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(54) **A climbing head for hoisting a self-climbing protection system for construction works in buildings**

Kletterkopf zum Hochziehen eines selbstkletternden Schutzsystems für Bauarbeiten in Gebäuden

Tête d'escalade pour lever un système de protection d'escalade pour les travaux de construction de bâtiments

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**WO-A1-2007/036300 WO-A1-2008/126999**

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## Description

**[0001]** The present invention is comprised within the technical field of construction of buildings and, more particularly, in the sector of formworks and of self-climbing perimetric protection systems for construction works in buildings and, specifically it relates to a climbing head for hoisting such protection systems.

## BACKGROUND OF THE INVENTION

**[0002]** In the construction of high building, the need of working safely at great heights and at adverse meteorological conditions (wind or rain) has made it indispensable to install in the periphery of the framing perimetric protections which safeguard the physical integrity of workers.

**[0003]** These protections have historically been made up of simple railings. However, the concept of protection that is currently used, entirely covers the framing, for example the last three framing structures being worked on, with canvas, wooden boards, fences, wire mesh, etc. Such protection systems were first introduced on the Spanish market in non self-climbing versions, such as the protection system used by the Spanish company UL-MA Construcción in the Sacyr tower works in Madrid. In this version, each part of the peripheral protection system has to be hoisted by a crane and this took time away from the availability of the crane for performing other tasks on site. As can be concluded from the foregoing, it makes no sense to install a complex self-climbing system for the wall formworks of the central core of a building if the crane is later occupied for long periods of time to raise the peripheral protection system. On the other hand, automatic hoisting of the protection system is safer because it is not necessary for there to be people guiding the assemblies in dangerous working positions. To that end, there is currently a growing demand for the peripheral protection systems to be self-climbing, such that they can be hoisted independently from the remaining work tasks.

**[0004]** To meet this demand, self-climbing protection systems have been developed, such as, for example, those described in documents EP-A-1899548, EP-A-1899549 and EP-A-1902185. Basically, these self-climbing protection systems for construction works in a building comprise at least two masts spaced away from each other, each mast comprising two vertical beams having respective longitudinal outwardly protruding lateral flanges at their rear portions and a plurality of support elements fixed between the vertical beams at different heights. A vertical protection panel is attached to the masts, and a plurality of pairs of support elements is arranged in different horizontal planes between the beams of each of the masts for supporting the masts during the hoisting process for hoisting the masts and a working phase, and a plurality of pairs of anchor members immobilized at different heights in a building for guiding the masts. These systems further comprise, in respect of

each mast to be hoisted, a climbing head which is releasably fastenable to the mast and comprises two vertical side plates which are distanced from each other and linked together at their lower end portions and at their upper end portions; hinging means for tiltably coupling the upper portions of the side plates to the upper end of a hoist cylinder the lower end of which is coupled to an anchor member that is fastened to a rim portion of a floor slab of a building. The hoist cylinder is of adopting an extended position and a retracted position. The climbing head further comprises a rocker member that is pivotal between the hoist position where its front portion protrudes from the side plates and engages the mast when the hoist cylinder extends towards said extended position for hoisting the mast, and a passing position, in which it allows the passage of the mast when the hoist cylinder retracts to said retracted position. A lower left claw member and a lower right claw member each protruding laterally beyond one of the side plates and lower locking means to lock each of the lower claw members in a locked position where it embraces one of said lateral flanges and an open position in which the claw members release said lateral flanges are also provided.

**[0005]** On the other hand, the document WO2007/036300 A1 describes a protection and access arrangement for protecting workers and for allowing access, in particular during the construction of building floors.

**[0006]** Nevertheless, there continues to be a need in the construction sector to be able to have alternative self-climbing perimetric protection systems with respect to those known, which are reliable, easy and quick enough to handle and not excessively expensive, and which ensure effective and safe hoisting, the climbing head being one of the crucial elements of such systems inasmuch it is essential for hoisting and has to secure and bear the weight of all other elements of the system during hoisting.

## DESCRIPTION OF THE INVENTION

**[0007]** The present invention is intended to improve the known self-climbing perimetric protection systems by providing a climbing head for hoisting a self-climbing protection support elements fixed between the vertical beams at different heights; and comprising two vertical side plates, distanced from each other and linked together at their lower end portions and at their upper end portions; hinging means for tiltably coupling the upper portions of the side plates to the upper end of a hoist cylinder the lower end of which is coupled to anchoring means fastened to a rim portion of a floor slab of a building, the hoist cylinder being capable of adopting an extended position and a retracted position; a rocker member that is pivotal between a hoist position where its front portion protrudes from the side plates and engages the mast when the hoist cylinder extends towards said extended position for hoisting the mast, and a passing position, in which it allows the passage of the mast when the hoist

cylinder retracts to said retracted position; a lower left claw member and a lower right claw member each protruding laterally beyond one of the side plates; lower locking means to lock each of the lower claw members in a locked position where it embraces one of said lateral flanges and an open position in which the lower claw members release said lateral flanges, the climbing head being characterized in that

the climbing head further comprises an upper left claw member and an upper right claw member each protruding laterally beyond one of the side plates, and upper locking means to lock each of the upper claw members in a locked position where it embraces one of said lateral flanges and an open position in which the upper claw members release said lateral flanges;

each of the claw members comprises a fixed claw portion emerging from one side plate and movable claw portion that is pivotal about a vertical rotation axis provided in the fixed claw portion to which it is mounted, between said locked and said open position;

the locking means comprise lower and upper left locking means and lower and upper right locking means, the locking means comprising each a vertical bolt which, in the claw member's locked position, remains removably inserted in vertically aligned first throughholes respectively provided in the fixed and in the movable claw portion between the respective vertical rotation axis and the respective side plate;

the vertical bolts of the left locking means are connected to a left vertical rod that extends slidingly through second throughholes provided respectively in the left movable claw portions at a position between its rotation axis and its free end;

the vertical bolts of the right locking means are connected to a right vertical rod that extends slidingly through second throughholes provided respectively in the right movable claw portions at a position between its rotation axis and its free end;

the vertical rods each have a length such that their lower end portions remain guided in the respective second throughholes in the lower movable claw portions when said vertical bolts are pulled upwards out of said first throughholes.

**[0008]** In accordance with an embodiment of the invention, the vertical bolts of the left locking means are connected respectively to a lower portion of the left vertical rod by means of a left lower connecting member and respectively to an upper portion of the left vertical rod by means of a left upper connecting member, and the vertical bolts of the right locking means are connected respectively to a lower portion of the right vertical rod by means of a right lower connecting member and respectively to an upper portion of the right vertical rod by means of a right upper connecting member. According to this embodiment, the left lower and upper movable claw members may pivot about a common left rotation axis comprised of a left vertical shaft that is mounted to the left lower and upper fixed claw members; and the right

lower and upper movable claw members may pivot about a common right rotation axis comprised of a right vertical pivot shaft that is mounted to the right lower and upper fixed claw members. In this latter case, an intermediate portion of each left connecting member may be additionally slidingly and rotably connected to the left vertical shaft and an intermediate portion of each right connecting member is additionally slidingly and rotably connected to the right vertical shaft. The vertical shafts each have a length such that the upper connecting member to which is connected remains guided on its upper portion when said vertical bolts are pulled upwards out of said first throughholes.

**[0009]** The rocker member may be pivotally mounted on a rotation shaft arranged between the side plates, and comprising a front portion and rear portion and an intermediate portion, the rocker member being pivotal between said hoist position where its rear portion abuts against a first limiting element arranged between the side plates and its front portion protrudes from the side plates towards the mast and supports one of the support elements when the hoist cylinder extends towards said extended position for hoisting the mast, and said passing position, in which it allows the passage of at least one of the support elements when the hoist cylinder retracts to said retracted position. The vertical side plates may be linked together at their lower end portions by an attachment plate, and at their upper end portions by an attachment bar. Also, each side plate may comprise a front edge facing the mast, with a convex upper section and an inclined section extending backwards between the first convex upper section and the attachment plate, whereas on the side opposite the convex upper section, each of the side plates may have a rear protuberance with a coupling opening for a coupling bolt that is coupleable the upper end of the hoist cylinder is coupled.

**[0010]** In a preferred embodiment, each of the movable claw portions has a free end portion provided with a recess in which, in said closed position of the claw member, at least a portion of one of said lateral flanges is guided.

**[0011]** According to this preferred embodiment, the climbing head may comprise a left vertical front guiding plate provided at respective front walls of the recesses of the movable left claw portions, and a right vertical front guiding plate provided at respective front walls of the recesses of the movable right claw portions. Each of the front guiding plates may comprise an outwardly-arched upper end portion protruding upwardly beyond the upper movable claw portion and an outwardly-arched lower end portion protruding downwardly below the lower movable claw portion.

**[0012]** The climbing head may also be provided with a left and a right vertical lateral guiding plate provided at respective lateral walls of the recesses of the lower movable claw portions. Each of the vertical lateral guiding plates may comprise an outwardly-arched upper end portion protruding upwardly beyond the lower movable claw

portion, and an outwardly-arched lower end portion protruding downwardly below the lower movable claw portion.

[0013] Also, the climbing head may comprise a left and a right vertical rear guiding plate provided at respective rear walls of the recesses of the lower movable claw portions. Each of the vertical rear guiding plates may comprise an outwardly-arched lower end portion protruding downwardly below the lower movable claw portion.

#### **BRIEF DESCRIPTION OF THE DRAWINGS**

[0014] Hereinafter, aspects and embodiments of the invention will be described on the grounds of drawings wherein

figure 1 is a side view of a self-climbing protection system including a climbing head according to an embodiment of the present invention;

figure 2 is an enlarged view of the climbing head shown in figure 1;

figure 3 is a sectional view corresponding to line A-A of the mast shown in figure 1;

figure 4 is a front perspective view of the climbing head shown in figure 2 with its lower and upper claws in their closed positions;

figure 5 is a front elevational view of the climbing head shown in figure 3;

figure 6 is a top plan view of the climbing head shown in figure 3;

figure 7 is a front elevational view of the climbing head shown in figure 3 where the left and right locking means for the claws are in their upper positions to unlock the claws which are still in the closed position;

figure 8 is a top plan view of the climbing head shown in figure 3 with its claws in their open position;

figure 9 is a top plan view of the climbing head in the position shown in figure 8.

[0015] In these figures, there are reference numerals identifying the following elements

|    |                        |
|----|------------------------|
| 1  | mast                   |
| 1a | vertical beams         |
| 1b | central section        |
| 1c | lateral flanges        |
| 2  | support element        |
| 2a | projection             |
| 3  | climbing head          |
| 3a | vertical side plates   |
| 3b | attachment plate       |
| 3c | upper convex sections  |
| 3d | rear protuberances     |
| 3e | coupling openings      |
| 3f | attachment bar         |
| 3g | first limiting element |
| 3h | support plate          |
| 4  | hoist cylinder         |

|    |                                                          |
|----|----------------------------------------------------------|
| 4a | upper end of the hoist cylinder                          |
| 4b | lower end of the hoist cylinder                          |
| 5  | anchor member                                            |
| 5a | front portion                                            |
| 5b | rear portion                                             |
| 5c | fastening bolt                                           |
| 6  | anchor head                                              |
| 6a | front portion                                            |
| 6b | rear portion                                             |
| 10 | 6c horizontal rotation shaft                             |
|    | 6d stopper                                               |
|    | 6e vertical guides                                       |
| 7  | floor slab                                               |
| 8  | rotation shaft                                           |
| 15 | 9 rocker member                                          |
|    | 9a front portion of the rocker member                    |
|    | 9b rear portion of the rocker member                     |
|    | 10 lower claw                                            |
|    | 10a lower fix left claw portion                          |
| 20 | 10b lower movable left claw portion                      |
|    | 10c lower fix right claw portion                         |
|    | 10d lower movable right claw portion                     |
|    | 11 upper claw                                            |
|    | 11a, upper fix left claw portion                         |
| 25 | 11b upper movable left claw portion                      |
|    | 11c upper fix right claw portion                         |
|    | 11d upper movable right claw portion                     |
|    | 10e recess                                               |
|    | 12a left vertical pivot shaft                            |
| 30 | 12b right vertical pivot shaft                           |
|    | 13a, 13b left vertical bolts                             |
|    | 14 left vertical rod                                     |
|    | 14a lower portion of the left vertical rod               |
|    | 14b upper portion of the left vertical rod               |
| 35 | 15a, 15b right vertical bolts                            |
|    | 16 right vertical rod                                    |
|    | 16a lower portion of the right vertical rod              |
|    | 16b upper portion of the right vertical rod              |
|    | 17a, 17b first left lower throughholes                   |
| 40 | 18a, 18b first left upper throughholes                   |
|    | 19a, 19b first right lower throughholes                  |
|    | 20a, 20b first right upper throughholes                  |
|    | 21a, 21b second left throughholes                        |
|    | 21c, 21d second right throughholes                       |
| 45 | 22 left lower connecting member                          |
|    | 23 left upper connecting member                          |
|    | 24 right lower connecting member                         |
|    | 25 right upper connecting member                         |
|    | 27 left vertical front guiding plate                     |
| 50 | 26a, 28a left and a right vertical lateral guiding plate |
|    | 26b, 28b rear guiding plate                              |
|    | 29 right vertical front guiding plate                    |
|    | 30 damper                                                |
|    | 30a damper rod                                           |
| 55 | 31 coupling bolt                                         |

## EMBODIMENTS OF THE INVENTION

**[0016]** Figure 1 illustrates an embodiment of a climbing head -3-, hoist cylinder -4-, anchor member -5- and anchor head -6-, applied a mast -1- as part of a self-climbing protection system. Although figure 1 shows only one vertical mast -1- and thus only one climbing head -3-, hoist cylinder -4-, anchor member and anchor head -6-, it is understood, that the self-climbing protection system should comprise at least two parallel masts -1- to support the perimetric protection elements -as for example one or more protection panels (not shown in the drawings), and therefore at least two climbing heads -3-, two hoist cylinders -4- and two anchor heads -6-, as well as at least a pair of anchor members -5- fixed each to at least two floor slabs -7- arranged at different heights of the building structure. The hoist cylinder -4- is capable of adopting an extended position and a retracted position.

**[0017]** As shown in figure 1, the climbing head -3- is connected by means of a connecting bolt -3e- traversing through holes in the upper portions of the side plates -3a- (the left side plate is shown in dotted lines in figures 1 and 2) of the climbing head -3-, to the upper end -4a- of the hydraulic hoist cylinder -4- the lower end -4b- of which is connected the anchor head -5-. The hoist cylinder -4- operating the climbing head -3- may be powered and controlled by means of a hydraulic generation system (not shown in the drawings), which is preferably capable of simultaneously powering a plurality of hoist cylinders -4-. As also apparent from figure 3, the mast -1- comprises two vertical beams -1a- having respective outwardly-protruding longitudinal lateral flanges -1c- at its front and rear portions. A plurality of support elements -2- having projections -2a- protruding from the rear portion of the mast -1- are fastened, for example by means of bolts or screws (not shown in the drawings), each at a different height of the mast -1-, between the central portions -1b- of the beams -1a-. The beams -1a- can be, for example, standard beams having a U-shaped cross section, such as UPN-180 channel irons of determined lengths provided with openings with an MK-type configuration which allows incorporating standard MK-type braces with a continuous configuration of standard simple attachments and openings which allows a great versatility when forming different types of protection structures: adapted to the desired floor height in each case, different sections adapted to the needs of each work, etc. Depending on the configuration of the protection panel conceived for each case, the latter can also be attached directly to the masts -1-. For example, if the panel is made with boards, the panel can be supported by standard horizontal wooden beams attached directly to the masts -1- with standard connectors.

**[0018]** The climbing head -3- comprises two vertical side plates -3a-, distanced from each other and linked together at their lower end portions by means of an attachment plate -3b- and at their upper end portions by means of an attachment bar -3f-, as well as hinging

means -3e, 31- for tiltably coupling the upper portions of the side plates -3a- to the upper end -4a- of the hoist cylinder -4- the lower end -4b- of which is coupled to the anchor head -5- that is coupled to the anchor head -6- fastened to a rim portion of the floor slab -7-.

**[0019]** The vertical side plates -3a- comprise each a front edge facing the mast -1-, with a convex upper section -3c- and an inclined section extending backwards between the first convex upper section -3c- and the attachment plate -3b-, whereas on the side opposite the convex upper section -3c-, each of the side plates -3a- comprises a rear protuberance -3d- where the hinging means -3e, 31- i.e. a coupling openings -3e- for a coupling bolt -31-, are located for coupling the upper end -4a- of the hoist cylinder -4- to the climbing head -3-.

**[0020]** The rocker member -9- is pivotally mounted on a rotation shaft -8- arranged between the side plates -3a-, and comprises a front portion -9a- and rear portion -9b- and an intermediate portion, the rocker member -9- being pivotal between said hoist position where its rear portion -9b- abuts against a first limiting element -3g- arranged between the side plates -3a- and its front portion -9a- protrudes from the side plates -3a- towards the mast -1- and supports one of the support elements -2, 2a- when the hoist cylinder -4- extends towards said extended position for hoisting the mast -1-, and said passing position, in which it allows the passage of at least one of the support elements -2, 2a- when the hoist cylinder -4- retracts to said retracted position. The upward movement of the front portion -9a- of the rocker member -9- is limited by a damper -30- mounted to an inclined support plate -3h-. The damper -30- has a damper rod -30a- which contacts the upper side of the front portion -9a- of the rocker member -9- such that the rocker member -9- remains in the hoisting position unless when being in contact with a projection -2a- of a support element -2- when the climbing head -3- descends along the mast -1-.

**[0021]** The climbing head further comprises a lower claw -10- comprising a lower left claw member -10a, 10b- and a lower right claw member -10c, 10d- each protruding laterally beyond one of the side plates -3a-, lower locking means to lock each of the lower claw members -10a, 10b, 10c, 10d- in a locked position where it embraces one of said lateral flanges -1c- and an open position in which the claw members -10a, 10b, 10c, 10d- release said lateral flanges -1c-, as well as an upper claw -11- comprising an upper left claw member -11a, 11b- and an upper right claw member -11c, 11d- each protruding laterally beyond one of the side plates -3a-, and upper locking means to lock each of the claw members -11a, 11b, 11c, 11d- in a locked position where it embraces one of said lateral flanges -1c- and an open position in which the claw members -11a, 11b, 11c, 11d- release said lateral flanges -1c-.

**[0022]** Each of the claws members -10a, 10b, 10c, 10d, 11a, 11b, 11c, 11d- comprises a fixed claw portion -10a, 10c, 11a, 11c- and movable claw portion -10b, 10d, 11b, 11d- that is pivotal about a vertical rotation axis -12a,

12b-, provided in the fixed claw portion -10a, 10c, 11 a, 11 c- to which it is mounted, between said locked and said open position.

**[0023]** The left lower and upper movable claw members -10b, 11b- pivot about a common left rotation axis comprised of a left vertical shaft -12a- that is mounted to the left lower and upper fixed claw members -10a, 11a-, and the right lower and upper movable claw members -10d, 11 d- pivot about a common right rotation axis comprised of a right vertical pivot shaft -12b- that is mounted to the right lower and upper fixed claw members -10c, 11c-. An intermediate portion of each left connecting member -22, 23- is additionally slidingly and rotably connected to the left vertical shaft -12a- and an intermediate portion of each right connecting member -24, 25- is additionally slidingly and rotably connected to the right vertical shaft -12b-. The vertical shafts -12a, 12b- each have a length such that the upper connecting member -23, 25- to which is connected remains guided on its upper portion when said vertical bolts -13a, 13b, 15a, 15b- are pulled upwards out of said first throughholes -17a, 17b; 18a, 18b; 19a, 19b; 20a, 20b-. Each of the movable claw portions -10b, 11 b; 10c, 10d- has a free end portion provided with a recess -10e- in which, in said closed position of the claw member -10a, 10b, 10c, 10d, 11 a, 11b, 11c, 11 d-, at least a portion of one of said lateral flanges -1c- is guided.

**[0024]** The climbing head -3- further comprises a left vertical front guiding plate -27- provided at respective front walls of the recesses -3f- of the movable left claw portions -10b, 11 b-, and a right vertical front guiding plate -29- provided at respective front walls of the recesses -10e- of the movable right claw portions -10d, 11 d-. Each of the front guiding plates -27, 29- comprises an outwardly-arched upper end portion protruding upwardly beyond the upper movable claw portion -11b, 11 d-, and an outwardly-arched lower end portion protruding downwardly below the lower movable claw portion -10b, 10d-. The climbing head -3- is also provided with a left and a right vertical lateral guiding plate -26a, 28a- provided at respective lateral walls of the recesses -10e- of the lower movable claw portions -10b, 10d-. Each of the vertical lateral guiding plates -26a, 28a- comprises an outwardly-arched upper end portion protruding upwardly beyond the lower movable claw portion -10b, 10d-, and an outwardly-arched lower end portion protruding downwardly below the lower movable claw portion -10b, 10d-. Additionally, the climbing head -3- has a left and a right vertical rear guiding plate -26b, 28b- provided at respective rear walls of the recesses -10e- of the lower movable claw portions -10b, 10d-. Each of the vertical rear guiding plates -26b, 28b- may comprise an outwardly-arched lower end portion protruding downwardly below the lower movable claw portion -10b, 10d-. These guiding plates ensure proper guidance of the climbing head -3- when moving along the rear lateral flanges -1a- of the mast -1-.

**[0025]** Each claw -10, 11- has vertically aligned first throughholes -17a, 17b; 18a, 18b; 19a, 19b; 20a, 20b-

respectively provided in the fixed -10a, 10c, 11 a, 11 c- and in the movable claw portion -10b, 10d, 11b, 11 d- between the respective vertical pivot shaft -12a, 12b- and the respective side plate -3a-, and a second throughhole -21 a, 21 b; 21 c, 21 d- provided in the movable claw portion -10b, 11 b, 10d, 11d - at a position between said pivot shaft -12a, 12b- and the free end of the movable claw portion -10b, 11 b, 10d, 11 d-.

**[0026]** The locking means comprise lower and upper left locking means and lower and upper right locking means. The locking means comprise each a vertical bolt -13a, 13b; 15a, 15b- which, in the claw member's -10a, 10b, 10c, 10d, 11 a, 11 b, 11c, 11d- locked position, remains removably inserted in said first throughholes -17a, 17b; 18a, 18b; 19a, 19b; 20a, 20b-, the vertical bolts -13a, 13b- of the left locking means being connected to a left vertical rod -14- that extends slidingly through the second throughholes -21a, 21b- in the left movable claw portions -10b, 11 b-, the vertical bolts -15a, 15b- of the right locking means being connected to a right vertical rod -16- that extends slidingly through the second throughholes -21 c, 21 d- provided in the right movable claw portions -10d, 11 d-. Each of the vertical rods -14, 16- has a length such that their lower end portions -14a, 16a- remain guided in the respective second throughholes -21a, 21c- in the lower movable claw portions -10a, 11 a- when said vertical bolts -13a, 13b, 15a, 15b- are pulled upwards out of said first throughholes -17a, 17b; 18a, 18b; 19a, 19b; 20a, 20b-. The vertical bolts -13a, 13b- of the left locking means are connected respectively to a lower portion -14a- of the left vertical rod -14- by means of a left lower connecting member -22- and respectively to an upper portion -14b- of the left vertical rod -14- by means of a left upper connecting member -23-. The vertical bolts -15a, 15b- of the right locking means are connected respectively to a lower portion -16a- of the right vertical rod -16- by means of a right lower connecting member -24- and respectively to an upper portion -16b- of the right vertical rod -16- by means of a right upper connecting member -25-.

**[0027]** As shown in figure 1, the anchor head -6- is releasably coupled to a front portion -5a- of the anchor member -5- which in turn is fixed to the floor slab -5- by means of fastening bolts-. Only one bolt -5c- is shown in figure 1 but it is understood that a plurality of bolts may be provided. The front portion -5a- of the anchor member -5- is fastened to the rear portion -5b- thereof, and protrudes beyond the outer rim of the floor slab -7-. The anchor member -6- comprises two mobile horizontal claw members -6a- which, in the closed position, brace the rear flanges -1c- of the mast -1-, and a supporting rocker -6b- with a front portion -6b'- adjacent to the mast -1-, an intermediate portion traversed by a horizontal rotation shaft -6c- and a rear part -6b-, such that the bearing rocker -6- is pivots between a working position in which said front portion -6a- protrudes towards the mast -1- and supports the projection -2a- of one of the support elements -2- of the mast -1- and a release position in which it is

distanced from the mast -1- to allow said projection -2a- to be overcome when the mast is hoisted by action of the climbing head -3- and the hoist cylinder -4-. In the working position of the supporting rocker -6-, the rear portion -6b- thereof abuts against a stopper -6d-. The supporting rocker -6b-, the claw members -6a- and the stopper -6d- are mounted to a pair of side plates (not shown in the drawings). The movable portions of the claw members -6a- are provided with vertical guides -6e- that embrace the front lateral flanges -1 c- of the mast -1- to enhance secure positioning of the mast -1- both when supported by the anchor member -6- and when being hoisted.

**[0028]** When the climbing head -3- is pulled upwards by means of the hoist cylinder -4-, due to the eccentricity of the thrusting force caused by the position of the coupling bolt -3e- to which the hydraulic cylinder -4- is articulated, the upper portion of the climbing head -3- tilts towards the mast -1- such that the arched sections -3c- of the front edges of the side plates -3a- contact the mast -1-. Upon following its upward path, the upper surface of the front portion -9a- of the rocker member -9- abuts with the lower surface of the projection -2a- of the corresponding self-climbing block -2- and then pushes the block -2- upwards so that the mast -1- is hoisted.

**[0029]** Once one of support members -2- located at a selected height of the mast -1- has surpassed the anchor member -6- and the hydraulic cylinder -4- is retracted, the projection -2a- of the support element -2- comes to rest on the front portion -6a- of the supporting rocker -6-. In turn, the climbing head -3- moves downward along the mast -1- guided by the closure of its claws -10, 11- and the front portion -9a- of its rocker member -9- rotates backwards against the action of the damper -30-, allowing the passage of the projection or projections -2a- of one or more of the support elements -2-.

**[0030]** When the hydraulic cylinder -25- has reached the desired retracted position, it is again extended, pulling the climbing head -3- upwards again such that the front portion -9a- of the rocker member -9- again abuts with the lower surface of the projection -2a- of a subsequent support element -2- and pushes it upwards whereby the mast -1- is hoisted to the next position. Thereby, the masts -1- and the thereto attached elements are hoisted successively to higher positions until they are arranged at the desired height.

## Claims

1. A climbing head for hoisting a self-climbing protection system for construction works in buildings, the climbing head (3) being releasably fastenable to a mast (1) comprising two vertical beams (1a) having respective longitudinal outwardly protruding longitudinal lateral flanges (1c) at their rear portions and a plurality of support elements (2, 2a) fixed between the vertical beams (1a) at different heights; and comprising two vertical side plates (3a), distanced from

each other and linked together at their lower end portions and at their upper end portions; hinging means (3e) for tiltably coupling the upper portions of the side plates (3a) to the upper end (4a) of a hoist cylinder (4) the lower end (4b) of which is coupled to anchoring means (5, 6) fastened to a rim portion of a floor slab (7) of a building, the hoist cylinder (4) being capable of adopting an extended position and a retracted position; a rocker member (9) that is pivotal between a hoist position where its front portion (9a) protrudes from the side plates (3a) and engages the mast (1) when the hoist cylinder (4) extends towards said extended position for hoisting the mast (1), and a passing position, in which it allows the passage of the mast (1) when the hoist cylinder (4) retracts to said retracted position; a lower claw (10) comprising a lower left claw member (10a, 10b) and a lower right claw member (10c, 10d) each protruding laterally beyond one of the side plates (3a); lower locking means to lock each of the lower claw members (10a, 10b, 10c, 10d) in a locked position where it embraces one of said lateral flanges (1c) and an open position in which the lower claw members (10a, 10b, 10c, 10d) release said lateral flanges (1c); **characterized in that**

the climbing head (3) further comprises an upper claw (11) comprising an upper left claw member (11a, 11b) and an upper right claw member (11 c, 11d) each protruding laterally beyond one of the side plates (3a), and upper locking means to lock each of the upper claw members (11a, 11 b, 11c, 11 d) in a locked position where it embraces one of said lateral flanges (1c) and an open position in which the upper claw members (11 a, 11 b, 11c, 11 d) release said lateral flanges (1 c);

each of the claws members (10a, 10b, 10c, 10d, 11 a, 11 b, 11c, 11 d) comprises a fixed claw portion (10a, 10c, 11a, 11c) emerging from one side plate (3a) and a movable claw portion (10b, 10d, 11 b, 11 d) that is pivotal about a vertical rotation axis (12a, 12b), provided in the fixed claw portion (10a, 10c, 11a, 11c) to which it is mounted, between said locked and said open position ;

the locking means comprise lower and upper left locking means and lower and upper right locking means, the locking means comprising each a vertical bolt (13a, 13b; 15a, 15b) which, in the claw member's (10a, 10b, 10c, 10d, 11a, 11b, 11c, 11d) locked position, remains removably inserted in vertically aligned first throughholes (17a, 17b; 18a, 18b; 19a, 19b; 20a, 20b) respectively provided in the fixed (10a, 10c, 11 a, 11c) and in the movable claw portion (10b, 10d, 11 b, 11 d) between the respective vertical rotation axis (12a, 12b) and the respective side plate (3a);

the vertical bolts (13a, 13b) of the left locking means are connected to a left vertical rod (14) that extends slidingly through second throughholes (21a, 21b)

- provided respectively in the left movable claw portions (10b, 11 b) at a position between its rotation axis (12a) and its free end;  
the vertical bolts (15a, 15b) of the right locking means are connected to a right vertical rod (16) that extends slidingly through second throughholes (21 c, 21 d) provided respectively in the right movable claw portions (10d, 11d) at a position between its rotation axis (12b) and its free end;  
each of the vertical rods (14, 16) has a length such that their lower end portions (14a, 16a) remain guided in the respective second throughholes (21a, 21c) in the lower movable claw portions (10b, 10d) when said vertical bolts (13a, 13b, 15a, 15b) are pulled upwards out of said first throughholes (17a, 17b; 18a, 18b; 19a, 19b; 20a, 20b).
2. A climbing head according to claim 1, **characterized in that** the vertical bolts (13a, 13b) of the left locking means are connected respectively to a lower portion (14a) of the left vertical rod (14) by means of a left lower connecting member (22) and respectively to an upper portion (14b) of the left vertical rod (14) by means of a left upper connecting member (23), and the vertical bolts (15a, 15b) of the right locking means are connected respectively to a lower portion (16a) of the right vertical rod (16) by means of a right lower connecting member (24) and respectively to an upper portion (16b) of the right vertical rod (16) by means of a right upper connecting member (25).
  3. A climbing head according to claim 2, **characterized in that**  
the left lower and upper movable claw members (10b, 11b) pivot about a common left rotation axis comprised of a left vertical shaft (12a) that is mounted to the left lower and upper fixed claw members (10a, 11 a);  
the right lower and upper movable claw members (10d, 11 d) pivot about a common right rotation axis comprised of a right vertical pivot shaft (12b) that is mounted to the right lower and upper fixed claw members (10c, 11c).
  4. A climbing head according to claim 3, **characterized in that**  
an intermediate portion of each left connecting member (22, 23) is additionally slidingly and rotably connected to the left vertical shaft (12a) and an intermediate portion of each right connecting member (24, 25) is additionally slidingly and rotably connected to the right vertical shaft (12b);  
the vertical shafts (12a, 12b) each having a length such that the upper connecting member (23, 25) to which is connected remains guided on its upper portion when said vertical bolts (13a, 13b, 15a, 15b) are pulled upwards out of said first throughholes (17a, 17b; 18a, 18b; 19a, 19b; 20a, 20b).
  5. A climbing head according to any of the preceding claims, **characterized in that**  
the rocker member (9) is pivotally mounted on a rotation shaft (8) arranged between the side plates (3a), and comprising a front portion (9a) and rear portion (9b) and an intermediate portion, the rocker member (9) being pivotal between said hoist position where its rear portion (9b) abuts against a first limiting element (3g) arranged between the side plates (3a) and its front portion (9a) protrudes from the side plates (3a) towards the mast (1) and supports one of the support elements (2, 2a) when the hoist cylinder (4) extends towards said extended position for hoisting the mast (1), and said passing position, in which it allows the passage of at least one of the support elements (2, 2a) when the hoist cylinder (4) retracts to said retracted position.
  6. A climbing head according to claim 5, **characterized in that** the vertical side plates (3a) are linked together at their lower end portions by an attachment plate (3b), and at their upper end portions by an attachment bar (3f).
  7. A climbing head according to claim 6, **characterized in that**  
each side plate (3a) comprises a front edge facing the mast (1), with a convex upper section (3c) and an inclined section extending backwards between the first convex upper section (3c) and the attachment plate (3b);  
on the side opposite the convex upper section (3c), each of the side plates (3a) has a rear protuberance (3d) with a coupling opening (3e) for a coupling bolt (31) that is couplable the upper end of the hoist cylinder (4) is coupled.
  8. A climbing head according to any of the preceding claims, **characterized in that** each of the movable claw portions (10b, 11 b; 10c, 10d) has a free end portion provided with a recess (10e) in which, in said closed position of the claw member (10a, 10b, 10c, 10d, 11 a, 11b, 11c, 11d), at least a portion of one of said lateral flanges (1c) is guided;
  9. A climbing head according to claim 8, **characterized in that** it comprises a left vertical front guiding plate (27) provided at respective front walls of the recesses (3f) of the movable left claw portions (10b, 11b), and a right vertical front guiding plate (29) provided at respective front walls of the recesses (10e) of the movable right claw portions (10d, 11 d).
  10. A climbing head according to claim 9, **characterized in that** each front guiding plate (27, 29) comprises an outwardly-arched upper end portion protruding upwardly beyond the upper movable claw portion (11b, 11 d), and an outwardly-arched lower end por-

tion protruding downwardly below the lower movable claw portion (10b, 10d).

11. A climbing head according to claim 8, **characterized in that** it comprises a left and a right vertical lateral guiding plate (26a, 28a) provided at respective lateral walls of the recesses (10e) of the lower movable claw portions (10b, 10d). 5
12. A climbing head according to claim 11, **characterized in that** each vertical lateral guiding plate (26a, 28a) comprises an outwardly-arched upper end portion protruding upwardly beyond the lower movable claw portion (10b, 10d), and an outwardly-arched lower end portion protruding downwardly below the lower movable claw portion (10b, 10d). 10
13. A climbing head according to claim 8, **characterized in that** it comprises a left and a right vertical rear guiding plate (26b, 28b) provided at respective rear walls of the recesses (10e) of the lower movable claw portions (10b, 10d). 20
14. A climbing head according to claim 13, **characterized in that** each vertical rear guiding plate (26b, 28b) comprises an outwardly-arched lower end portion protruding downwardly below the lower movable claw portion (10b, 10d). 25

#### Patentansprüche

1. Kletterkopf zum Heben eines selbstkletternden Schutzsystems für Bauarbeiten in Gebäuden, wobei der Kletterkopf (3) entfernbar an einen Mast (1) befestigt werden kann, umfassend zwei vertikalen Balken (1 a) mit entsprechenden längs gerichteten, nach außen vorstehenden Längsseitenflanschen (1c) an ihren hinteren Abschnitten und eine Vielzahl von Stützelementen (2, 2a), die zwischen den vertikalen Balken (1a) in verschiedenen Höhen befestigt sind; und umfassend zwei vertikale Seitenplatten (3a), die voneinander beabstandet sind und an ihren unteren Endabschnitten und an in ihren oberen Endabschnitten miteinander verbunden sind; Gelenkmittel (3e) zum kippbaren Koppeln der oberen Abschnitte der Seitenplatten (3a) mit dem oberen Ende (4a) eines Hebezyinders (4), dessen unteres Ende (4b) an Verankerungsmittel (5, 6) gekoppelt ist, die an einen Randabschnitt einer Bodenplatte (7) eines Gebäudes befestigt sind, wobei der Hebezyinder (4) dazu in der Lage ist, eine erweiterte Position und eine zurückgezogene Position einzunehmen; ein Kippelement (9), das zwischen einer Hebe-Position, in der sein Vorderabschnitt (9a) aus den Seitenplatten (3a) hervorsteht und den Mast (1) eingreift, wenn sich der Hebezyinder (4) hin zu der erweiterten Position erstreckt, um den Mast (1) zu heben, und einer 50

Durchgangsposition drehbar ist, in der es den Durchgang des Mastes ermöglicht (1), wenn sich der Hebezyinder (4) in die zurückgezogene Position zurückzieht; eine untere Klaue (10), umfassend ein unteres linkes Klauenelement (10a, 10b) und ein unteres rechtes Klauenelement (10c, 10d), die jeweils seitlich über eine der Seitenplatten (3a) hinaus vorstehen; untere Verriegelungsmittel, um jedes der unteren Klauenelemente (10a, 10b, 10c, 10d) in einer verriegelten Position zu verriegeln, in der es einen der seitlichen Flansche (1c) umgibt, und einer offenen Position, in der die unteren Klauenelemente (10a, 10b, 10c, 10d) die seitlichen Flansche (1 c) freigeben; **dadurch gekennzeichnet, dass** das Kletterkopf (3) weiter eine obere Klaue (11) umfasst, umfassend ein oberes linkes Klauenelement (11a, 11b) und ein oberes rechtes Klauenelement (11c, 11d), die jeweils seitlich über eine der Seitenplatten (3a) hinaus vorstehen, und obere Verriegelungsmittel, um jedes der oberen Klauenelemente (11a, 11 b, 11 c, 11 d) in einer verriegelten Position zu verriegeln, in der es einen der seitlichen Flansche (1c) umgibt, und einer offenen Position, in der die oberen Klauenelemente (11 a, 11 b, 11c, 11 d) die seitlichen Flansche (1) freigeben; jedes der Klauenelemente (10a, 10b, 10c, 10d, 11 a, 11 b, 11 c, 11 d) einen festen Klauenabschnitt (10a, 10c, 11 a, 11 c) umfasst, der aus einer Seitenplatte (3a) austritt, und einen beweglichen Klauenabschnitt (10b, 10d, 11b, 11d), der um eine vertikale Drehachse (12a, 12b) drehbar ist, die im festen Klauenabschnitt (10a, 10c, 11a, 11c) bereitgestellt ist, auf den sie montiert ist, zwischen der verriegelten Position und der offenen Position; die Verriegelungsmittel untere und obere linke Verriegelungsmittel und untere und obere rechte Verriegelungsmittel umfassen, wobei die Verriegelungsmittel jeweils einen vertikalen Bolzen (13a, 13b; 15a, 15b) umfassen, der, in der verriegelten Position des Klauenelements (10a, 10b, 10c, 10d, 11a, 11 b, 11 c, 11 d) entfernbar in vertikal ausgefluchteten ersten Durchgangslöchern (17a, 17b; 18a, 18b; 19a, 19b; 20a, 20b) eingeführt bleibt, die jeweils in der festen (10a, 10c, 11 a, 11c) und in der beweglichen Klauenposition (10b, 10d, 11 b, 11 d) zwischen der entsprechenden vertikalen Drehachse (12a, 12b) und der entsprechenden Seitenplatte (3a) bereitgestellt sind; die vertikalen Bolzen (13a, 13b) des linken Verriegelungsmittels an eine linke vertikale Stange (14) verbunden sind, die sich gleitend durch zweite Durchgangslöcher (21a, 21b) erstreckt, die jeweils in den linken beweglichen Klauenpositionen (10b, 11b) bereitgestellt sind, an einer Position zwischen ihrer Drehachse (12a) und ihrem freien Ende; die vertikalen Bolzen (15a, 15b) des rechten Verriegelungsmittels an eine rechte vertikale Stange (16) verbunden sind, die sich gleitend durch zweite

Durchgangslöcher (21c, 21 d) erstreckt, die jeweils in den rechten beweglichen Klauenpositionen (10d, 11b) bereitgestellt sind, an einer Position zwischen ihrer Drehachse (12b) und ihrem freien Ende; jede der vertikalen Stangen (14, 16) eine derartige Länge aufweist, dass ihre unteren Endabschnitte (14a, 16a) in den entsprechenden zweiten Durchgangslöchern (21a, 21c) in den unteren beweglichen Klauenabschnitten (10b, 10d) geführt bleiben, wenn die vertikalen Bolzen (13a, 13b, 15a, 15b) nach oben aus den ersten Durchgangslöchern (17a, 17b; 18a, 18b; 19a, 19b; 20a, 20b) gezogen werden.

2. Kletterkopf nach Anspruch 1, **dadurch gekennzeichnet, dass** die vertikalen Bolzen (13a, 13b) der linken Verriegelungsmittel jeweils mit einem unteren Abschnitt (14a) der linken vertikalen Stange (14) mit Hilfe eines linken unteren Verbindungselements (22) und jeweils mit einem oberen Abschnitt (14b) der linken vertikalen Stange (14) mit Hilfe eines linken oberen Verbindungselements (23) verbunden sind, und die vertikalen Bolzen (15a, 15b) der rechten Verriegelungsmittel jeweils mit einem unteren Abschnitt (16a) der rechten vertikalen Stange (14) mit Hilfe eines rechten unteren Verbindungselements (24) und jeweils mit einem oberen Abschnitt (16b) der rechten vertikalen Stange (16) mit Hilfe eines rechten oberen Verbindungselements (25) verbunden sind.

3. Kletterkopf nach Anspruch 2, **dadurch gekennzeichnet, dass** sich das linke untere und obere bewegliche Klauenelement (10b, 11 b) um eine gemeinsame linke Drehachse drehen, die einen linken vertikalen Schaft (12a) umfasst, der auf dem linken unteren und oberen festen Klauenelement (10a, 11a) befestigt ist; sich das rechte untere und obere bewegliche Klauenelement (10d, 11d) um eine gemeinsame rechte Drehachse drehen, die einen rechten vertikalen Drehschaft (12b) umfasst, der auf dem rechten unteren und oberen festen Klauenelement (10c, 11 c) befestigt ist;

4. Kletterkopf nach Anspruch 3, **dadurch gekennzeichnet, dass** ein Zwischenabschnitt jedes linken Verbindungselements (22, 23) zusätzlich gleitend und drehbar mit dem linken vertikalen Schaft (12a) verbunden ist und ein Zwischenabschnitt jedes rechten Verbindungselements (24, 25) zusätzlich gleitend und drehbar mit dem rechten vertikalen Schaft (12b) verbunden ist; wobei die vertikalen Schäfte (12a, 12b) jeweils eine derartige Länge aufweisen, dass das obere Verbindungselement (23, 25), mit dem sie verbunden sind, auf seinem oberen Abschnitt geführt bleibt, wenn die vertikalen Bolzen (13a, 13b, 15a, 15b) nach oben aus den ersten Durchgangslöchern (17a, 17b;

18a, 18b; 19a, 19b; 20a, 20b) gezogen werden.

5. Kletterkopf nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** das Kippelement (9) drehend auf einem Drehschaft (8) montiert ist, der zwischen den Seitenplatten (3a) angeordnet ist, und einen vorderen Abschnitt (9a) und einen hinteren Abschnitt (9b) und einen Zwischenabschnitt umfasst, wobei das Kippelement (9) drehbar zwischen der Hebe position, an der sein hinterer Abschnitt (9b) gegen ein erstes Begrenzungselement (3g) anstößt, das zwischen den Seitenplatten (3a) angeordnet ist, und sein vorderer Abschnitt (9a) aus den Seitenplatten (3a) hin zum Mast (1) vorspringt und eines der Stützelemente (2, 2a) stützt, wenn sich der Hebezylinder (4) hin zu der erweiterten Position erstreckt, um den Mast (1) zu heben, und der Durchgangsposition gedreht werden kann, in der er den Durchgang von mindestens einem der Stützelemente (2, 2a) ermöglicht, wenn sich der Hebezylinder (4) in die zurückgezogene Position zurückzieht.

6. Kletterkopf nach Anspruch 5, **dadurch gekennzeichnet, dass** die vertikalen Seitenplatten (3a) an ihren unteren Endabschnitten durch eine Befestigungsplatte (3b) und an ihren oberen Endabschnitten durch eine Befestigungsstange (3f) miteinander verbunden sind.

7. Kletterkopf nach Anspruch 6, **dadurch gekennzeichnet, dass** jede Seitenplatte (3a) eine vordere Kante umfasst, die dem Mast (1) gegenüber liegt, wobei sich ein konvexer oberer Abschnitt (3c) und ein geneigter Abschnitt nach hinten zwischen dem ersten konvexen oberen Abschnitt (3c) und der Befestigungsplatte (3b) erstrecken; auf der Seite gegenüber dem konvexen oberen Abschnitt (3c) jede der Seitenplatten (3a) einen hinteren Vorsprung (3d) mit einer Kuppelungsöffnung (3e) für einen Kupplungsbolzen (31) aufweist, der mit dem oberen Ende des Hubzylinders (4) gekoppelt werden kann.

8. Kletterkopf nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** jeder der beweglichen Klauenabschnitte (10b, 11 b; 10c, 10d) einen freien Endabschnitt aufweist, der mit einer Aussparung (10e) versehen ist, in der in der geschlossenen Position des Klauenelements (10a, 10b, 10c, 10d, 11a, 11b, 11c, 11 d) mindestens ein Abschnitt einer der Seitenflansche (1 c) geführt ist.

9. Kletterkopf nach Anspruch 8, **dadurch gekennzeichnet, dass** er eine linke vertikale vordere Führungsplatte (27) umfasst, die an entsprechenden vorderen Wänden der Aussparungen (3f) der beweglichen linken Klauenabschnitte (10b, 11 b) be-

reitgestellt ist, und eine rechte vertikale vordere Führungsplatte (29), die an entsprechenden vorderen Wänden der Aussparungen (10e) der beweglichen rechten Klauenabschnitte (10d, 11 d) bereitgestellt ist.

10. Kletterkopf nach Anspruch 9, **dadurch gekennzeichnet, dass** jede vordere Führungsplatte (27, 29) einen nach außen gebogenen oberen Endabschnitt umfasst, der nach oben über den oberen beweglichen Klauenabschnitt (11b, 11 d) hinaus vorspringt, und einen nach außen gebogenen unteren Endabschnitt, der nach unten unter den beweglichen Klauenabschnitt (10b, 10d) vorspringt.
11. Kletterkopf nach Anspruch 8, **dadurch gekennzeichnet, dass** er eine linke und eine rechte vertikale seitliche Führungsplatte (26a, 28a) umfasst, bereitgestellt an entsprechenden seitlichen Wänden der Aussparungen (10e) der unteren beweglichen Klauenabschnitte (10b, 10d).
12. Kletterkopf nach Anspruch 11, **dadurch gekennzeichnet, dass** jede vertikale seitliche Führungsplatte (26a, 28a) einen nach außen gebogenen oberen Endabschnitt umfasst, der nach oben über den oberen beweglichen Klauenabschnitt (10b, 10d) hinaus vorspringt, und einen nach außen gebogenen unteren Endabschnitt, der nach unten unter den beweglichen Klauenabschnitt (10b, 10d) vorspringt.
13. Kletterkopf nach Anspruch 8, **dadurch gekennzeichnet, dass** er eine linke und eine rechte vertikale seitliche Führungsplatte (26b, 28b) umfasst, ausgestattet an entsprechenden hinteren Wänden der Aussparungen (10e) der unteren beweglichen Klauenabschnitte (10b, 10d).
14. Kletterkopf nach Anspruch 13, **dadurch gekennzeichnet, dass** jede vertikale hintere Führungsplatte (26b, 28b) einen nach außen gebogenen unteren Endabschnitt umfasst, der nach unten unter den unteren beweglichen Klauenabschnitt (10b, 10d) vorspringt.

## Revendications

1. Tête télescopique pour lever un système de protection autogrimpant pour des travaux de construction dans les bâtiments, la tête télescopique (3) pouvant être fixée de manière amovible à un mât (1) comprenant deux poutres verticales (1 a) ayant des brides latérales longitudinales (1 c) respectives faisant saillie latéralement vers l'extérieur au niveau de leurs parties arrière et une pluralité d'éléments de support (2, 2a) fixés entre les poutres verticales (1a) à différentes hauteurs ; et comprenant deux plaques laté-

rales verticales (3a), à distance l'une de l'autre et reliées ensemble au niveau de leurs parties d'extrémité inférieures et au niveau de leurs parties d'extrémité supérieures ; des moyens d'articulation (3e) pour coupler de manière inclinable les parties supérieures des plaques latérales (3a) à l'extrémité supérieure (4a) d'un cylindre de levage (4), dont l'extrémité inférieure (4b) est couplée aux moyens d'ancrage (5, 6) fixés à une partie de rebord d'une dalle de plancher (7) d'un bâtiment, le cylindre de levage (4) pouvant adopter une position étendue et une position rétractée ; un élément de culbuteur (9) qui peut pivoter entre une position de levage dans laquelle sa partie avant (9a) fait saillie des plaques latérales (3a) et met en prise le mât (1) lorsque le cylindre de levage (4) s'étend vers ladite position étendue pour lever le mât (1), et une position de passage dans laquelle il permet le passage du mât (1) lorsque le cylindre de levage (4) se rétracte dans ladite position rétractée ; une griffe inférieure (10) comprenant un élément de griffe gauche inférieur (10a, 10b) et un élément de griffe droit inférieur (10c, 10d) faisant chacun saillie latéralement au-delà de l'une des plaques latérales (3a) ; des moyens de verrouillage inférieurs pour verrouiller chacun des éléments de griffe inférieurs (10a, 10b, 10c, 10d) dans une position verrouillée dans laquelle ils comprennent l'une des dites brides latérales (1c) et une position ouverte dans laquelle les éléments de griffe inférieurs (10a, 10b, 10c, 10d) libèrent lesdites brides latérales (1c) ;

**caractérisée en ce que**

la tête télescopique (3) comprend en outre une griffe supérieure (11) comprenant un élément de griffe gauche supérieur (11 a, 11b) et un élément de griffe droit supérieur (11 c, 11 d) chacun faisant saillie latéralement au-delà de l'une des dites plaques latérales (3a), et des moyens de verrouillage supérieurs pour verrouiller chacun des éléments de griffe supérieurs (11a, 11b, 11c, 11 d) dans une position verrouillée dans laquelle ils comprennent l'une des dites brides latérales (1c) et une position ouverte dans laquelle les éléments de griffe supérieurs (11 a, 11 b, 11 c, 11 d) libèrent lesdites brides latérales (1 c); chacun des éléments de griffe (10a, 10b, 10c, 10d, 11 a, 11 b, 11 c, 11 d) comprend une partie de griffe fixe (10a, 10c, 11 a, 11 c) sortant d'une plaque latérale (3a) et une partie de griffe mobile (10b, 10d, 11b, 11 d) qui peut pivoter autour d'un axe de rotation vertical (12a, 12b), prévu dans la partie de griffe fixe (10a, 10c, 11 a, 11 c), sur lequel elle est montée, entre ladite position verrouillée et ladite position ouverte;

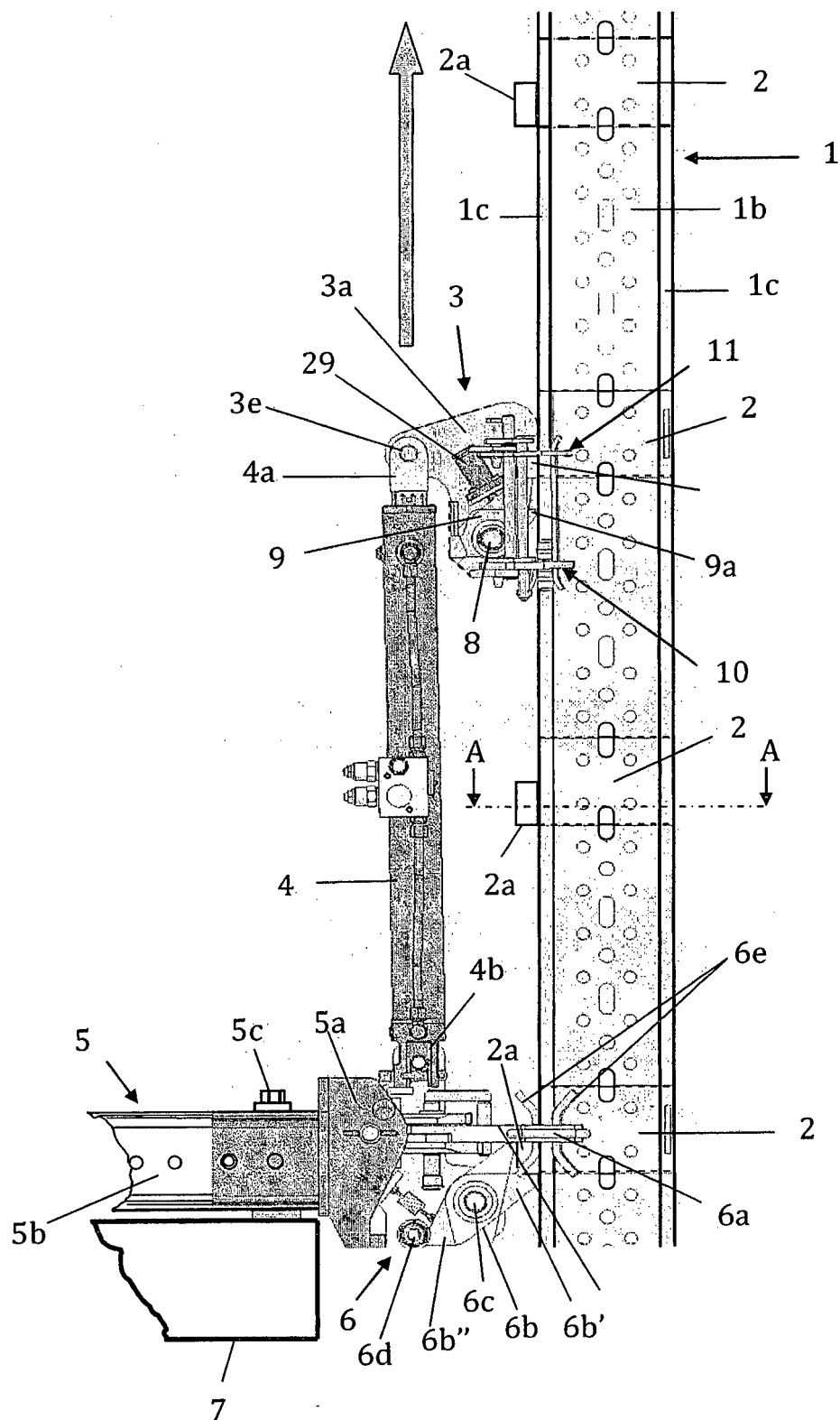
les moyens de verrouillage comprennent des moyens de verrouillage gauches inférieur et supérieur et des moyens de verrouillage droits inférieur et supérieur, les moyens de verrouillage comprenant chacun un boulon vertical (13a, 13b; 15a, 15b) qui, dans la position verrouillée de l'élément de griffe

- (10a, 10b, 10c, 10d, 11 a, 11 b, 11 c, 11 d), reste inséré de manière amovible dans des premiers trous débouchants verticalement alignés (17a, 17b ; 18a, 18b ; 19a, 19b ; 20a, 20b) respectivement prévus dans la partie de griffe fixe (10a, 10c, 11 a, 11 c) et dans la partie de griffe mobile (10b, 10d, 11 b, 11 d) entre l'axe de rotation vertical (12a, 12b) respectif et la plaque latérale (3a) respective ;  
les boulons verticaux (13a, 13b) des moyens de verrouillage gauches sont raccordés à une tige verticale gauche (14) qui s'étend de manière coulissante à travers des seconds trous débouchants (21 a, 21 b) respectivement prévus dans les parties de griffe mobiles gauches (10b, 11b) dans une position située entre son axe de rotation (12a) et son extrémité libre ; les boulons verticaux (15a, 15b) des moyens de verrouillage droits sont raccordés à une tige verticale droite (16) qui s'étend de manière coulissante à travers des seconds trous débouchants (21 c, 21 d) respectivement prévus dans les parties de griffe mobiles droites (10d, 11d) dans une position située entre son axe de rotation (12b) et son extrémité libre ; chacune des tiges verticales (14, 16) a une longueur de sorte que ses parties d'extrémité inférieures (14a, 16a) restent guidées dans les seconds trous débouchants (21a, 21c) respectifs dans les parties de griffe mobiles inférieures (10b, 10d) lorsque lesdits boulons verticaux (13a, 13b, 15a, 15b) sont tirés vers le haut hors desdits premiers trous débouchants (17a, 17b ; 18a, 18b ; 19a, 19b ; 20a, 20b).
2. Tête télescopique selon la revendication 1, **caractérisée en ce que** les boulons verticaux (13a, 13b) des moyens de verrouillage gauches sont raccordés respectivement à une partie inférieure (14a) de la tige verticale gauche (14) au moyen d'un élément de raccordement inférieur gauche (22) et respectivement à une partie supérieure (14b) de la tige verticale gauche (14) au moyen d'un élément de raccordement supérieur gauche (23), et les boulons verticaux (15a, 15b) des moyens de verrouillage droits sont raccordés respectivement à une partie inférieure (16a) de la tige verticale droite (16) au moyen d'un élément de raccordement inférieur droit (24) et respectivement à une partie supérieure (16b) de la tige verticale droite (16) au moyen d'un élément de raccordement supérieur droit (25).
3. Tête télescopique selon la revendication 2, **caractérisée en ce que** les éléments de griffe mobiles inférieurs et supérieurs gauches (10b, 11 b) pivotent autour d'un axe de rotation gauche commun composé d'un arbre vertical gauche (12a) qui est monté sur les éléments de griffe fixes inférieurs et supérieurs gauches (10a, 11 a) ;  
les éléments de griffe mobiles inférieurs et supérieurs droits (10d, 11d) pivotent autour d'un axe de rotation droit commun composé d'un arbre de pivot vertical droit (12b) qui est monté sur les éléments de griffe fixes inférieurs et supérieurs droits (10c, 11c).
4. Tête télescopique selon la revendication 3, **caractérisée en ce que** une partie intermédiaire de chaque élément de raccordement gauche (22, 23) est, de plus, raccordée de manière coulissante et rotative à l'arbre vertical gauche (12a) et une partie intermédiaire de chaque élément de raccordement droit (24, 25) est, de plus, raccordée de manière coulissante et rotative à l'arbre vertical droit (12b) ;  
les arbres verticaux (12a, 12b) ayant chacun une longueur de sorte que l'élément de raccordement supérieur (23, 25) à laquelle il est raccordé, reste guidé sur sa partie supérieure lorsque lesdits boulons verticaux (13a, 13b, 15a, 15b) sont tirés vers le haut hors desdits premiers trous débouchants (17a, 17b ; 18a, 18b ; 19a, 19b ; 20a, 20b).
5. Tête télescopique selon l'une quelconque des revendications précédentes, **caractérisée en ce que** l'élément de culbuteur (9) est monté de manière pivotante sur un arbre de rotation (8) agencé entre les plaques latérales (3a) et comprenant une partie avant (9a) et une partie arrière (9b) et une partie intermédiaire, l'élément de culbuteur (9) pouvant pivoter entre ladite position de levage dans laquelle sa partie arrière (9b) vient en butée contre un premier élément de limitation (3g) agencé entre les plaques latérales (3a) et sa partie avant (9a) fait saillie des plaques latérales (3a) vers le mât (1) et supporte l'un des éléments de support (2, 2a) lorsque le cylindre de levage (4) s'étend vers ladite position étendue pour lever le mât (1) et ladite position de passage dans laquelle il permet le passage d'au moins l'un des éléments de support (2, 2a) lorsque le cylindre de levage (4) se rétracte dans ladite position rétractée.
6. Tête télescopique selon la revendication 5, **caractérisée en ce que** les plaques latérales verticales (3a) sont reliées ensemble au niveau de leurs parties d'extrémité inférieures par une plaque de fixation (3b) et au niveau de leurs parties d'extrémité supérieures par une barre de fixation (3f).
7. Tête télescopique selon la revendication 6, **caractérisée en ce que** chaque plaque latérale (3a) comprend un bord avant faisant face au mât (1), avec une section supérieure convexe (3c) et une section inclinée s'étendant vers l'arrière entre la première section supérieure convexe (3c) et la plaque de fixation (3b) ;  
sur le côté opposé à la section supérieure convexe (3c), chacune des plaques latérales (3a) a une protubérance arrière (3d) avec une ouverture de cou-

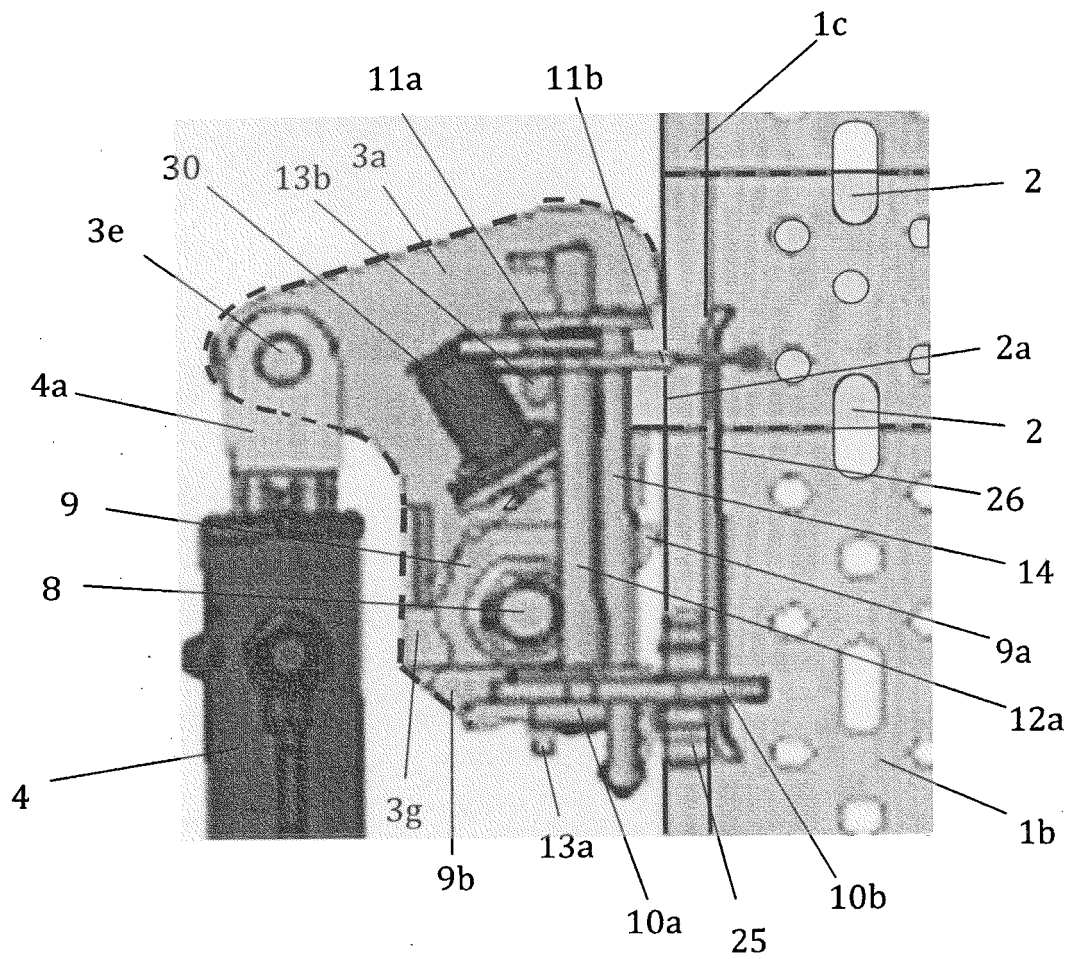
plage (3e) pour un boulon de couplage (31) qui peut être couplé à l'extrémité supérieure du cylindre de levage (4).

8. Tête télescopique selon l'une quelconque des revendications précédentes, **caractérisée en ce que** chacune des parties de griffe mobiles (10b, 11 b ; 10c, 10d) a une partie d'extrémité libre prévue avec un évidement (10e) dans lequel, dans ladite position fermée de l'élément de griffe (10a, 10b, 10c, 10d, 11 a, 11 b, 11 c, 11 d), au moins une partie de l'une des desdites brides latérales (1c) est guidée. 5 10
9. Tête télescopique selon la revendication 8, **caractérisée en ce qu'elle** comprend une plaque de guidage avant verticale gauche (27) prévue au niveau des parois avant respectives des évidements (3f) des parties de griffe gauches mobiles (10b, 11 b) et une plaque de guidage avant verticale droite (29) prévue au niveau des parois avant respectives des évidements (10e) des parties de griffe droites mobiles (10d, 11d). 15 20
10. Tête télescopique selon la revendication 9, **caractérisée en ce que** chaque plaque de guidage avant (27, 29) comprend une partie d'extrémité supérieure arquée vers l'extérieur faisant saillie vers le haut au-delà de la partie de griffe mobile supérieure (11b, 11 d) et une partie d'extrémité inférieure arquée vers l'extérieur faisant saillie vers le bas au-delà de la partie de griffe mobile inférieure (10b, 10d). 25 30
11. Tête télescopique selon la revendication 8, **caractérisée en ce qu'elle** comprend une plaque de guidage latérale verticale gauche et une plaque de guidage latérale verticale droite (26a, 28a) prévues au niveau des parois latérales respectives des évidements (10e) des parties de griffe mobiles inférieures (10b, 10d). 35 40
12. Tête télescopique selon la revendication 11, **caractérisée en ce que** chaque plaque de guidage latérale verticale (26a, 28a) comprend une partie d'extrémité supérieure arquée vers l'extérieur faisant saillie vers le haut au-delà de la partie de griffe mobile inférieure (10b, 10d) et une partie d'extrémité inférieure arquée vers l'extérieur faisant saillie vers le bas au-delà de la partie de griffe mobile inférieure (10b, 10d). 45 50
13. Tête télescopique selon la revendication 8, **caractérisée en ce qu'elle** comprend une plaque de guidage arrière verticale gauche et une plaque de guidage arrière verticale droite (26b, 28b) prévues au niveau des parois arrière respectives des évidements (10e) des parties de griffe mobiles inférieures (10b, 10d). 55

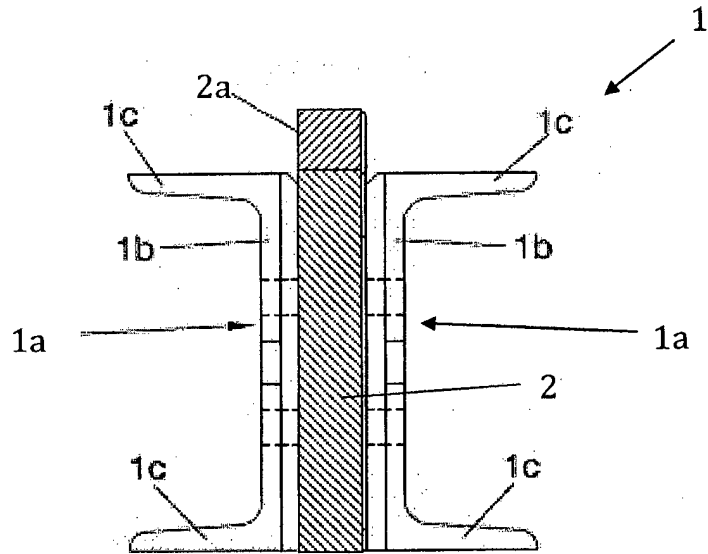
14. Tête télescopique selon la revendication 13, **caractérisée en ce que** chaque plaque de guidage arrière verticale (26b, 28b) comprend une partie d'extrémité inférieure arquée vers l'extérieur faisant saillie vers le bas au-dessous de la partie de griffe mobile inférieure (10b, 10d).



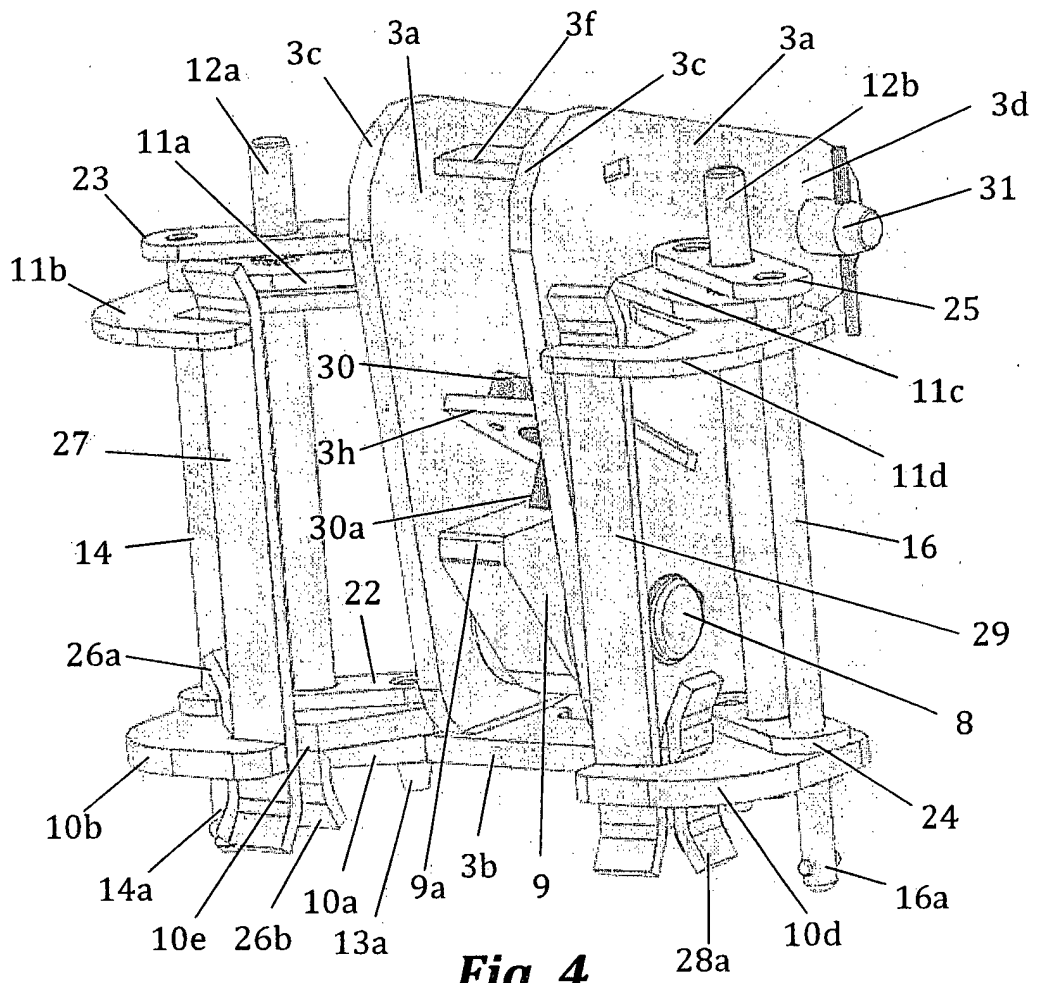
**Fig. 1**



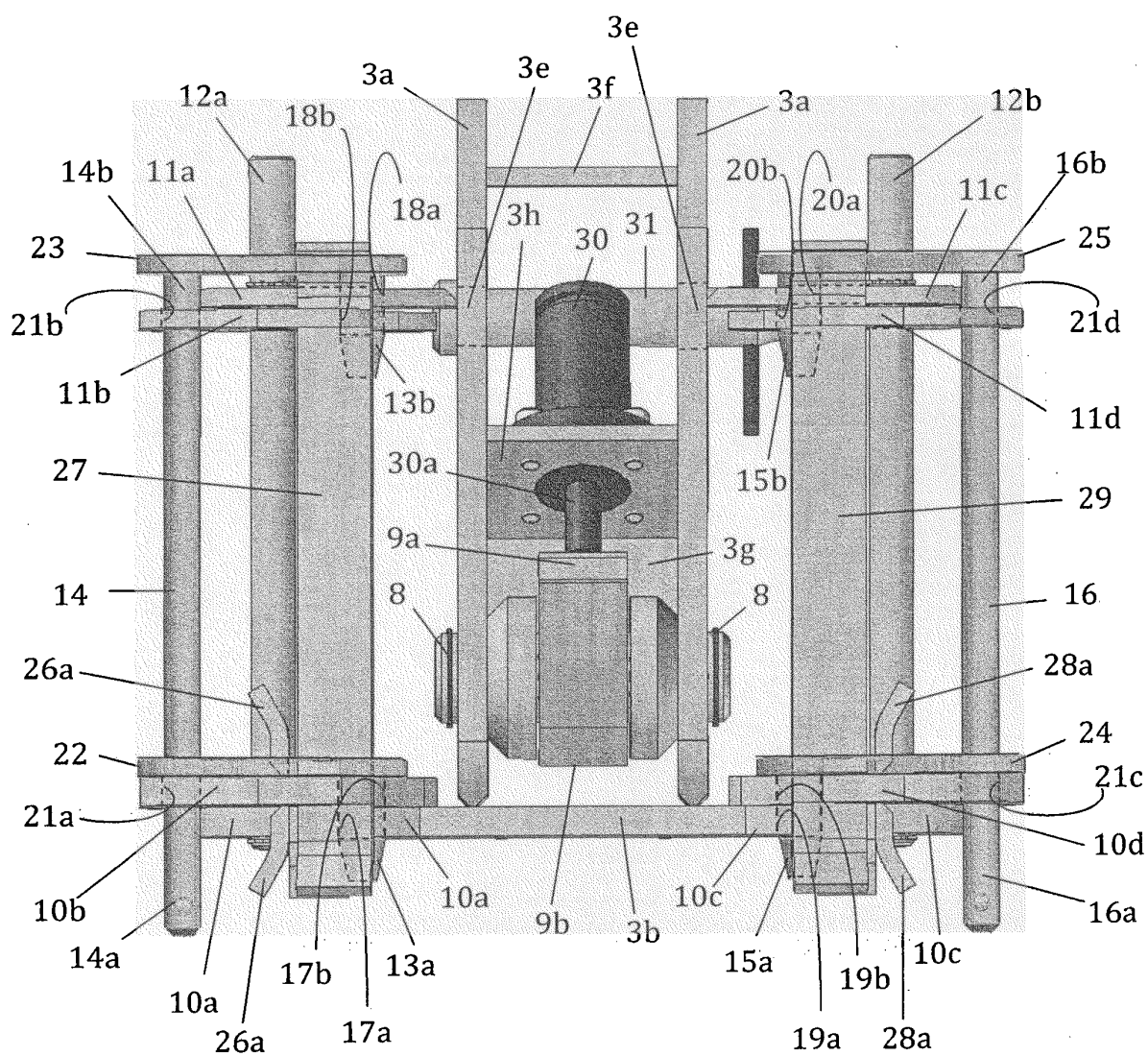
**Fig. 2**



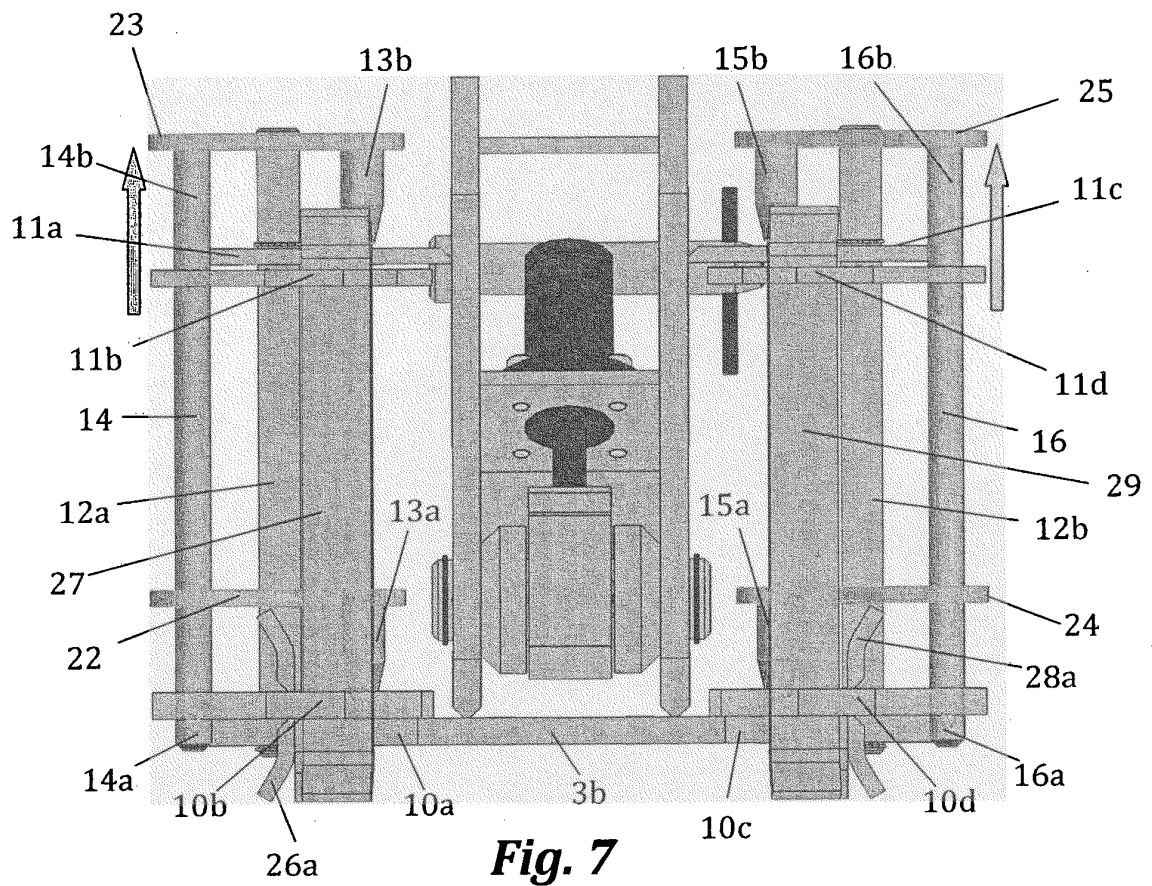
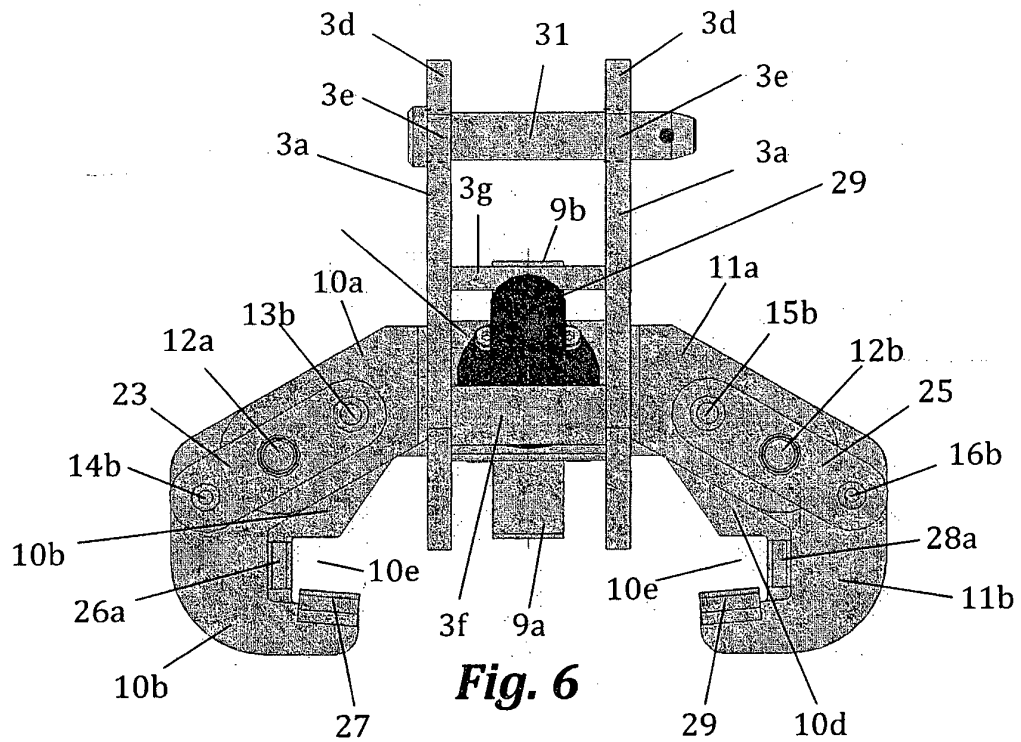
**Fig. 3**

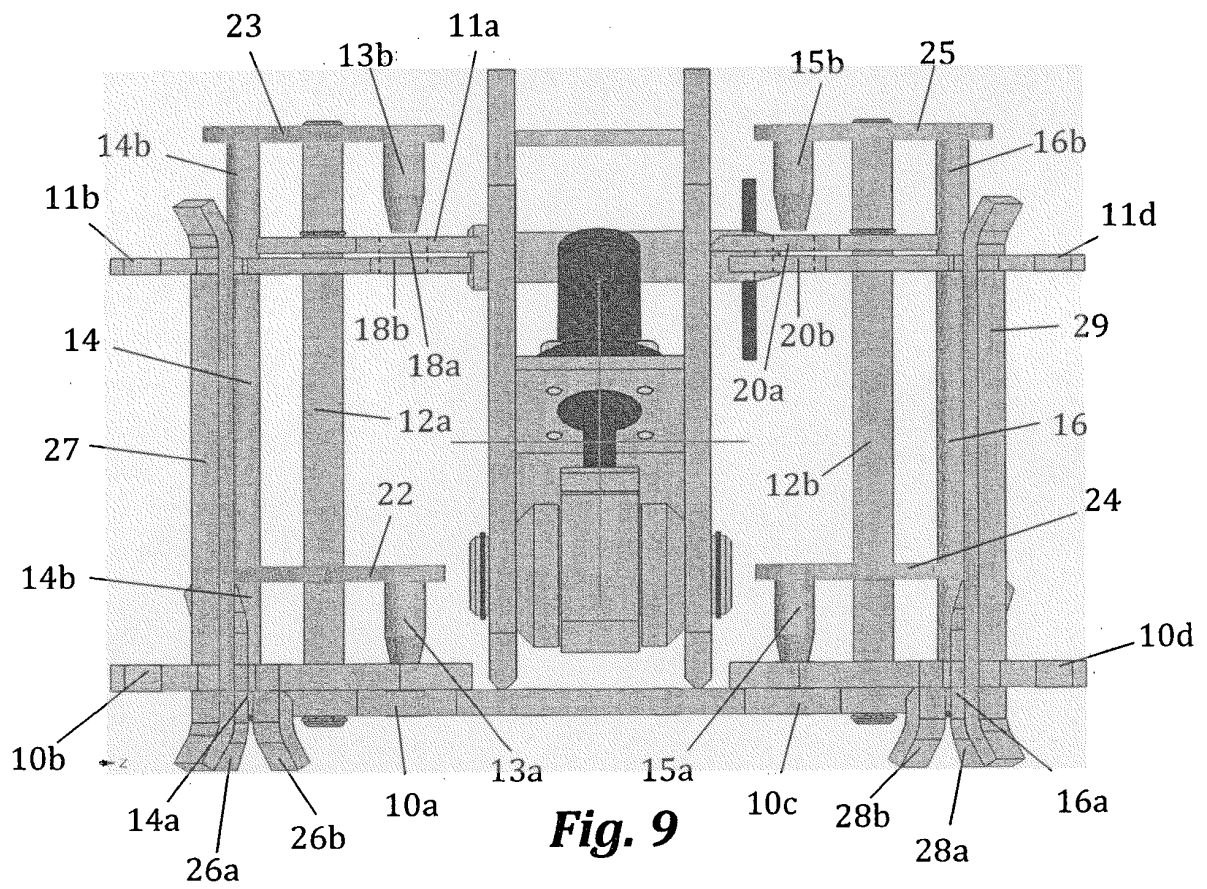
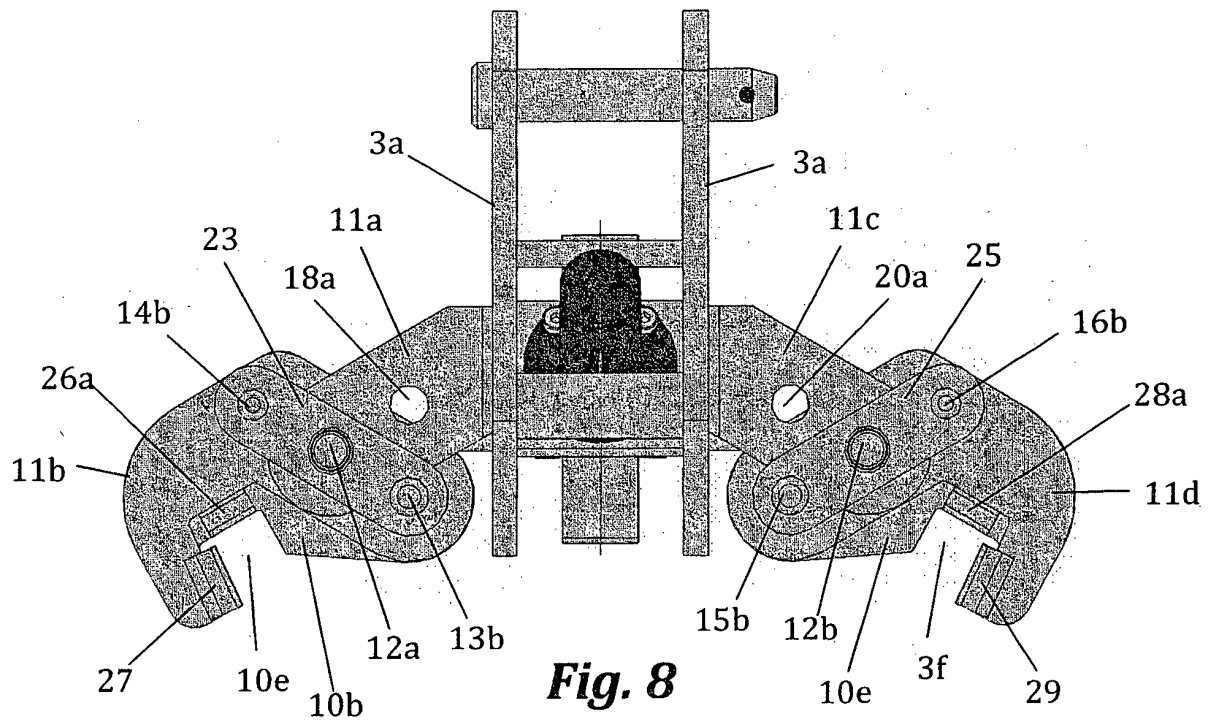


**Fig. 4**



**Fig. 5**





**REFERENCES CITED IN THE DESCRIPTION**

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