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(54) **LADDER ARRANGEMENT, PERSON LIFTER AND METHOD OF USING A PERSON LIFTER**

LEITERANORDNUNG, PERSONENHEBEVORRICHTUNG UND VERFAHREN ZUR
VERWENDUNG EINER PERSONENHEBEVORRICHTUNG

ECHELLE, ASCENSEUR POUR PERSONNE ET PROCEDE D'UTILISATION D'ASCENSEUR

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Description

BACKGROUND OF THE INVENTION

[0001] The invention relates to a person lifter according to a preamble of independent apparatus claim 1.

[0002] The invention still further relates to a method of using a person lifter provided with ladders, and disclosed in a preamble of independent method claim 5.

[0003] Fire-fighting vehicles and corresponding rescue vehicles typically comprise a person lifter provided with ladders in a manner enabling climbing into a person cage or the like at the outermost end of the person lifter. The beam comprised by the person lifter can usually be extended and shortened, whereby the length of the ladders has to be able to change correspondingly. Accordingly, the ladders are typically arranged partly overlapping, and they are able to glide relative to each other when the beam is being moved. In order to enable climbing along the ladders, the steps of the ladders should be substantially at the same point in the overlapping portion. Accordingly, the steps have to be placed in position by changing the length of the beam. In this case, the position of the outermost end of the beam naturally changes and the entire beam has to be repositioned for getting the person cage into the original position. Consequently, the problem is the complex and slow use of the person lifter.

[0004] US-3584703-A discloses a hydraulic platform provided with a ladder arrangement, in accordance with the preamble of claim 1 and a method of using it in accordance with the preamble of claim 5.

BRIEF DESCRIPTION OF THE INVENTION

[0005] The object of the present invention is to provide a new and improved person lifter, and a method of using a person lifter provided with ladders.

[0006] The person lifter of the invention is characterized by the features of independent apparatus claim.

[0007] The method of the invention is characterized by the features of independent method claim.

[0008] The essential idea of the invention is that the ladder arrangement comprises one or more actuators arranged to move the movable portion comprised by the ladders in a manner allowing the steps of the overlapping ladder portions to be positioned substantially at the same point. The upper end of the ladder arrangement is arranged to remain in position when the steps are positioned in place by means of the actuator.

[0009] An advantage is that the steps of the overlapping ladder parts can be placed at the same point without having to move the beam. This allows the person cage to be driven to the desired position and to be kept in place in this position during the setting of the steps. The actuator moves the movable portion of the ladders, but does not affect the upper end of the ladder arrangement. Accordingly, the invention speeds up and simplifies the driving in place of the person cage, which is a very important

issue at least in rescue operations.

[0010] An idea of an embodiment of the invention is that movement of the beam is prevented when the movable ladder part is being moved by means of the actuator.

[0011] An idea of an embodiment of the invention is that the actuator is arranged to operate both as a transfer device and as a locking device of the movable ladder part. This way, several separate devices are not required for the transfer and locking.

[0012] An idea of an embodiment of the invention is that the pressure medium-operated actuator, such as a hydraulic cylinder, for example, is arranged to move the movable ladder part.

[0013] An idea of an embodiment of the invention is that the outermost part of the ladder arrangement, i.e. the upper end, is fastened immobile to the upper part of the beam. The mounting of the upper part of the ladder arrangement thus receives part of the load of the ladders. The actuator may be arranged to move the lowest portion of the ladder arrangement. Alternatively or in addition, some movable ladder part between the lowest ladder part and the immobile uppermost ladder part can be moved.

[0014] An idea of an embodiment of the invention is that the outermost part, i.e. the upper end, of the ladder arrangement is fastened immobile to the upper part of the beam, and the lower part of the ladder arrangement is fastened immobile to the carriage of the lifter or to a corresponding support point. This being so, the actuator is arranged to move a movable ladder part between the ends of the ladder arrangement for placing the steps in position.

[0015] An idea of an embodiment of the invention is that the person lifter is arranged on a movable carriage, which is a rescue vehicle.

[0016] An idea of an embodiment of the invention is that the ladder arrangement comprises at least one sensor arranged to monitor the position of the steps in the overlapping portion of the ladder parts.

[0017] An idea of an embodiment of the invention is that the ladder arrangement comprises at least one control unit arranged to control the actuator and to drive the movable ladder part automatically in such a manner that the steps in the overlapping portion are substantially at the same point.

BRIEF DESCRIPTION OF THE FIGURES

[0018] The invention will be described in more detail in the accompanying drawings, wherein

Figure 1 is a schematic side view of a person lifter according to the invention with the beam lifted to its uppermost position,

Figure 2 schematically shows the person lifter shown in Figure 1 with the beam lifted to a horizontal position,

Figure 3 schematically shows the person lifter shown in Figure 1 with the beam directed downwards,

Figure 4 schematically shows the structure of a ladder arrangement according to the invention, Figure 5 schematically shows the principle of a second ladder arrangement according to the invention, and Figure 6 schematically shows still another ladder arrangement.

[0019] For the sake of clarity, the figures show some embodiments of the invention in a simplified manner. Like parts are denoted with the same reference numerals.

DETAILED DESCRIPTION OF SOME EMBODIMENTS

[0020] The person lifter shown in Figure 1 comprises a carriage 1, which can be a movable carriage, such as a fire-fighting vehicle or another rescue vehicle. A beam 2 is arranged on the carriage 1, the beam being movable in a manner enabling the driving of a person cage 3 or the like at the outermost end of the beam to the desired place. The beam 2 may comprise a first part 2a and a second part 2b. The first beam part 2a may be connected by means of a first articulation 4 or the like to the carriage 1 in a manner allowing the beam 2 to be rotated in direction A. The outermost end of the first part 2a is provided with a second articulation 5 or the like, and the second beam part 2b, connected thereto, can be rotated in direction B relative to the first part 2a. The length of the first part 2a may be fixed. The second beam part 2b, in turn, may be telescopically extendable and retractable, enabling the movement of the person cage 3 by lengthening and shortening the length of the second part 2b and by rotating the beam parts 2a and 2b relative to the articulations 4 and 5.

[0021] The person lifter also comprises a ladder arrangement 6 in a manner allowing climbing from the carriage 1 along the ladders to the person cage 3 and back. On the other hand, the beam 2 does not necessarily have to comprise a person cage 3, but it may be provided with some other means, such as a fire-extinguishing medium nozzle. The ladder arrangement 6 may be arranged on the side of one flank of the beam 2, as is illustrated in Figures 1 to 3. The ladder arrangement may comprise a first ladder 6a arranged in the first beam part 2a and a second ladder 6b arranged in the second beam part 2b. The first ladder 6a and the second ladder 6b may be interconnected by means of a third articulation 7. The articulation between the ladders 6a, 6b may be fastened to the second beam part 2b, at a distance from the articulation 5 between the beam parts 2a, 2b. Accordingly, the articulations 5 and 7 are located at different points. This being so, the angle between the first ladder 6a and the carriage 1 is always smaller than the angle between the first beam part 2a and the carriage 1, as can be seen in Figures 1 to 3. This substantially facilitates and speeds up climbing in the ladders. When the beam 2 is moved to different positions, the distance changes between the lower end of the first ladder 6a and the articulation 7. The

first ladder 6a comprises at least two ladder parts arranged movable relative to each other. The ladder parts may be arranged to glide telescopically relative to each other, whereby the ladder parts enable a change in the length of the first ladder 6a when the beam 2 is moved.

[0022] Figure 4 shows a structure of the ladder arrangement 6 according to the invention in a strongly simplified manner. The ladders comprise at least one movable ladder part 8 and at least one fixed ladder part 9. The ladder parts comprise steps 8a and 9a having substantially the same step distribution T. The ladder parts 8 and 9 are arranged in succession and they may be interconnected with suitable support members in a manner allowing the movable ladder part 8 to be moved longitudinally relative to the fixed ladder part 9. The ladder parts 8 and 9 are superimposed in an overlapping portion 10. The movable ladder part 8 can be moved longitudinally S by means of one or more actuators 11, which may be connected directly or by means of suitable power transmission members to act on the movable ladder part 8. The actuator 11 may be a hydraulic or pneumatic cylinder. Alternatively, the actuator 11 may be a pressure medium driven motor arranged to act on the movable ladder part 8 by means of a toothed bar or the like. Furthermore, the actuator 11 may be an electric motor or any other power unit suitable for moving the ladder part 8. The actuator 11 may operate both as a transfer device and as a locking device. The upper end 30 of the ladder arrangement 6 may be fastened to the beam 2 in a fastening portion 31. The fastening portion 31 may be arranged in the vicinity of the person cage 3 at the upper end of the beam 2, enabling easy transfer from the ladder into the carriage. When steps are being set by means of the actuator 11, the position of the person cage 3 and the position of the upper end 30 of the ladders remain unchanged, and thus their position does not have to be reset later.

[0023] The ladder arrangement 6 comprises one or more sensors 12 for monitoring the mutual position of the steps 8a and 9a in the overlapping portion 10. Monitoring information can be transmitted from the sensor 12 to a control device 13 comprised by the ladder arrangement 6, the control device, in turn, being arranged to directly control the actuator 11 or a valve 14 or a corresponding adjustment member acting on the actuator 11. When the beam 6 is driven to the desired place and position, the steps 8a and 9a in the overlapping portion 10 may be at different points relative each other. This is illustrated by a step 15 shown with a dashed line. In order to get the steps in the overlapping portion to substantially the same point relative to each other, the movable ladder part 8 should be moved with the actuator 11 either upwards U or downwards V in such a manner that the steps 8a and 9a take the position shown by a solid line in Figure 4. The control device 13 may be arranged to control the actuator 11 automatically to set the steps 8a and 9a at the same point. The sensor 12 indicates to the control device 13 when the steps 8a and 9a are at the same

point. Alternatively, the actuator 11 is operated manually, for instance by controlling the actuator in a first direction or a second direction by means of push buttons 16 for transferring the ladder part 8. An indicator 17, such as an indicator lamp or a sound signal, for example, can be provided in connection with the control device 13 for indicating to the user when the steps 8a and 9a are correctly in the overlapping portion 10.

[0024] Figure 5 further shows an embodiment for adjusting the movable part 8 of the ladder 6b. The actuator 11 may be arranged to move the third articulation 7 in direction S, enabling movement of the movable ladder part 8 relative to the fixed ladder part 9 in a manner allowing the steps in the overlapping portion of the ladder parts 8 and 9 to be arranged at substantially the same point. Figure 5 further shows that the third articulation 7 is closer by distance X to the outermost end of the beam 2 as compared with the second articulation 5. This being so, angle C between the first ladder 6a and the carriage 1 is always smaller than angle D between the first beam part 2a and the carriage 1. This allows the angle of ascent of the ladder part 6a to be rendered smaller, which naturally facilitates and speeds up climbing in the ladders.

[0025] Let it be mentioned that, in the same way as the first ladder 6a, the second ladder 6b shown in Figures 1 to 3 and 5 may comprise a movable part and a fixed part and one or more actuators 11 for setting the steps 8a and 9a of the ladder parts substantially at the same point in the overlapping portion.

[0026] The ladder arrangement shown in Figure 6 comprises a lower first ladder 6a and an upper second ladder 6b. The lower end of the first ladder 6a may be fastened to the carriage 1 of the person lifter by means of a fastening point 20. The outermost end 30, i.e. upper end, of the second ladder 6b may, in turn, be fastened to the upper end of the beam 2 by means of a fastening point 31. The second ladder 6b may comprise a turning part 22, which may be rotationally connected by means of an articulation 23 to a movable portion 24 in the second ladder 6b. The turning part 22 may further be connected by means of the articulation 7 to a movable portion 25 in the first ladder 6a. The actuator 11, which is not shown in Figure 6 by way of clarity, may be arranged to turn the turning part 22 in direction E, whereby the movable ladder parts 24, 25 move. The steps can then be set in place by turning the turning part 22. The lower part of the first ladder 6a may comprise a fixed ladder portion 26, which may be connected to the carriage 1 by means of an articulation 27. Furthermore, the outermost end of the second ladder 6b may comprise a fixed ladder portion 28. In both ladders 6a, 6b, the movable ladder parts and the fixed ladder parts are arranged to glide telescopically relative to each other, which is illustrated by transverse lines 29 marked in Figure 6.

[0027] The ladder arrangement according to the invention can be applied to other kinds of beams than those shown in the figures. The beam may comprise a plurality of extendable and retractable beam parts articulated to

each other or having a fixed length. Furthermore, the ladders may comprise a plurality of movable portions and, correspondingly, one or more fixed portions.

[0028] The characteristics described in the present application can also be applied separately and, on the other hand, other combinations than those shown in the figures by way of example can be constructed from the characteristics.

[0029] The drawings and the related description are only intended to illustrate the idea of the invention. The details of the invention may vary within the scope of the claims.

15 Claims

1. A person lifter comprising:

- a carriage (1);
- a movable beam (2);
- a first beam part (2a) connected to the carriage (1) by means of a first articulation (4) and movable relative to the first articulation (4), and the first part (2a) having a fixed length;
- a second beam part (2b) connected to an outermost end of the first beam part (2a) by means of a second articulation (5), the second part (2b) being extendable and retractable;
- a ladder arrangement (6) comprising a first ladder (6a) arranged on the first beam part (2a) and a second ladder (6b) arranged on the second beam part (2b), the first ladder (6a) and the second ladder (6b) comprising a plurality of steps (8a, 9a) having a predetermined step distribution (T), the first ladder (6a) comprising at least one fixed ladder part (9) and at least one movable ladder part (8), the ladder parts (8, 9) being arranged in succession and partly overlapping relative to each other,
- and wherein an upper end (30) of the ladder arrangement (6) is fastened to an upper part of the beam (2),
- and the lower part of the ladder arrangement is fastened immobile to the carriage of the lifter or to a corresponding support point, the first ladder (6a) and the second ladder (6b) are interconnected by means of a third articulation (7);

characterized in that

- the third articulation (7) is fastened to the second beam part (2b) such that the third articulation (7) is located at a distance (X) from the second articulation (5), whereby an angle (C) between the first ladder (6a) and the carriage (1) is always smaller than an angle (D) between the first beam part (2b) and the carriage (1);
- the first ladder (6a) comprises at least one actuator (11) for positioning the movable ladder part (8) relative to the fixed ladder part (9) such

- that the steps (8a, 9a) in the overlapping portion (10) of the ladder parts (8, 9) can be positioned substantially at the same point by moving the movable part (8);
the upper end (30) of the ladder arrangement (6) is arranged to remain substantially immobile when the actuator (11) is being used. 5
2. A person lifter as claimed in claim 1, **characterized in that** 10
the actuator (11) is a hydraulic cylinder.
3. A person lifter as claimed in claim 1 or 2, **characterized in that** 15
an upper end of the second beam part (6b) comprises a person cage (3).
4. A person lifter as claimed in any one of the preceding claims, **characterized in that** 20
the movement of the beam (2) is prevented when the actuator (11) connected to the movable part (8) of the ladders is being used.
5. A method of using a person lifter provided with ladders, 25
the person lifter comprising at least a carriage (1), a movable beam (2) and a ladder arrangement (6), the ladder arrangement (6) comprising a movable ladder part (8) and a fixed ladder part (9) arranged in succession and partly overlapping relative to each other, 30
and an upper end (30) of the ladder arrangement is fastened to an upper part of the beam,
and the lower part of the ladder arrangement is fastened immobile to the carriage of the lifter or to a corresponding support point, 35
the method comprising:
- moving the beam (2) for driving an upper end of the beam into the desired position, and
placing steps (8a, 9a) of the movable ladder part (8) and the fixed ladder part (9) substantially at the same point in the overlapping portion (10) of the ladder parts, 40
- characterized by** 45
moving the movable ladder part (8) by means of at least one actuator (11) relative to the fixed ladder part (9) for placing the steps (8a, 9a) substantially at the same point in the overlapping portion (10) of the ladder parts; and
keeping the beam (2) and an upper end (30) of the ladder arrangement (6) substantially immobile when the actuator (11) is being used. 50
6. A method as claimed in claim 5, **characterized by** 55
monitoring the mutual position of the steps (8a, 9a) of the ladder parts (8, 9) on the overlapping portion (10) of the ladder parts by means of at least one sensor (12),

transmitting monitoring information from the sensor (12) to a control device (13), and
automatically driving the steps (8a, 9a) of the ladder parts (8, 9) by means of the control device (13) at a substantially same point in the overlapping portion (10).

7. A method as claimed in claim 5 or 6, **characterized by**
using the actuator (11) to move only one movable ladder part (8) lowest in the ladder arrangement (6).
8. A method as claimed in claim 5 or 6, **characterized by**
using the actuator (11) to move an articulation (7) that connects the first ladder (6a) and the second ladder (6b) comprised by the ladder arrangement (6), the movement of the articulation (7) being arranged to cause the movement of the movable portion (8) of the first ladder (6a) relative to the fixed portion (9), and the movement of the movable portion (8) of the second ladder (6b) relative to the fixed portion (9).

Patentansprüche

1. Personenhebevorrichtung mit:

einer Unterlage (1);
einem bewegbaren Ausleger (2);
einem ersten Auslegerteil (2a), der durch ein erstes Gelenk (4) mit der Unterlage (1) verbunden und in Bezug auf das erste Gelenk (4) bewegbar ist, und welcher erste Teil (2a) eine feste Länge hat;
einem zweiten Auslegerteil (2b), der durch ein zweites Gelenk (5) mit einem äußersten Ende des ersten Auslegerteils (2a) verbunden ist, welcher zweite Teil (2b) ausziehbar und einziehbar ist;
einer Leiteranordnung (6), die eine am ersten Auslegerteil (2a) angeordnete erste Leiter (6a) und eine am zweiten Auslegerteil (2b) angeordnete zweite Leiter (6b) aufweist, wobei die erste Leiter (6a) und die zweite Leiter (6b) eine Vielzahl von Stufen (8a, 9a) mit einer vorbestimmten Stufenverteilung (T) aufweisen, welche erste Leiter (6a) zumindest einen festen Leiterteil (9) und zumindest einen bewegbaren Leiterteil (8) aufweist, wobei die Leiterteile (8, 9) nacheinander und sich teilweise überlappend angeordnet sind,
und wobei ein oberes Ende (30) der Leiteranordnung (6) an einem oberen Teil des Auslegers (2) befestigt ist
und der untere Teil der Leiteranordnung unbeweglich an der Unterlage der Hebevorrichtung

oder an einem entsprechenden Stützpunkt befestigt ist,
die erste Leiter (6a) und die zweite Leiter (6b) durch ein drittes Gelenk (7) miteinander verbunden sind;

dadurch gekennzeichnet, dass

das dritte Gelenk (7) am zweiten Auslegerteil (2b) derart befestigt ist, dass sich das dritte Gelenk (7) in einem Abstand (X) vom zweiten Gelenk (5) befindet, wobei ein Winkel (C) zwischen der ersten Leiter (6a) und der Unterlage (1) immer kleiner als ein Winkel (D) zwischen dem ersten Auslegerteil (2b) und der Unterlage (1) ist; die erste Leiter (6a) zumindest einen Stellantrieb (11) aufweist, um den bewegbaren Leiterteil (8) in Bezug auf den festen Leiterteil (9) derart zu positionieren, dass die Stufen (8a, 9a) im überlappenden Abschnitt (10) der Leiterteile (8, 9) wesentlich an derselben Stelle positioniert werden können, indem der bewegbare Teil (8) bewegt wird;
das obere Ende (30) der Leiteranordnung (6) angeordnet ist, wesentlich unbeweglich zu bleiben, wenn der Stellantrieb (11) verwendet wird.

2. Personenhebevorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** der Stellantrieb (11) ein Hydraulikzylinder ist.

3. Personenhebevorrichtung nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** ein oberes Ende des zweiten Auslegerteils (6b) einen Personenkorb (3) aufweist.

4. Personenhebevorrichtung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Bewegung des Auslegers (2) verhindert ist, wenn der mit dem bewegbaren Teil (8) der Leitern verbundene Stellantrieb (11) verwendet wird.

5. Verfahren zur Verwendung einer Personenhebevorrichtung mit Leitern, wobei die Personenhebevorrichtung zumindest eine Unterlage (1), einen bewegbaren Ausleger (2) und eine Leiteranordnung (6) aufweist, welche Leiteranordnung (6) einen bewegbaren Leiterteil (8) und einen festen Leiterteil (9) aufweist, die nacheinander und sich teilweise überlappend angeordnet sind, wobei ein oberes Ende (30) der Leiteranordnung an einem oberen Teil des Auslegers befestigt ist und der untere Teil der Leiteranordnung unbeweglich an der Unterlage der Hebevorrichtung oder an einem entsprechenden Stützpunkt befestigt ist, welches Verfahren aufweist:

Bewegen des Auslegers (2), um ein oberes Ende des Auslegers in die erwünschte Position zu

fahren, und

Platzieren von Stufen (8a, 9a) des bewegbaren Leiterteils (8) und des festen Leiterteils (9) wesentlich an dieselbe Stelle im überlappenden Abschnitt (10) der Leiterteile,

dadurch gekennzeichnet, dass

der bewegbare Leiterteil (8) anhand zumindest eines Stellantriebs (11) in Bezug auf den festen Leiterteil (9) bewegt wird, um die Stufen (8a, 9a) wesentlich an dieselbe Stelle im überlappenden Abschnitt (10) der Leiterteile zu platzieren; und der Ausleger (2) und ein oberes Ende (30) der Leiteranordnung (6) wesentlich unbeweglich gehalten werden, wenn der Stellantrieb (11) verwendet wird.

6. Verfahren nach Anspruch 5, **dadurch gekennzeichnet, dass**

die gegenseitigen Positionen der Stufen (8a, 9a) der Leiterteile (8, 9) im überlappenden Abschnitt (10) der Leiterteile anhand zumindest eines Sensors (12) überwacht werden, Überwachungsinformation von dem Sensor (12) einer Steuervorrichtung (13) übertragen wird und die Stufen (8a, 9a) der Leiterteile (8, 9) automatisch anhand der Steuervorrichtung (13) an wesentlich dieselbe Stelle im überlappenden Abschnitt (10) gefahren werden.

7. Verfahren nach Anspruch 5 oder 6, **dadurch gekennzeichnet, dass**

der Stellantrieb (11) dafür verwendet wird, nur einen bewegbaren Leiterteil (8) am weitesten nach unten in der Leiteranordnung (6) zu bewegen.

8. Verfahren nach Anspruch 5 oder 6, **dadurch gekennzeichnet, dass**

der Stellantrieb (11) dafür verwendet wird, ein Gelenk (7) zu bewegen, das die erste Leiter (6a) und die zweite Leiter (6b) in der Leiteranordnung (6) verbindet, wobei die Bewegung des Gelenks (7) vorgesehen ist, die Bewegung des bewegbaren Abschnitts (8) der ersten Leiter (6a) in Bezug auf den festen Abschnitt (9) und die Bewegung des bewegbaren Abschnitts (8) der zweiten Leiter (6b) in Bezug auf den festen Abschnitt (9) zustande zu bringen.

Revendications

1. Élévateur pour personne comprenant :

un chariot (1) ;
une poutre mobile (2) ;
une première partie de poutre (2a) reliée au chariot (1) à l'aide d'une première articulation (4) et pouvant bouger par rapport à la première articulation (4), et la première partie (2a) ayant une

longueur fixe ;

une seconde partie de poutre (2b) reliée à l'extrémité la plus extérieure de la première partie de poutre (2a) à l'aide d'une deuxième articulation (5), la seconde partie (2b) pouvant s'étendre et se rétracter ;

un agencement d'échelles (6) comprenant une première échelle (6a) agencée sur la première partie de poutre (2a) et une seconde échelle (6b) agencée sur la seconde partie de poutre (2b), la première échelle (6a) et la seconde échelle (6b) comprenant une pluralité d'échelons (8a, 9a) présentant une répartition d'échelons prédéfinie (T), la première échelle (6a) comprenant au moins une partie d'échelle fixe (9) et au moins une partie d'échelle mobile (8), les parties d'échelle (8, 9) étant agencées en série et se chevauchant mutuellement de façon partielle, et dans lequel une extrémité supérieure (30) de l'agencement d'échelles (6) est fixée à une partie supérieure de la poutre (2), et la partie inférieure de l'agencement d'échelles est fixée immobile au chariot de l'élévateur ou à un point de support correspondant, la première échelle (6a) et la seconde échelle (6b) étant reliées l'une à l'autre à l'aide d'une troisième articulation (7) ;

caractérisé en ce que

la troisième articulation (7) est fixée à la seconde partie de poutre (2b) de sorte que la troisième articulation (7) se situe à une distance (X) de la deuxième articulation (5), moyennant quoi l'angle (C) entre la première échelle (6a) et le chariot (1) est toujours inférieur à un angle (D) entre la première partie de poutre (2b) et le chariot (1) ;

la première échelle (6a) comprend au moins un actionneur (11) destiné à positionner la partie d'échelle mobile (8) par rapport à la partie d'échelle fixe (9) de sorte que les échelons (8a, 9a) dans la partie de chevauchement (10) des parties d'échelle (8, 9) puissent être positionnées sensiblement au même point en déplaçant la partie mobile (8) ; l'extrémité supérieure (30) de l'agencement d'échelles (6) est conçue pour rester sensiblement immobile lorsque l'actionneur (11) est en cours d'utilisation.

2. Élévateur pour personne selon la revendication 1, **caractérisé en ce que** l'actionneur (11) est un cylindre hydraulique.

3. Élévateur pour personne selon la revendication 1 ou 2, **caractérisé en ce que** une extrémité supérieure de la seconde partie de poutre (6b) comprend une cage (3) pour personne.

4. Élévateur pour personne selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le déplacement de la poutre (2) est empêché lorsque l'actionneur (11) relié à la partie mobile (8) des échel-

les est en cours d'utilisation.

5. Procédé d'utilisation d'un élévateur pour personne doté d'échelles ; l'élévateur pour personne comprenant au moins un chariot (1), une poutre mobile (2) et un agencement d'échelles (6), l'agencement d'échelles (6) comprenant une partie d'échelle mobile (8) et une partie d'échelle fixe (9) agencées en série et se chevauchant mutuellement de façon partielle, et une extrémité supérieure (30) de l'agencement d'échelles est fixée à une partie supérieure de la poutre, et la partie inférieure de l'agencement d'échelles est fixée immobile au chariot de l'élévateur ou à un point de support correspondant, le procédé consistant à :

déplacer la poutre (2) pour entraîner une extrémité supérieure de la poutre dans la position souhaitée, et

placer les échelons (8a, 9a) de la partie d'échelle mobile (8) et de la partie d'échelle fixe (9) sensiblement au même point dans la partie de chevauchement (10) des parties d'échelle,

caractérisé par

le déplacement de la partie d'échelle mobile (8) à l'aide d'au moins un actionneur (11) par rapport à la partie d'échelle fixe (9) pour placer les échelons (8a, 9a) sensiblement au même point dans la partie de chevauchement (10) des parties d'échelle ; et

maintenir la poutre (2) et une extrémité supérieure (30) de l'agencement d'échelles (6) sensiblement immobiles lorsque l'actionneur (11) est en cours d'utilisation.

6. Procédé selon la revendication 5, **caractérisé par** le contrôle de la position mutuelle des échelons (8a, 9a) des parties d'échelle (8, 9) sur la partie de chevauchement (10) des parties d'échelle à l'aide d'au moins un capteur (12), la transmission d'informations de contrôle du capteur (12) à un dispositif de commande (13), et l'entraînement automatique des échelons (8a, 9a) des parties d'échelle (8, 9) à l'aide du dispositif de commande (13) sensiblement au même point dans la partie de chevauchement (10).

7. Procédé selon la revendication 5 ou 6, **caractérisé par** l'utilisation de l'actionneur (11) pour déplacer seulement une partie d'échelle mobile (8) au plus bas de l'agencement d'échelles (6).

8. Procédé selon la revendication 5 ou 6, **caractérisé par** l'utilisation de l'actionneur (11) pour déplacer une articulation (7) qui relie la première échelle (6a) et la

seconde échelle (6b) composant l'agencement d'échelles (6), le déplacement de l'articulation (7) étant conçu pour provoquer le déplacement de la partie mobile (8) de la première échelle (6a) par rapport à la partie fixe (9), et le déplacement de la partie mobile (8) de la seconde échelle (6b) par rapport à la partie fixe (9).

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FIG. 1

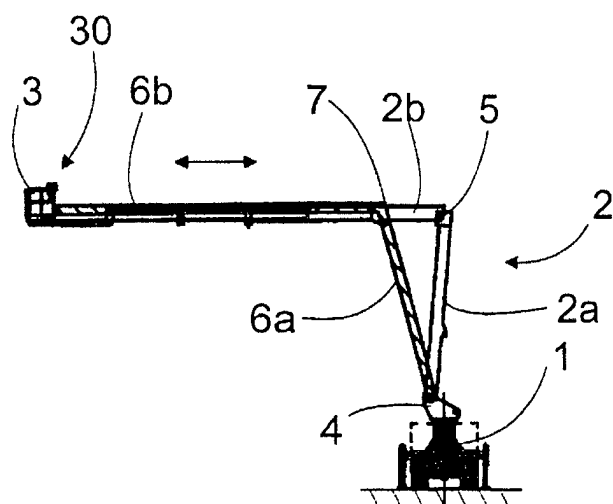
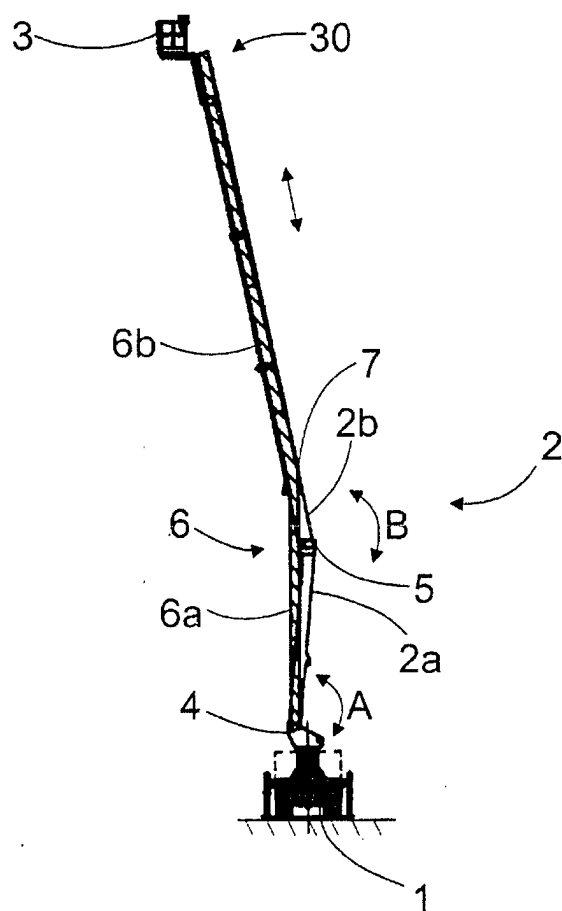


FIG. 2

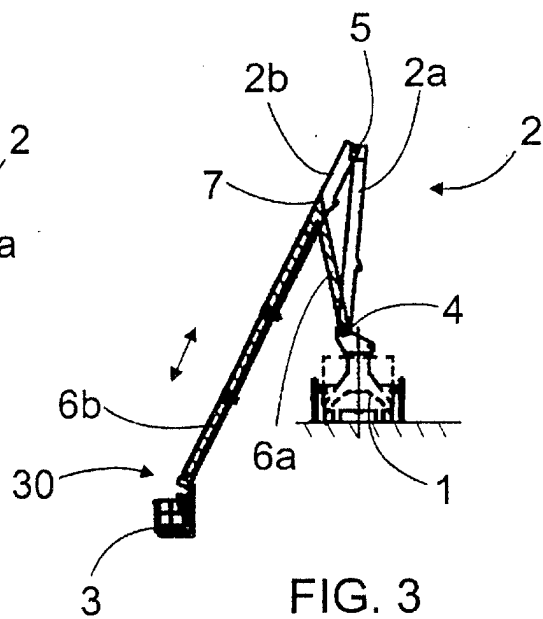


FIG. 3

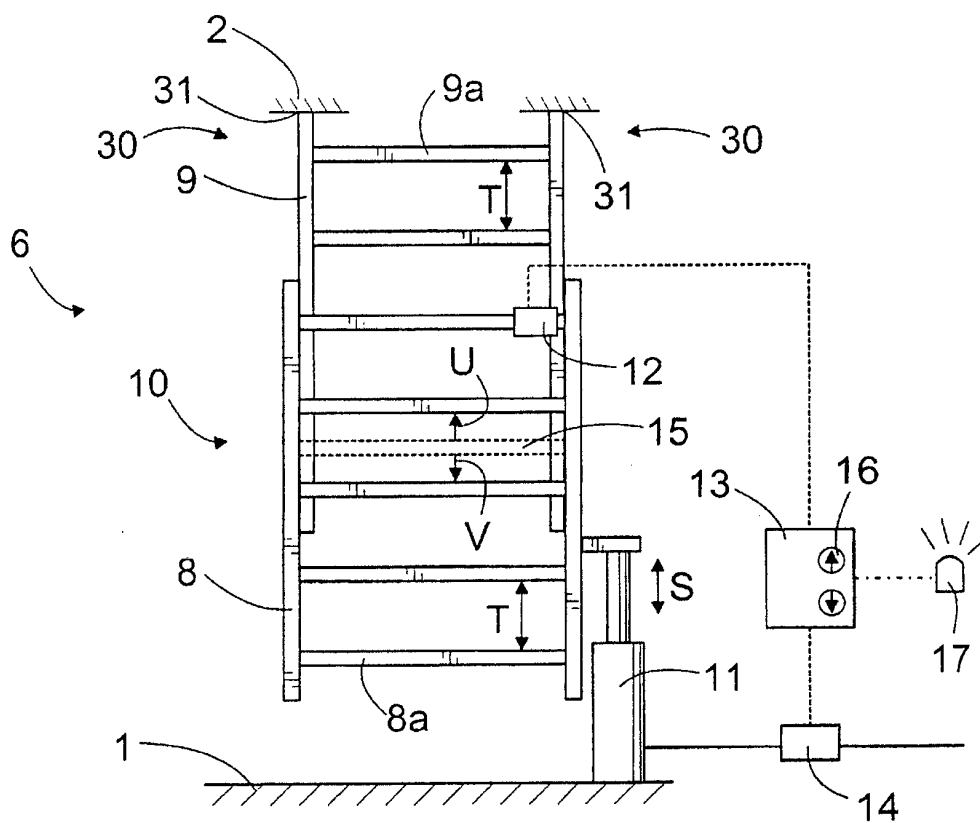


FIG. 4

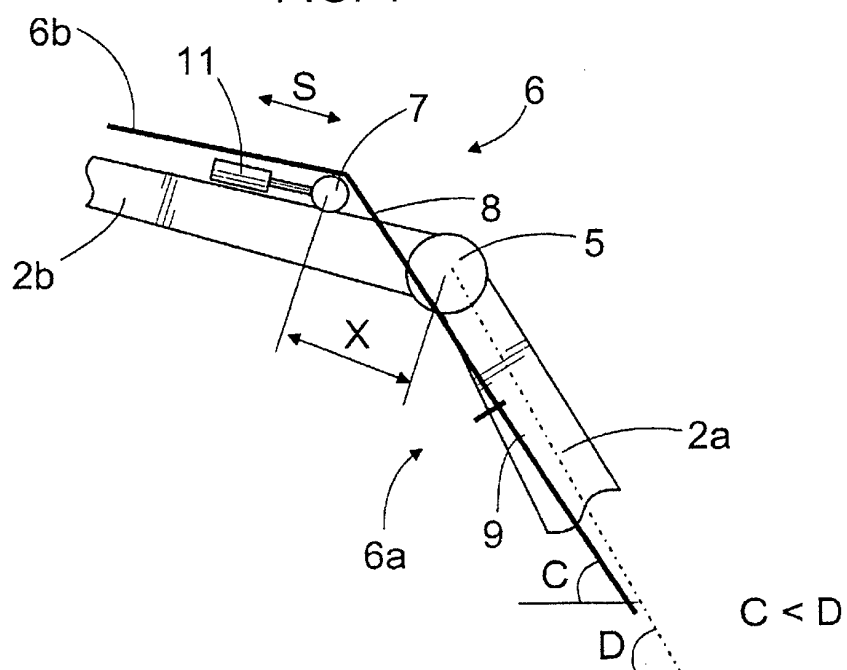


FIG. 5

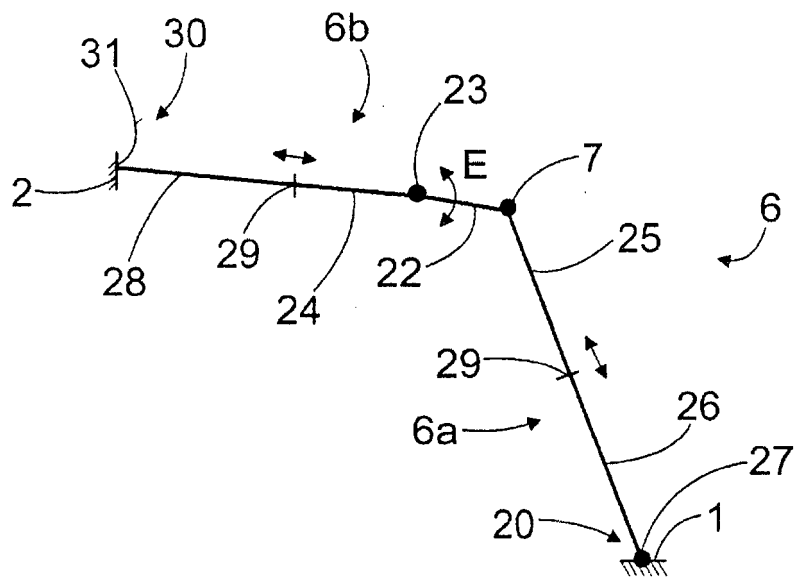


FIG. 6

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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