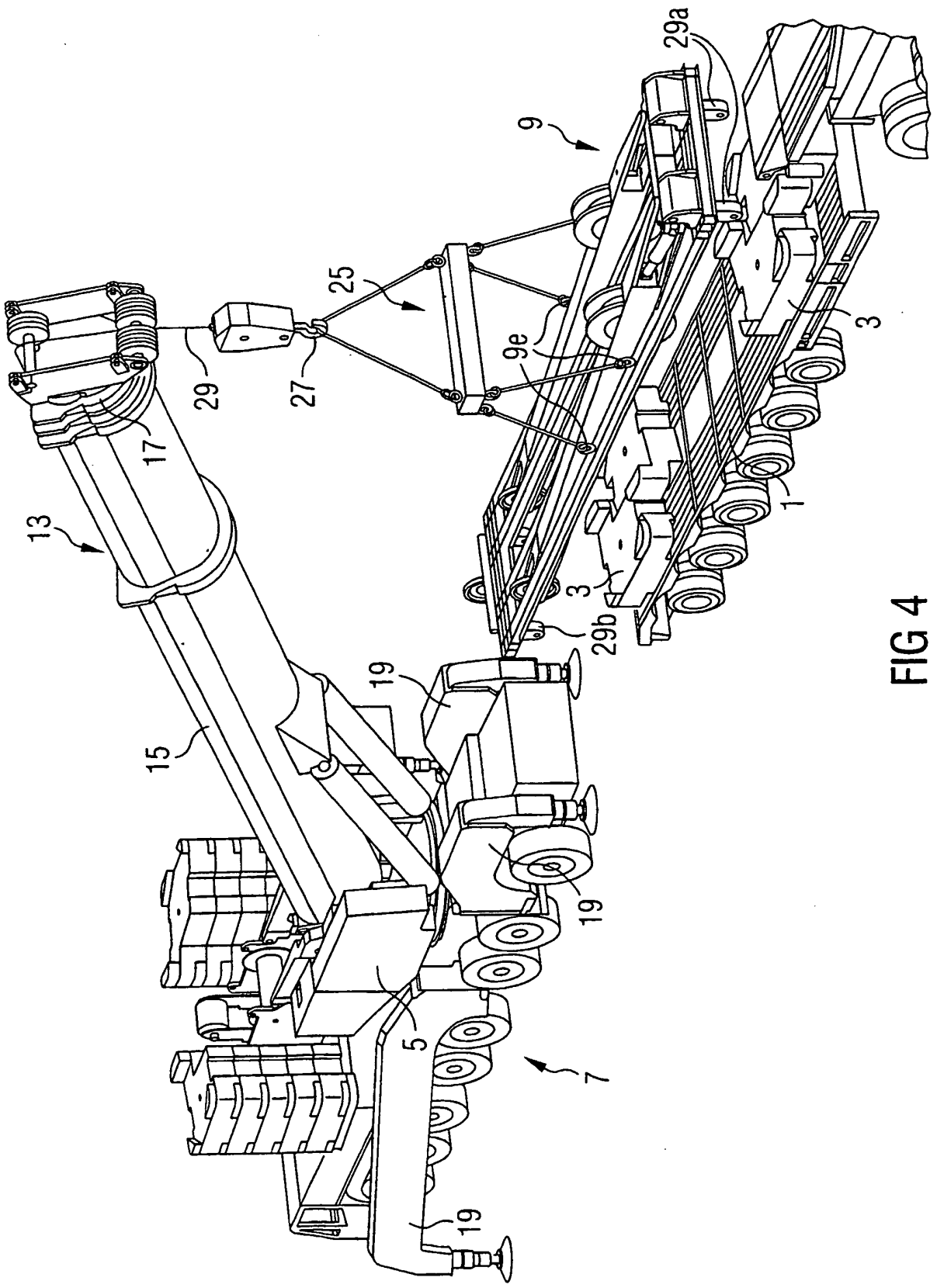

FIG 4

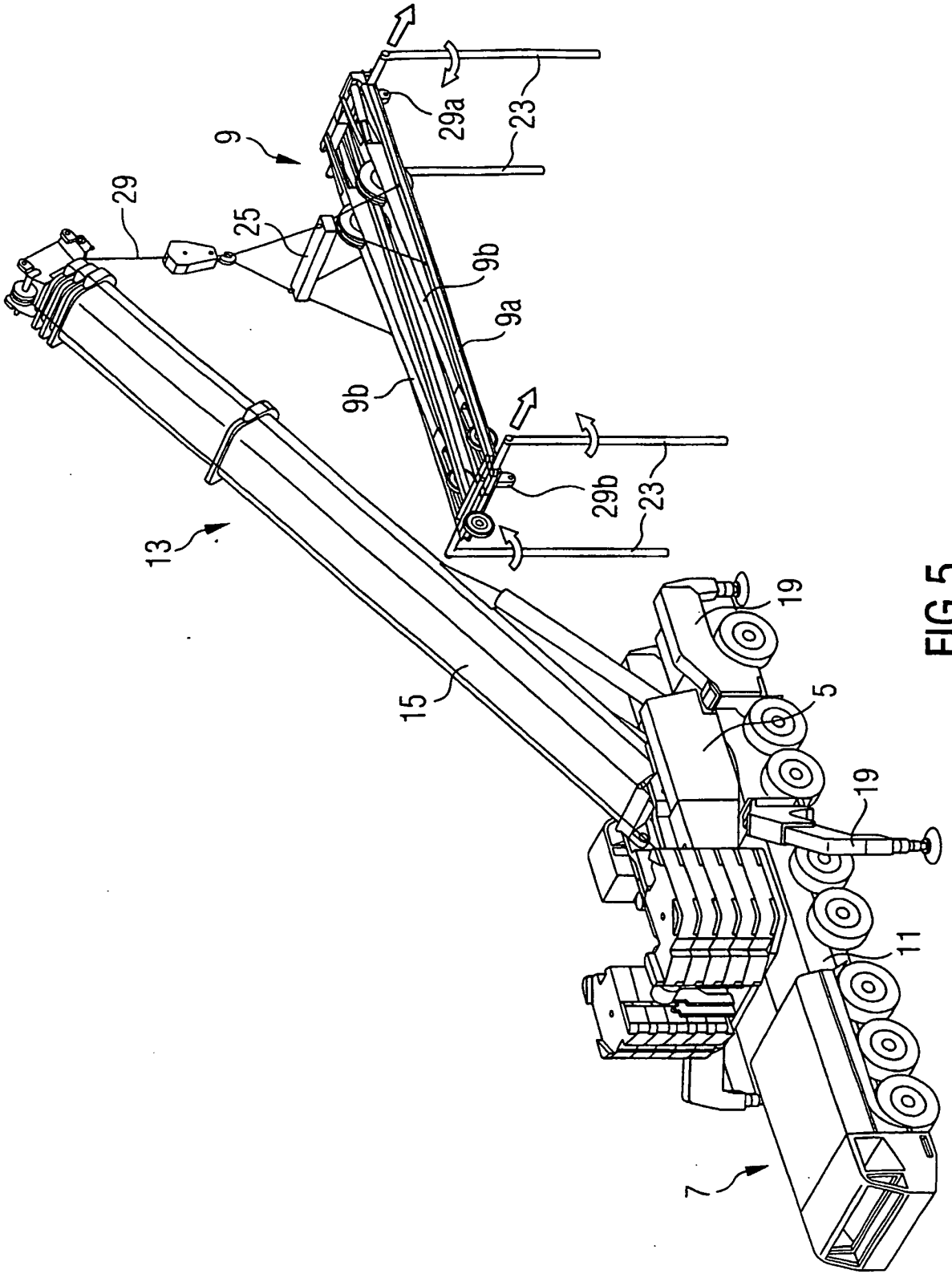

FIG 5

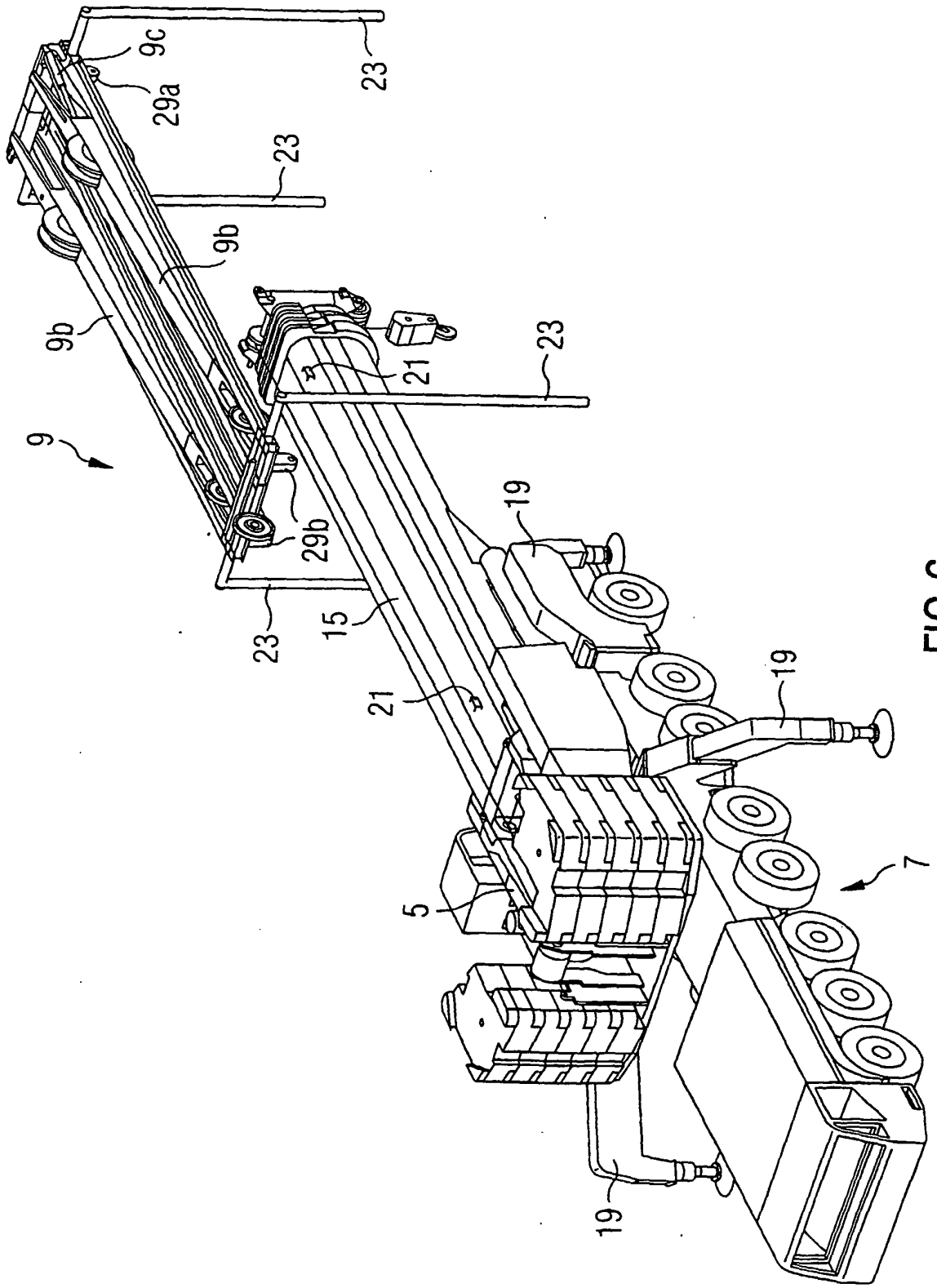

FIG 6

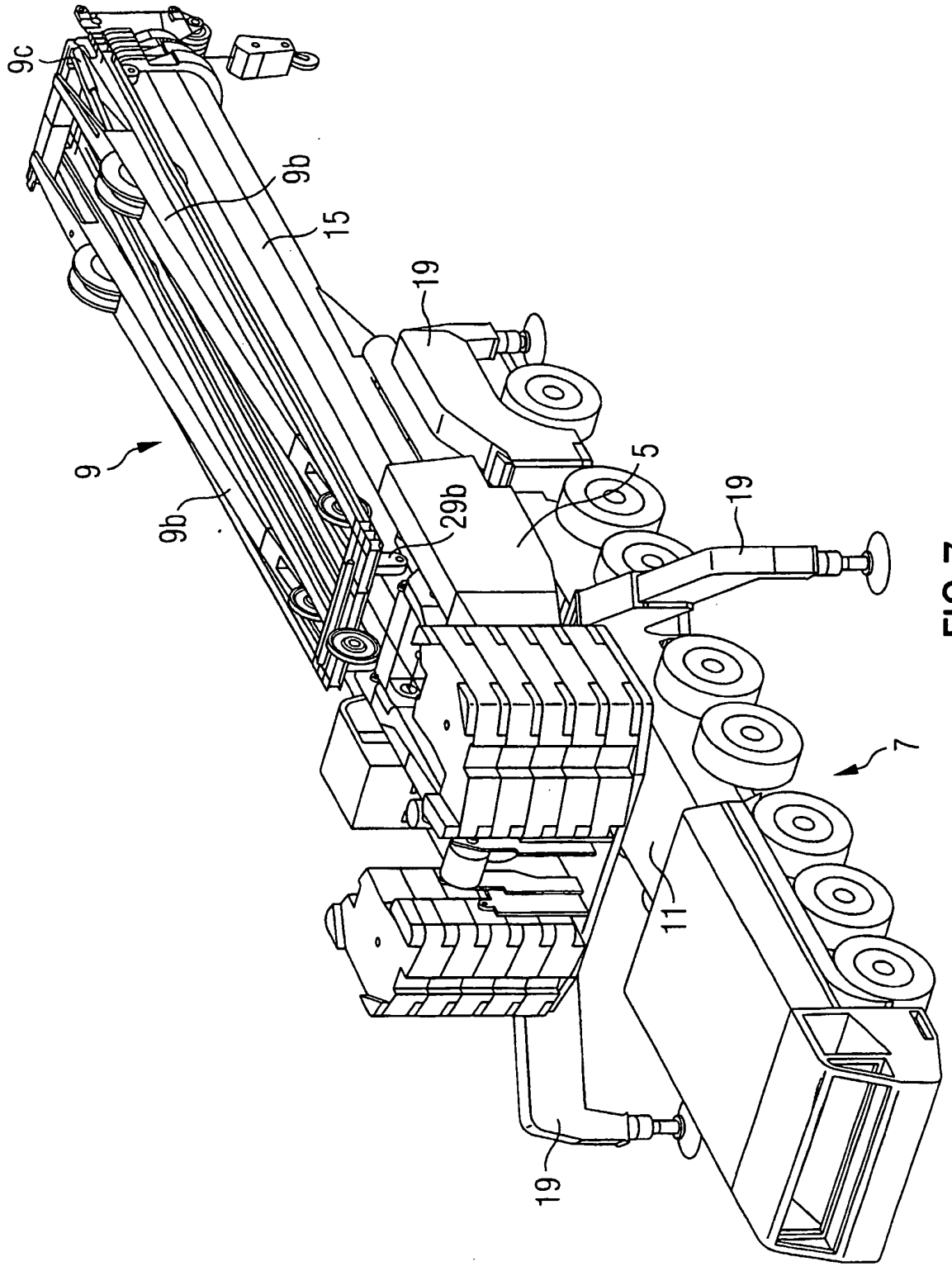

FIG 7

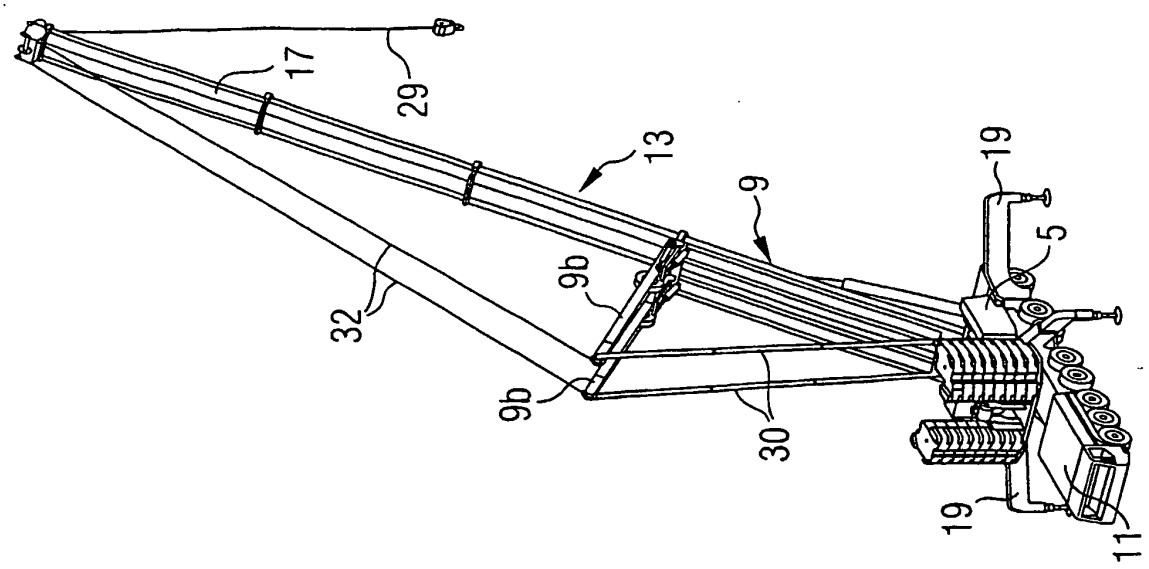
17
29
13
9
19
5
9b
32
9b
30
19
11

FIG 9

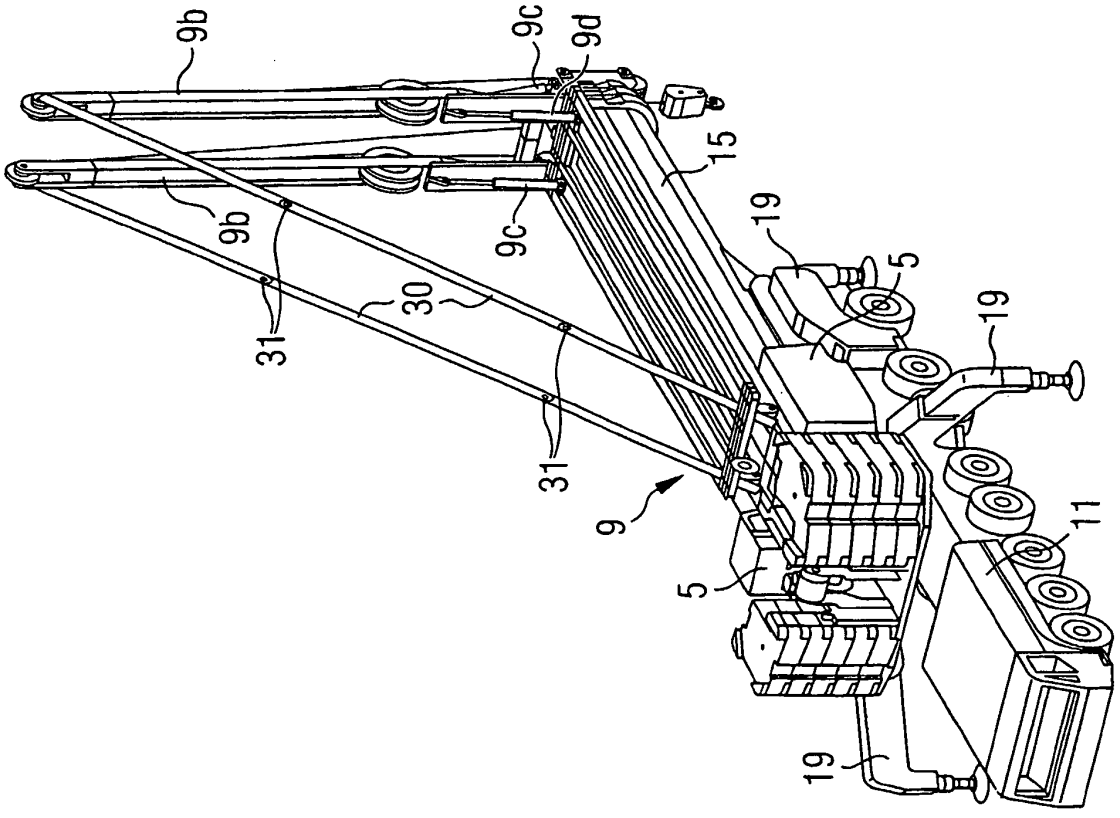
9b
9c
9d
15
19
5
9b
9c
30
31
19
31
9
5
11
19

FIG 8

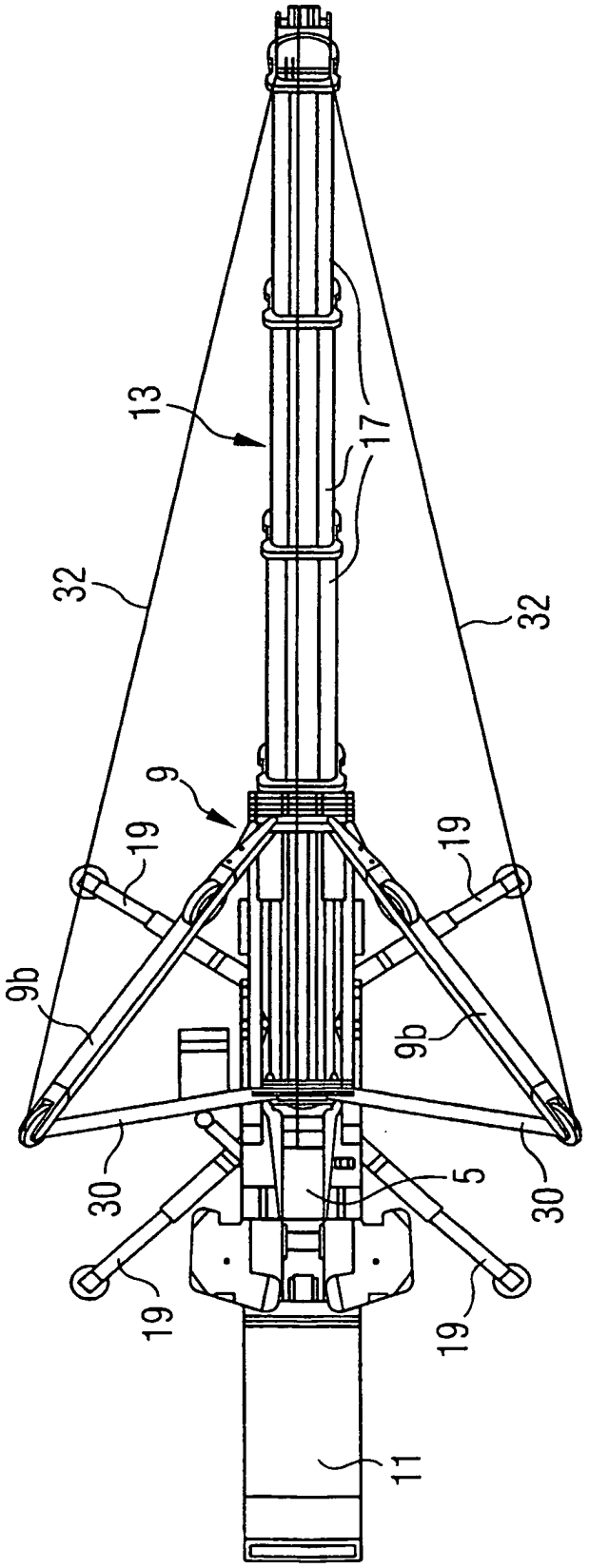

FIG 10

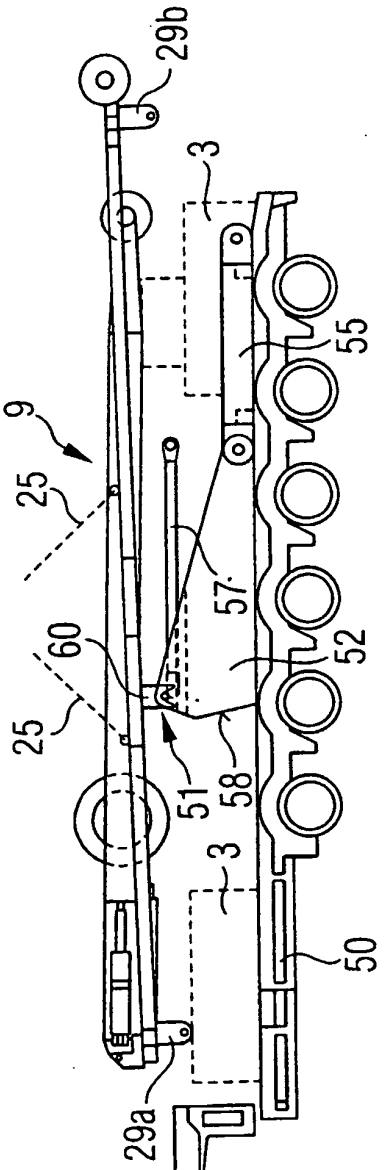
29b
3
9
25
55
57
60
52
25
51
58
3
50
29a

FIG 11

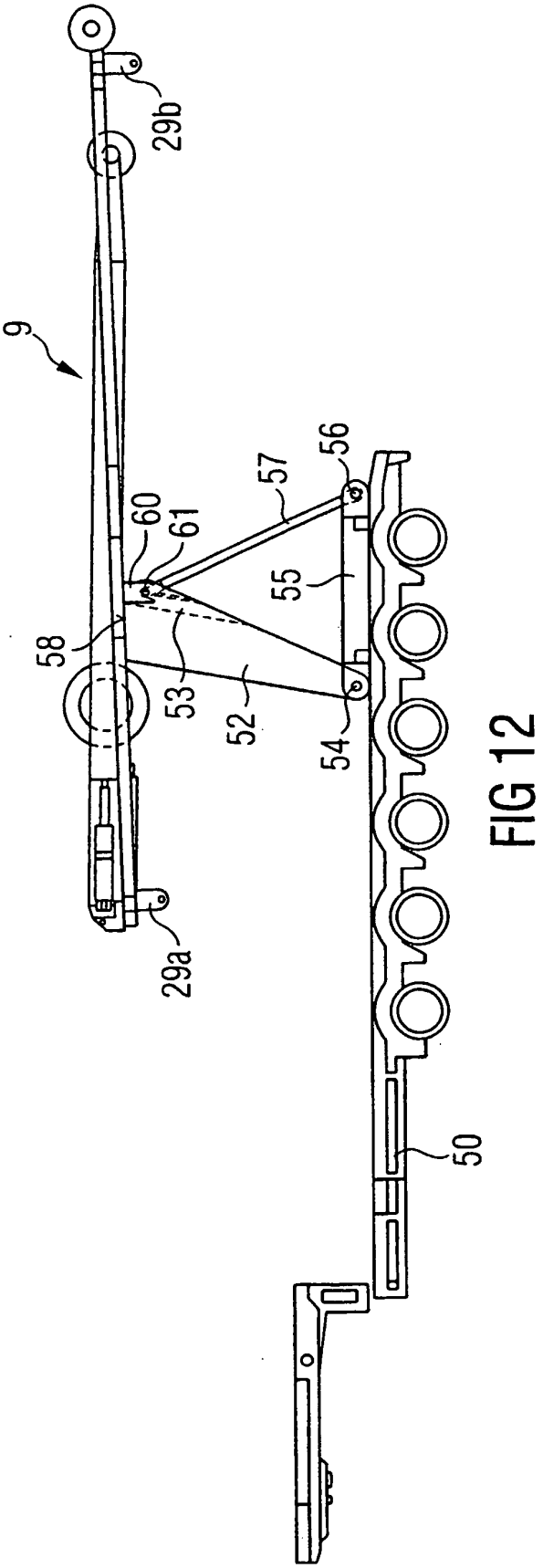
29b
9
57
56
60
61
55
58
53
52
54
29a
50

FIG 12

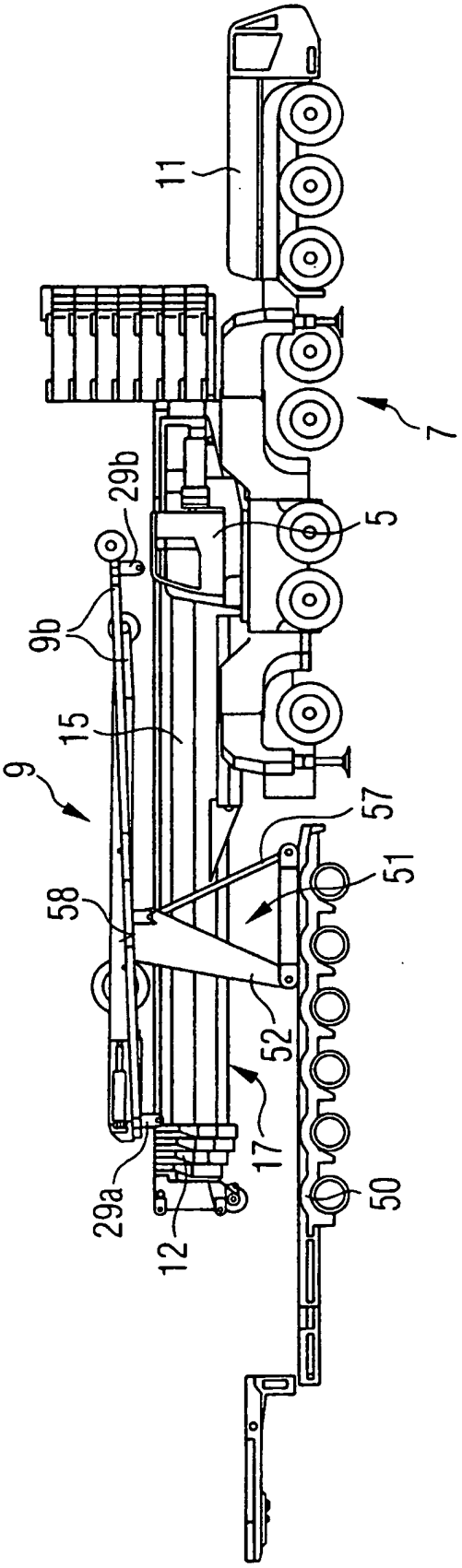

FIG 13

REFERENCES CITED IN THE DESCRIPTION

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