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(54) **BOOM TRUCK**

LASTKRAFTWAGEN MIT AUSLEGER

CAMION A FLECHE

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Description

[0001] The present invention relates to a boom truck comprising a chassis, a front pair of wheels, a rear pair of wheels, a cab situated within the chassis, a pivotably journaled lifting boom supporting a lifting unit and extending from the rear part of the chassis, centrally over the chassis and cab past the front pair of wheels, actuators for turning the lifting boom in vertical plane, and a device for converting the truck to transport state with reduced total height in relation to the height in an operating state when the truck is ready to manipulate a load, the cab being located vertically under the lifting boom in operating state of the truck, said device comprising a stand which is pivotably journaled about a lower axis of rotation at the rear part of the chassis and extends upwardly from the chassis to support the lifting boom which is pivotably journaled at the stand about an upper axis of rotation, and a rear actuator which is arranged on the side of the stand facing away from the cab to turn the stand about the lower axis of rotation of said stand, the stand being arranged to be turned in rearward direction together with the lifting boom while simultaneously lowering this to a lower level in order to achieve said transport state.

[0002] A boom truck of the type defined above (see for instance FR-A-7 723 636) has such a total height when the lifting boom is in its lowermost, substantially horizontal position that the truck cannot be driven through certain low passages where it is desired to transport and drive the truck. The boom truck therefore has limited use.

[0003] The object of the present invention is to reduce this problem and provide a boom truck that can be easily and quickly changed to a transport state with reduced total height so that it can also be driven through low passages with a height between said two total heights. The boom truck is thus considerably more useful.

[0004] The boom truck according to the invention is characterized in that the cab is situated within the central area of the chassis, that said rear actuator is mounted between the chassis and the stand at a distance from the lower axis of rotation of the stand on the chassis, and that said device comprises guide means which movably connect the cab to the chassis to enable movement of the cab from its position vertically below the lifting boom to a side position outside the lifting boom and its said actuator seen in vertical projection, the lifting boom being arranged by means of said rear actuator to be lowered to a substantially horizontal position with its lower side situated below the level of the roof of the cab in its side position.

[0005] The invention will be described in more detail in the following, with reference to the accompanying drawings.

[0006] Figure 1 shows a boom truck according to the invention from the side, in operating state for manipulating a load.

[0007] Figure 2 shows the boom truck according to Figure 1, seen from above.

[0008] Figure 3 shows the boom truck according to Figure 1, seen from the side in transport state with reduced total height.

[0009] Figure 4 shows the boom truck according to Figure 3, seen from above.

[0010] The drawings show schematically a truck of the type generally termed a boom truck. The truck has a chassis 1, a front pair of wheels 2 and a rear pair of wheels 3, a driver's cab 4 between the pairs of wheels 2, 3, a long, telescopic lifting boom 5 extending centrally above the chassis 1 from a point approximately above the rear pair of wheels 3, past the front pair of wheels 2 and to a point in front of the front pair of wheels 2. The lifting boom 5 supports a lifting unit 6 and comprises a hollow main body or outer boom 7 with rectangular cross section and an outer telescopic arm or inner boom 8 with rectangular cross section, protruding from the outer boom 7. The telescopic arm 8 is L-shaped, having a downwardly directed part 9 which at its free end supports said lifting unit 6, the latter having an engagement body arranged to be set in desired positions in relation to the lifting boom by means of linear displacement and turning. Two hydraulic cylinders 10 are provided for the turning adjustment and are mounted on the telescopic arm 8 and lifting unit 6 to turn this about a horizontal shaft 11 located perpendicular to the lifting boom 5. In alternative embodiments the lifting boom has one or more intermediate telescopic arms. Extension and withdrawal of the outer telescopic arm 8 in relation to the main body 7 is effected hydraulically by means of suitable hydraulic cylinders in the main body 7, and the telescopic arm 8 thus functions as a piston rod.

[0011] A platform 12 is arranged horizontally on the chassis 1 between the pairs of wheels 2, 3. Two parallel rails 13 are rigidly mounted on the platform 12 and extend perpendicularly to the longitudinal centre line 14 of the truck. The cab is provided on its lower side with two parallel engagement elements (not shown), which cooperate with the rails 13, enabling the cab to be moved along the rails. Displacement of the cab is achieved in controlled manner with the aid of suitable actuator, e.g. a hydraulic cylinder (not shown). The rails 13 extend from an inner position on the truck on one side of said centre line 14 to an outer position on the truck on the other side of said centre line 14 so that the outer ends of the rails 13 are situated in line with the wheels on the relevant side of the truck. The rail and cab arrangement is thus such that the cab 4 can be set in a first, inner position in the middle of the truck where the lifting boom 5 is located vertically above the cab 4, and a second, outer side position on one side of the truck so that no part of the cab is within the area of the lifting boom and its associated equipment, seen in vertical projection of the lifting boom and the equipment increasing its width.

[0012] The lifting boom 5 is pivotably journaled on a stand 15, about an axis of rotation 16, the stand being

arranged on the chassis 1 at the rear end of the truck above the rear pair of wheels 3. The stand 15 extends upwardly a predetermined distance from the chassis 1 so that the axis of rotation 16 of the lifting boom 5 is situated on the stand 15 at such a level that a small space 17 exists between the cab 4 and the lifting boom 5 when the lifting boom 5 is in its lowermost, horizontal position in operating state of the truck, as shown in Figure 1.

[0013] Pivoting of the lifting boom 5 about the axis of rotation 16 is achieved with the aid of two forward hydraulic cylinders 18, the lower ends of which are pivotably journalled on the chassis 1 or on elements rigidly connected to the chassis, and the upper ends of which are pivotably journalled on the lifting boom 5. The lower coaxial journalling shafts 19 of the hydraulic cylinders 18 are situated vertically above the centre axle 20 of the front pair of wheels 2, while the upper coaxial journalling shafts 21 are situated a predetermined distance from the axis of rotation 16 of the lifting boom on the stand 15 in order to provide sufficient lifting capacity. These journalling shafts 21 are normally situated above a central region of the truck seen in the lowermost horizontal position of the lifting boom 5 when the truck is in operating state as shown in Figure 1. The hydraulic cylinders 18 thus form an acute angle, such as 40-50°, with the horizontal plane.

[0014] In operating state of the truck according to Figure 1, the axis of rotation 16 of the lifting boom 5 on the stand 15 is situated vertically above the centre axle 22 of the rear pair of wheels 3, this centre axle being perpendicular to the centre line 14 of the truck.

[0015] The stand 15 is pivotably journalled on the chassis above a lower axis of rotation 23 which is stationary and situated vertically above the centre axle 22 of the rear pair of wheels 3, and thus vertically below the axis of rotation 16 of the lifting boom 5 on the stand 15 when the truck is in its operating state for manipulating a load. The stand 15 is extended forwards to the cab and is provided on the extended part with support elements 24 cooperating with corresponding support elements 25 on the chassis 1 in the operating state of the truck. Part of the load from the lifting boom 5, the lifting unit 6 and any load being carried, is transferred to the chassis 1 via these support elements 24, 25. The support elements 24, 25 are situated at a predetermined distance from and in front of the axis of rotation 23 of the stand 15 on the chassis 1. The distance is suitably about 40-60% of the distance between said two upper and lower axes of rotation 16, 23.

[0016] On the side of the stand 15 facing away from the support element 24 there are two hydraulic cylinders 26, the lower ends of which are pivotably journalled on the chassis 1 at a predetermined distance from the axis of rotation 23 of the stand 15 and the upper ends of which are journalled on the stand 15 at its upper part in the vicinity of the axis of rotation 16 of the lifting boom 5 on the stand 15. The hydraulic cylinders 26 have a

stabilizing effect on the stand 15 when this is turned about its axis of rotation 23.

[0017] In the embodiment shown the stand 15 comprises two parallel, generally triangular plates 27, 28, resembling link arms, which are situated one on each side of the lifting boom 5 and are pivotably journalled on coaxial journalling pins forming said lower axis of rotation 23. Said support element 24 of the stand 15 is formed by a flat support element on each stand plate 27, 28, situated at the inner corner of the support plate 27, 28 and at its base, the chassis 1 being provided with a corresponding support element. Each of the two rear hydraulic cylinders 26 is connected to a stand plate 27, 28 in the vicinity of its upper corner which also constitutes the journalling point for a journalling pin, these coaxial journalling pins forming the axis of rotation 16 of the lifting boom 5 on the stand. Each stand plate 27, 28 is pivotably journalled by means of journalling pins on mounting lugs 29 extending upwardly from the chassis, said coaxial journalling pins forming said lower axis of rotation 23 of the stand 15 on the chassis 1.

[0018] The arrangement also includes a locking device 30 for locking the stand 15 to the chassis 1 when the truck assumes operating state to manipulate a load. In the embodiment shown this locking device comprises suitable screws arranged at said support elements 24, 25 to form a detachable screw joint. The locking device may be of any type that provides the desired locking function with maximum safety. It may also include one or more hydraulic locking devices, suitably spring loaded, so that locking position is always assumed by a suitable locking element, e.g. a locking wedge, even if the hydraulic system is out of action for some reason.

[0019] The truck is arranged to be changed to transport state as shown in Figures 3 and 4 when desired.. In this state the truck has reduced total height in comparison with the lowest height the truck has in its operating state as shown in Figure 1. The first measure taken is for the cab 4 to be moved from its central location to its side location on the truck, in which it is situated outside a vertical projection of the lifting boom and the hydraulic cylinders 18 with associated mounting equipment at the sides. The locking device 30 is then released so that the stand 15 can be turned freely backwards. The rear hydraulic cylinders 26 are then activated to retract their piston rods, at the same time as the hydraulic cylinders of the lifting boom are activated to press out their piston rods. The hydraulic cylinders 18 of the lifting boom 5 will thus displace the lifting boom 5 backwards at the same time as the hydraulic cylinders 26 of the stand 15 pull the stand 15 backwards and downwards, and the support elements 24 of the stand 15 leave the support elements 25 of the chassis 1. The stand 15 is turned about its lower axis of rotation 23 and the axis of rotation 16 of the lifting boom 5 will thus describe a circular arc. The lifting boom 5 will then assume a horizontal position with its upper side on a level with the roof of the cab 4 or just above it, e.g. less than 10 cm and pref-

erably less than 5 cm above the roof. In general, therefore, when the truck is in transport state the lower side of the lifting boom is situated beneath the level of the roof of the cab, which is now in its side position, whereby the distance between the lower side of the lifting boom and the level of the roof may be equivalent to the thickness of the lifting boom (which may be 40-80 cm, for instance) in vertical direction, seen in the transport state of the truck, or somewhat less than this according to the above values. The total height of the truck has thus quickly been considerably reduced and the truck can thus pass through low passages to spaces not previously accessible to this type of truck.

Claims

1. A boom truck comprising a chassis (1), a front pair of wheels (2), a rear pair of wheels (3), a cab (4) situated within the chassis (1), a pivotably journalled lifting boom (5) supporting a lifting unit (6) and extending from the rear part of the chassis (1), centrally over the chassis (1) and cab (4) past the front pair of wheels (2), actuators (18) for turning the lifting boom (5) in vertical plane, and a device for converting the truck to transport state with reduced total height in relation to the height in an operating state when the truck is ready to manipulate a load, the cab (4) being located vertically under the lifting boom (5) in operating state of the truck, said device comprising a stand (15) which is pivotably journalled about a lower axis of rotation (23) at the rear part of the chassis (1) and extends upwardly from the chassis (1) to support the lifting boom (5) which is pivotably journalled at the stand (15) about an upper axis of rotation (16), and a rear actuator (26) which is arranged on the side of the stand (15) facing away from the cab (4) to turn the stand (15) about the lower axis of rotation (23) of said stand (15), the stand (15) being arranged to be turned in rearward direction together with the lifting boom (5) while simultaneously lowering this to a lower level in order to achieve said transport state, **characterized in that** the cab (4) is situated within the central area of the chassis (1), that said rear actuator (26) is mounted between the chassis (1) and the stand (15) at a distance from the lower axis of rotation (23) of the stand (15) on the chassis (1), and that said device comprises guide means (13) which movably connect the cab (4) to the chassis (1) to enable movement of the cab (4) from its position vertically below the lifting boom (5) to a side position outside the lifting boom (5) and its said actuator (18) seen in vertical projection, the lifting boom (5) being arranged by means of said rear actuator (26) to be lowered to a substantially horizontal position with its lower side situated below the level of the roof of the cab (4) in its side position.
2. A boom truck as claimed in claim 1, **characterized in that** said device also comprises a locking element (30) to lock the stand (15) in order to prevent the stand (15) from turning about its axis of rotation (23) in the operating state of the truck for manipulating loads.
3. A boom truck as claimed in claim 1 or 2, **characterized in that** the axis of rotation (23) of the stand (15) on the chassis (1) is located vertically above the centre axle (22) of the rear pair of wheels (3).
4. A boom truck as claimed in any one of the preceding claims, **characterized in that** the axis of rotation (16) of the lifting boom (5) on the stand (15) is located vertically above the centre axle (22) of the rear pair of wheels (3) when the truck assumes its operating state for manipulating load.
5. A boom truck as claimed in any one of the preceding claims, **characterized in that** the stand (15) comprises two parallel triangular plates (27, 28) which are journalled on upwardly directed mounting lugs (29) on the chassis by means of journalling pins forming said lower axis of rotation (23) and are situated at one base corner of the stand plates, **in that** said actuator comprises two hydraulic cylinders journalled at the top corners of the stand plates, and **in that** support elements (24) are arranged at the base of the stand plates at the other base corner for cooperation with a similar opposing support element (25) on the chassis (1).
6. A boom truck as claimed in claim 5 in combination with claim 2, **characterized in that** the locking device comprises a plurality of bolts or the like forming screw joints at said support elements (24, 25).

Patentansprüche

1. Lastkraftwagen mit Ausleger, aufweisend eine Chassis (1), ein vorderes Paar Räder (2), ein hinteres Paar Räder (3), ein Führerhaus (4), das sich innerhalb der Chassis (1) befindet, einen schwenkbar gelagerten Hubausleger (5), der eine Hubeinheit (6) trägt und sich vom rückwärtigen Teil der Chassis (1) aus zentral oberhalb der Chassis (1) und des Führerhauses (4) über das vordere Räderpaar (2) erstreckt, Stellorgane (18) zum Wenden des Hubauslegers (5) in vertikaler Ebene und eine Vorrichtung zum Umstellen des Lastkraftwagens auf einen Transportzustand mit verringerter Gesamthöhe in Bezug auf die Höhe in einem Arbeitszustand, wenn der Lastkraftwagen bereit ist, eine Last zu manipulieren, wobei sich das Führerhaus (4) im Arbeitszustand des Lastkraftwagens vertikal unter dem Hubausleger (5) befindet, wobei die Vorrichtung eine

Stütze (15) aufweist, die schwenkbar um eine untere Rotationsachse (23) im rückwärtigen Teil der Chassis (1) gelagert ist und sich von der Chassis (1) aus nach oben erstreckt, um den Hubausleger (5) zu tragen, der schwenkbar um eine obere Rotationsachse (16) an der Stütze (15) gelagert ist, und ein rückwärtiges Stellorgan (26), das an derjenigen Seite der Stütze (15) angeordnet ist, die von dem Führerhaus (4) weg gerichtet ist, um die Stütze (15) um die untere Rotationsachse (23) der Stütze (15) zu drehen, wobei die Stütze (15) so angeordnet ist, dass sie zusammen mit dem Hubausleger (5) nach rückwärts gedreht wird, während dieser gleichzeitig auf ein unteres Niveau abgesenkt wird, um den Transportzustand zu erreichen, **dadurch gekennzeichnet, dass** sich das Führerhaus (4) im Zentralbereich der Chassis (1) befindet, dass das rückwärtige Stellorgan (26) zwischen der Chassis (1) und der Stütze (15) in einem Abstand von der unteren Rotationsachse (23) der Stütze (15) auf der Chassis (1) angebracht ist und dass die Vorrichtung Führungsmittel (13) umfaßt, die das Führerhaus (4) beweglich mit der Chassis (1) verbinden, um eine Bewegung des Führerhauses (4) aus seiner Position vertikal unterhalb des Hubauslegers (5) zu einer Seitenposition außerhalb des Hubauslegers (5) und dessen Stellorgan (18), in vertikaler Projektion gesehen, zu bewegen, wobei der Hubausleger (5) mittels des rückwärtigen Stellorgans (26) so angeordnet ist, dass er in eine im wesentlichen horizontale Position abgesenkt wird, in der sich seine untere Seite unterhalb des Niveaus des Daches des Führerhauses (4) in seiner Seitenposition befindet.

2. Lastkraftwagen mit Hubausleger nach Anspruch 1, **dadurch gekennzeichnet, dass** die Vorrichtung auch ein Sperrelement (30) aufweist, um die Stütze (15) zu sperren, um zu verhindern, dass sich die Stütze (15) im Arbeitszustand des Lastkraftwagens zum Manipulieren von Lasten um ihre Rotationsachse (23) dreht.
3. Lastkraftwagen mit Hubausleger nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** die Rotationsachse (23) der Stütze (15) auf der Chassis (1) vertikal oberhalb der Zentralachse (22) des hinteren Räderpaares (3) gelegen ist.
4. Lastkraftwagen mit Hubausleger nach einem der vorstehenden Ansprüche, **dadurch gekennzeichnet, dass** die Rotationsachse (16) des Hubauslegers (5) auf der Stütze (15) vertikal oberhalb der Zentralachse (22) des hinteren Räderpaares (3) gelegen ist, wenn der Lastkraftwagen seinen Arbeitszustand für das Manipulieren von Lasten einnimmt.
5. Lastkraftwagen mit Hubausleger nach einem der vorstehenden Ansprüche, **dadurch gekennzeichnet,**

net, dass die Stütze (15) zwei parallele dreieckige Platten (27, 28) aufweist, die auf nach oben gerichteten Lagerböcken (29) auf der Chassis mittels Lagerstiften gelagert sind, welche die untere Rotationsachse (23) bilden und sich an einer Basisecke der Stützplatten befinden, dass das Stellorgan zwei hydraulische Zylinder aufweist, die auf den oberen Ecken der Stützplatten gelagert sind, und dass Tragelemente (24) an der Basis der Stützplatten an der anderen Basisecke zum Zusammenwirken mit einem ähnlichen gegenüberliegenden Tragelement (25) auf der Chassis (1) gelagert sind.

6. Lastkraftwagen mit Ausleger nach Anspruch 5 in Kombination mit Anspruch 2, **dadurch gekennzeichnet, dass** die Sperrvorrichtung eine Vielzahl von Bolzen oder dergleichen umfaßt, die Schraubenverbindungen an den Tragelementen (24, 25) bilden.

Revendications

1. Camion à flèche comprenant un châssis (1), une paire avant de roues (2), une paire arrière de roues (3), une cabine (4) située dans le châssis (1), une flèche élévatrice tourillonnée à pivotement (5) supportant une unité d'élévation (6) et s'étendant de la partie arrière du châssis (1), centralement au-dessus du châssis (1) et de la cabine (4) au-delà de la paire avant de roues (2), des éléments d'actionnement (18) pour faire tourner la flèche élévatrice (5) dans le plan vertical, et un dispositif pour faire passer le camion en état de transport avec une hauteur totale réduite par rapport à la hauteur en état de fonctionnement lorsque le camion est prêt à manipuler une charge, la cabine (4) étant située verticalement en dessous de la flèche élévatrice (5) en état de fonctionnement du camion, ledit dispositif comprenant un support (15) qui est tourillonné à pivotement autour d'un axe inférieur de rotation (23) dans la partie arrière du châssis (1) et s'étend vers le haut depuis le châssis (1) pour supporter la flèche élévatrice (5) qui est tourillonnée à pivotement sur le support (15) autour d'un axe supérieur de rotation (16), et un élément d'actionnement arrière (26) qui est aménagé sur le côté du support (15) opposé à la cabine (4) pour faire tourner le support (15) autour de l'axe inférieur de rotation (23) dudit support (15), le support (15) étant aménagé pour tourner en direction arrière conjointement avec la flèche élévatrice (5) tout en abaissant simultanément celle-ci à un niveau inférieur afin d'atteindre ledit état de transport, **caractérisé en ce que** la cabine (4) est située dans la zone centrale du châssis (1), **en ce que** ledit élément d'actionnement arrière (26) est monté entre le châssis (1) et le support (15) à distance de l'axe inférieur de rotation (23) du support

(15) sur le châssis (1), et **en ce que** ledit dispositif comprend des moyens de guidage (13) qui raccordent de manière mobile la cabine (4) au châssis (1) pour permettre le déplacement de la cabine (4) de sa position située verticalement en dessous de la flèche élévatrice (5) dans une position latérale à l'écart de la flèche élévatrice (5) et de son élément d'actionnement précité (8) observé en projection verticale, la flèche élévatrice (5) étant aménagée au moyen dudit élément d'actionnement arrière (26) pour être abaissée en position sensiblement horizontale avec son côté inférieur situé en dessous du niveau du toit de la cabine (4) dans sa position latérale.

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2. Camion à flèche selon la revendication 1, **caractérisé en ce que** ledit dispositif comprend également un élément de blocage (30) pour bloquer le support (15) afin d'empêcher le support (15) de tourner autour de son axe de rotation (23) dans l'état de fonctionnement du camion pour manipuler des charges.

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3. Camion à flèche selon la revendication 1 ou 2, **caractérisé en ce que** l'axe de rotation (23) du support (15) sur le châssis (1) est situé verticalement au-dessus de l'essieu central (22) de la paire arrière de roues (3).

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4. Camion à flèche selon l'une quelconque des revendications précédentes, **caractérisé en ce que** l'axe de rotation (16) de la flèche élévatrice (5) sur le support (15) est situé verticalement au-dessus de l'essieu central (22) de la paire arrière de roues (3) lorsque le camion adopte son état de fonctionnement pour manipuler des charges.

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5. Camion à flèche selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le support (15) comprend deux plaques triangulaires parallèles (27, 28) qui sont tourillonnées sur des ressauts de montage (29) dirigés vers le haut sur le châssis au moyen de broches tourillons formant ledit axe inférieur de rotation (23) et sont situés sur un coin de base des plaques du support, **en ce que** ledit élément d'actionnement comprend deux verins hydrauliques tourillonnés sur les coins supérieurs des plaques du support, et **en ce que** des éléments porteurs (24) sont aménagés sur la base des plaques du support à l'autre coin de base pour coopérer avec un élément porteur similaire opposé (25) sur le châssis (1).

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6. Camion à flèche selon la revendication 5 en combinaison avec la revendication 2, **caractérisé en ce que** le dispositif de blocage comprend une pluralité de boulons ou analogues formant des joints filetés sur lesdits éléments porteurs (24, 25).

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