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(54) **Self-climbing perimetric protection system adaptable to buildings undergoing construction having a variable vertical projection**

(57) The invention relates to a perimetric protection system for a building undergoing construction, comprising:
- at least two masts (1) spaced from one another;
- a plurality of pairs of guiding heads (10) for said masts (1);

characterized in that the system comprises:
- a plurality of pairs of anchoring parts (20) that can be fixed in parts (5, 5a, 5b, 5c, 5d) of the building;
- a plurality of pairs of adjustable supports (30), each support being moveable on each anchoring part (20), and each pair of adjustable supports (30) being attached to each pair of guiding heads (10).

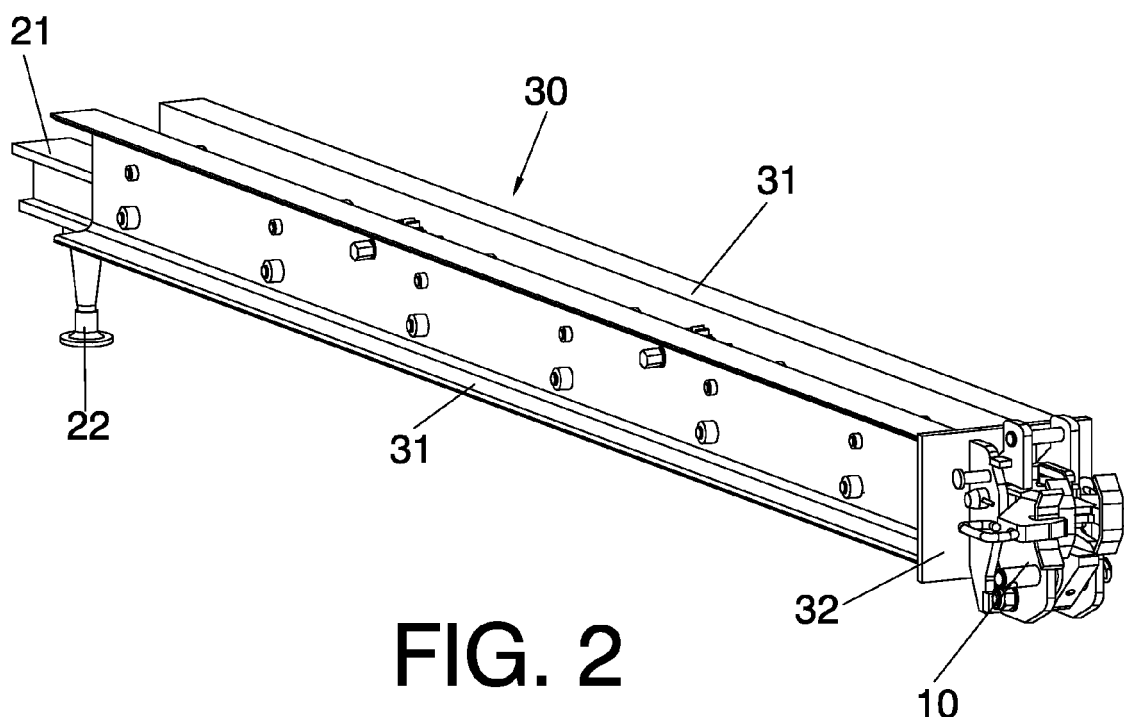


FIG. 2

Description

Technical Field of the Invention

[0001] The present invention is comprised in the technical field of construction and, more particularly, in the sector of self-climbing perimetric protections for buildings undergoing construction, and more specifically to anchoring systems for self-climbing perimetric protection systems.

Background of the Invention

[0002] The proliferation of very tall buildings, such as skyscrapers, in large cities has considerably improved the systems for their construction both in terms of efficiency and safety in recent years. The need to work safely at great heights and to continue working even with adverse meteorological conditions (wind or rain) has made it necessary to install in the periphery thereof, attached to the formworks, perimetric protections which safeguard the physical integrity of workers, as well as the safety of pedestrians and vehicles close to the work site which could be affected by objects and materials from the site undergoing construction.

[0003] Historically, these protections were initially built using simple rails which were fastened to the formworks and which, once the job on that floor was finished, were moved to the following floor under construction. However, the concept of protection currently followed seeks to completely cover the periphery of the work site with canvases, boards, panels, meshes, etc. These perimetric protections have been used for a long time and there are very different systems for their assembly and installation at the work site, although in all cases they require a fixed support structure for the formworks, to which structure the protective elements are fastened, i.e., the panels, meshes and the like. In this version, as occurred with the protective rails, once the work was finished on the floor or floors covered by the perimetric protection, the elements forming said protection, such as the metal support structure and the protective panels and meshes, had to be moved manually by means of a crane to the upper floors that had to be protected.

[0004] Self-climbing perimetric protections have been developed in recent years, which have means for being moved up and down, such that they are placed on the floors that must be perimetrically protected. Examples of such self-climbing protections can be seen in patent documents WO 2004/020766, WO 2007/036300 and in European patent application EP 10382052.8.

[0005] However, the problem arises when there is a modification to the floors of the building undergoing construction in their vertical alignment, i.e., when the slabs or the different floors of the building present variations in the position of their end edges which are not vertically aligned. In the case of European patent application EP 10382052.8, this is solved by means of auxiliary parts to

which the masts holding the perimetric protection are articulated. These auxiliary parts allow certain angular deviation that can absorb minor deviations occurring in the building when they are not significant deviations.

[0006] There are times, however, in which the building presents major deviations in the vertical alignment of the slabs or floors of the building (for example a balcony projecting with respect to a lower floor without a balcony) such that the use of articulated auxiliary parts for the attachment of the masts supporting the perimetric protection is insufficient because the masts must maintain their vertical alignment to follow the profile of the building during hoisting (climbing).

Description of the Invention

[0007] The object of the present invention is a perimetric protection system according to claim 1. Preferred embodiments of the system are defined in the dependent claims.

[0008] To solve the drawbacks of current perimetric protection systems in relation to possible deviations in the geometry (vertical alignment) that the building undergoing construction may have, the protection system of the present invention comprises an adjustable anchoring system for anchoring to the slabs or floors of the building. Therefore, depending on the geometry of the floor in which the protection system is used, the corresponding adjustment is made in the anchoring system such that it can move closer to or farther from the end of the floor of the building, absorbing the vertical misalignments of the building.

[0009] The self-climbing perimetric protection system comprises:

- at least two masts spaced from one another;
- protective vertical panels attached to the masts;
- at least two guiding heads for supporting and guiding said masts, said pairs of heads being able to be fixed to the slab or floors of the building by means of an anchoring system.

[0010] According to the present invention the anchoring system comprises:

- a plurality of pairs of anchoring parts that can be fixed to said horizontal slabs or floors of the building;
- a plurality of pairs of adjustable supports to which the guiding heads are attached (for example at one of the ends of the adjustable support);
- displacement means for moving the pairs of adjustable supports with respect to the pairs of anchoring parts to allow linear movement of the guiding heads.

[0011] This linear movement can cause the guiding heads to move closer to or farther from an end edge of the slab or floor of the building to be in a vertical alignment position with the guiding heads corresponding to other

slabs or floors of the building and the system thus allows absorbing the vertical misalignments that may arise in the slabs or floors of the building. Thus, when the masts of the perimetric protection system are hoisted, the heads are vertically aligned, i.e., in the position suitable for the correct hoisting of the masts:

[0012] The displacement means can comprise a rack and at least one pinion. The rack can be assembled in the anchoring parts and the pinion in the adjustable supports or vice versa.

[0013] When the required movement (from the end edge) length is very long, the system may incorporate a first pinion (in the front part) and a second pinion (in the rear part), the pinions being arranged such that the operation of the second pinion overlaps with the operation of the first pinion. Thus, the second pinion can follow the linear movement of the heads, reaching a greater distance farther away from the end edge of the slab or floor of the building.

[0014] The first and second pinions can be externally operable by means of a tool causing the linear sliding of the guiding heads.

[0015] The displacement means can also comprise guiding means which ensure contact between the rack and the first/second pinion. These guiding means can comprise, for example, sliding rollers arranged in the adjustable supports and resting on the anchoring parts facilitating and guiding the sliding between both. For better guiding, pairs of rollers facing one another such that part of the anchoring parts is arranged between each pair of rollers to prevent the vertical movement between both parts can be used. The rollers can obviously be in the anchoring parts and rest on the adjustable supports.

[0016] According to a preferred embodiment, each anchoring part has an I-beam section and a rack solidly assembled (for example by means of welding) on the upper part of each anchoring part and the adjustable support is formed by two channel irons facing one another and attached by pins (through their central branches), the adjustable support being provided with:

- a plurality of pairs of first rollers arranged between the channel irons and along an upper part of the channel irons in their assembly position such that they rest on the upper part of one of the arms of the I-beam in said assembly position;
- a plurality of pairs of second rollers arranged between the channel irons and along a lower part of channel irons in their assembly position, such that they are in contact with the lower part of one of the arms of the I-beam in said assembly position.
- a first and a second pinions arranged between the channel irons and along an upper part of the channel irons in their assembly position such that they can mesh in the rack of the anchoring part.

[0017] Each plurality of pairs of first rollers is separated from one another by a distance greater than the width of

the rack and each plurality of pairs of second rollers is separated from one another by a distance greater than the width of the narrow part of the I-beam.

[0018] Each pinion is preferably attached to the channel irons by means of a pin, at one of the ends of which a hexagon head is assembled. Each pinion can thus be operated by means of a tool that can be coupled to said hexagon head.

[0019] The distribution of the pairs of first rollers along the adjustable support is preferably uniform.

[0020] The distribution of the pairs of second rollers along the adjustable support is preferably uniform.

[0021] The masts are each formed by preferably vertical channel irons open towards opposite lateral sides.

[0022] The system can thus be adapted to the changes in the geometry of the building on which it is assembled.

[0023] The perimetric protection system of the invention can be self-climbing, of the type described in European patent application EP 10382052.8; to that end, the system further comprises a self-climbing device that can be coupled to said at least two masts and to at least said guiding heads.

[0024] As can be seen, the system according to the present invention is simple, can be easily hoisted, adaptable without major changes to different work sites and made up of combinable modules making the system very versatile.

Brief Description of the Drawings

[0025] To complement the description being made and for the purpose of aiding to better understand the features of the invention according to a preferred practical embodiment thereof, a set of drawings is attached as an integral part of said description in which the following has been depicted in an illustrative and non-limiting manner:

Figure 1 is a side view of an embodiment of a known self-climbing perimetric protection system.

Figure 2 is a perspective view of the adjustable anchoring system according to a preferred embodiment of the invention.

Figure 3 is a perspective view of the adjustable anchoring system shown in Figure 2, in which one of the channel irons of the support has been removed. Figure 4 shows an enlarged perspective view of the anchoring system from a point of view opposite that shown in Figure 2.

Figure 5 shows an exploded side view of the anchoring system.

Figure 6 is a section view along line A-A of Figure 5. Figure 7 shows a sequence of the movement between anchoring part and adjustable support according to the present invention.

Figures 8a, 8b and 8c show a sequence of the adjustment and subsequent climbing of the protection system of the invention.

Description of a Preferred Embodiment of the Invention

[0026] Figure 1 shows a side section view of a known self-climbing perimetric protection system- such as the one described in European patent application EP 10382052.8- comprising a pair of vertical masts 1 (since it is a side view, Figure 1 only shows one of them) which are fixed to slabs or floors 5 of a building and guided by means of respective anchors 4. A horizontal work or loading platform 3 can be assembled on these masts 1. A vertical protective panel 2 is assembled on the masts 1.

[0027] The masts 1 can be, for example, standard beams having determined lengths with a continuous configuration of simple standard attachments and holes which affords extreme versatility when forming different types of structures: structures adapted to the desired floor height in each case, different sections adapted to the needs of each work site, etc. Depending on the configuration of the protective panel 2 conceived for each case, it can also be attached directly to the masts 1. For example, if the protective panel 2 is formed with a board, it can be supported with standard horizontal wood beams 2a attached directly to the masts 1 with standard connectors.

[0028] The system further has support or self-climbing blocks having projections 6a emerging from the masts 1 towards the anchors 4.

[0029] As can also be observed in Figure 1, the self-climbing system comprises a climbing head 7 connected to a guiding head 10 of the anchor 4 immediately thereunder by means of a hydraulic hoisting cylinder 9 the lower end of which is connected to the guiding head 10.

[0030] The mast 1 can be rigid but it can also be articulated by means of an articulation. The articulation comprises an upper body attached to the upper part of the mast and a lower body attached to the lower part of the mast, which are connected to one another by means of a bolt. There are respective wedge-shaped side spaces between the upper body and the lower body which together determine the maximum angle of rotation of the articulation.

[0031] As described above, this articulated mast embodiment is useful when there is a variation in the geometry of the different slabs or floors of the building in the perimeter to be protected, such that there are height variations of the different slabs or floors 5. Except in exceptional cases, the anchors 4 are placed in the same position from the end of the slabs or floors 5, so if this end varies, the masts 1, and therefore the entire assembly, have to be adapted. As a result of the articulation, which constitutes the attachment of two vertical parts of each mast 1, limited articulation, such as 4° of maximum rotation, for example, towards and away from the building, between those two parts of the mast 1 is allowed.

[0032] In order for the system to be able to adapt to larger vertical deviations between the different floors of the building undergoing construction, the present invention proposes replacing the anchors 4 with an adjustable

anchoring system.

[0033] Thus, as shown in Figures 2, 3 and 4, the adjustable anchoring system is made up of an anchoring part 20 and an adjustable support 30.

[0034] This anchoring part 20 comprises an I-beam section 21 which is assembled solidly by means of an anchoring cone 22 embedded in the slab or floor of the building, and forming a movement guide for the adjustable support 30. A rack 23 which, as explained below, is responsible for the necessary linear movement for adjustment is fixed in the upper part of the beam 21, for example by welding.

[0035] The upper part of Figure 5 shows a side view and a section view of this anchoring part 20, with the I-beam 21 and the rack 23 in the upper part.

[0036] The adjustable support 30, comprising two channel irons 31 welded at one end to an end plate 32, which in turn has welded thereto a series of plates forming the base support for the guiding head 10. (One of the channel irons has been removed in Figure 3 for greater clarity).

[0037] The two channel irons 31 are open towards opposite sides and attached by pins 33, each pin being provided at its ends with a pair of first rollers 34 uniformly distributed along the channel irons although they could also be non-uniformly distributed.

[0038] Also in the inner part located between and along the two channel irons 31, but under the pairs of first rollers 34 there is a plurality of pairs of second rollers 35, also uniformly distributed along the channel irons, and they can also be distributed such that they are not necessarily uniform.

[0039] Likewise in the inner part between the two channel irons 31 the adjustable support 30 incorporates at least several pinions 36, 36' spaced from one another along the channel irons 31. Each pinion 36, 36' is assembled integrally to the channel irons 31 by means of the corresponding pin 37.

[0040] The lower part of Figure 5 shows a side view of the adjustable support 30, with one of the channel irons 31, the first rollers 34, the second rollers 35 and the pinions 36.

[0041] Figure 6 shows a section view along line A-A of Figure 5.

[0042] As a result of these elements (upper, lower rollers and pinions) the adjustable support 30 can slide along the anchoring part 20: the rollers keep the adjustable support 30 attached to the anchoring part 20, and the forward and backward movement of the support on the anchoring part is by rack and pinion.

[0043] The pinions are operated by means of a tool (not shown) acting on the end of the pin 37 of the pinion, having a hexagon head 38 or the like, for the corresponding key and tool.

[0044] The upper part of Figure 7 shows the initial position of the assembly, the relative position between adjustable support 30 and anchoring part 20 being shown. The linear movement of the assembly is performed by

operating the pinion 36 on the rack, and thus it reaches the position shown in the intermediate part of this Figure 7. In the event that the necessary adjustment length is even longer, another pinion 36' is operated with the suitable tool; this pinion continues with the linear movement of the assembly until the end position shown in the lower part of Figure 7. Linear movement of the guiding heads 10, which move farther way to a greater or lesser extend (as required) from the outer edge of the slab or floor, is thus achieved such that when the masts 1 of the perimetric protection system are hoisted, the heads 10 are in the appropriate position for being coupled to the masts 1.

[0045] The amount of pins 33 with first rollers 34 or upper rollers, of second rollers 35 or lower rollers, and of pinions 36 depends on the adjustment length to be achieved.

[0046] As shown in Figures 8a-8b-8c, the telescopic nature of the adjustable support 30 of the guiding head 10 allows for assembling the perimetric protection system even though the floors are not vertically aligned.

[0047] Thus, Figure 8a shows the self-climbing perimetric protection system of the invention assembled by means of the adjustable anchoring system for anchoring to a first slab or floor 5 of a first storey and to a second slab or floor 5 of a second storey of a building. It also shows a third slab or floor 5 and a fourth slab or floor 5a of the third and fourth storeys of the building. The fourth slab or floor 5a is not vertically aligned with the other first, second and third slabs or floors 5. As a result, before the perimetric protection system climbs, first a linear movement of the assembly towards the right (indicated by the arrow 100 in Figure 8b) is performed. The linear movement is performed according to the sequence shown in Figures 8a-8b-8c, reaching the position of the assembly shown in Figure 8b. Then the system climbs (indicated by the arrow 101 in this same Figure 8b), for which purpose the climbing head 7 is connected by means of the hydraulic cylinder 9 to the guiding head 10, which is in turn attached to the anchoring system of the second slab or floor 5. At the end of the hoisting step, the situation shown in Figure 8c is reached, in which it is seen that the protection system is in the correct position for being able to continue moving upwards to the second storey, in which the fourth slab 5a is moved with respect to the others but the guiding head 10 of the fourth slab is aligned with the guiding heads 10 of the first, second and third slabs.

[0048] The invention has been described according to a preferred embodiment thereof, but it will be evident for the person skilled in the art that multiple variations can be introduced in said embodiment without exceeding the object of the claimed invention.

Claims

1. Self-climbing perimetric protection system for a

building undergoing construction, comprising:

- at least two masts (1) spaced from one another;
- protective panels (2) attached to the masts (1);
- a plurality of pairs of guiding heads (10) for supporting and guiding said masts (1), said pairs of heads being able to be fixed to horizontal grounds (5,5a) of the building by means of an anchoring system;

characterized in that the anchoring system comprises:

- a plurality of pairs of anchoring parts (20) that can be fixed in said horizontal grounds (5, 5a) of the building;
- a plurality of pairs of adjustable supports (30) to which the pairs of guiding heads (10) are attached;
- displacement means (23, 36) for moving the pairs of adjustable supports (30) with respect to the pairs of anchoring parts (10) to allow linear movement of the guiding heads (10).

2. System according to claim 1, wherein the displacement means comprise a rack (23) and a first pinion (36) configured to mesh in said rack (23).

3. System according to claim 2, incorporating a second pinion (36') linearly displaced with respect to the first pinion (36) to mesh in the rack (23) in an overlapping manner with respect to the operation of the first pinion (36).

4. System according to claims 2 or 3, wherein the first and second pinion (36, 36') are externally operable by means of a tool causing the linear sliding of the guiding heads (10).

5. System according to any of the preceding claims, wherein each anchoring part (20) has an I-beam section (21), and a rack (23) solidly assembled on the upper part of each anchoring part (20); and wherein the adjustable support (30) is formed by two channel irons (31) facing one another and attached by pins (33), the adjustable support (30) being provided with:

- a plurality of pairs of first rollers (34) arranged between the channel irons and along an upper part of the channel irons in their assembly position such that they rest on the upper part of one of the arms of the I-beam (21) in said assembly position;
- a plurality of pairs of second rollers (35) arranged between the channel irons and along a lower part of the channel irons in their assembly position such that they are in contact with the lower part of one of the arms of the I-beam (21)

in said assembly position and,

- a first and a second pinions (36,36') arranged between the channel irons (31) and along an upper part of the channel irons in their assembly position and in that said first and second pinion (36) mesh in the rack (23) of the anchoring part (20).

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6. System according to claim 5, wherein the first and second pinions (36, 36') are attached to the channel irons (31) by means of a pin (37), at one of the ends of which a hexagon head (38) is assembled which is operable by means of a tool adapted to said hexagon head (38).

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7. System according to any of claims 1-6, further comprising a self-climbing device (7, 9) that can be coupled to said at least two masts (1) and to at least said guiding heads (10).

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8. System according to any of claims 1-7, wherein said at least two masts are formed by two vertical channel irons open towards opposite lateral sides.

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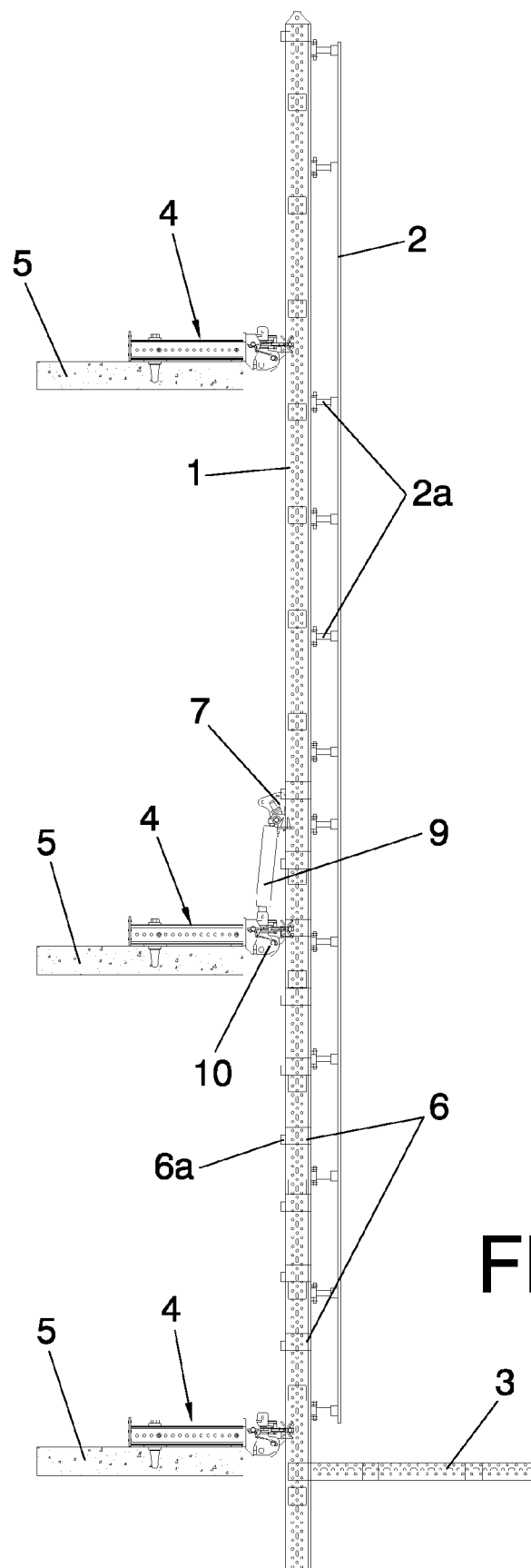
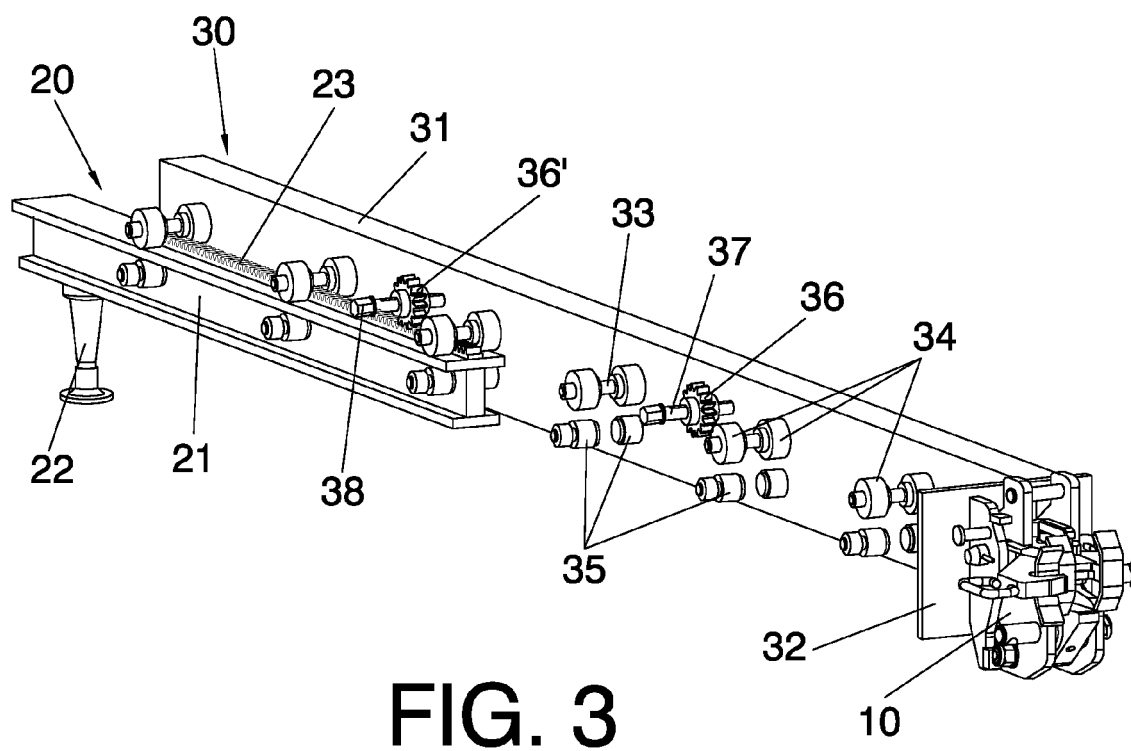
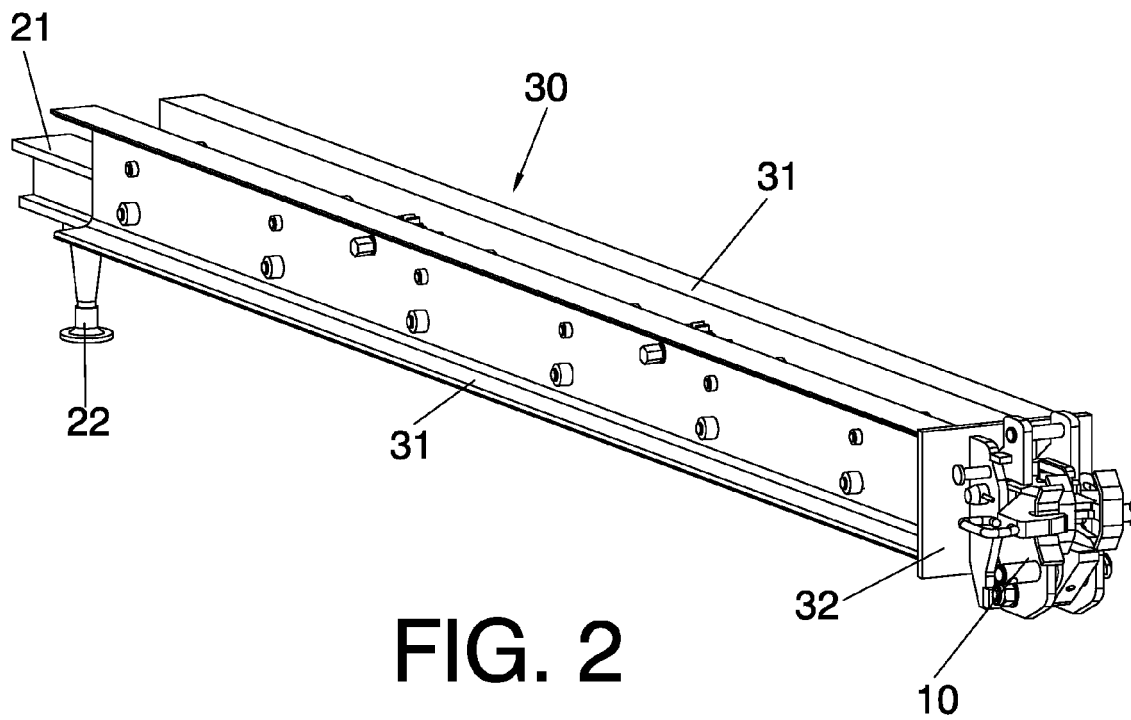


FIG. 1



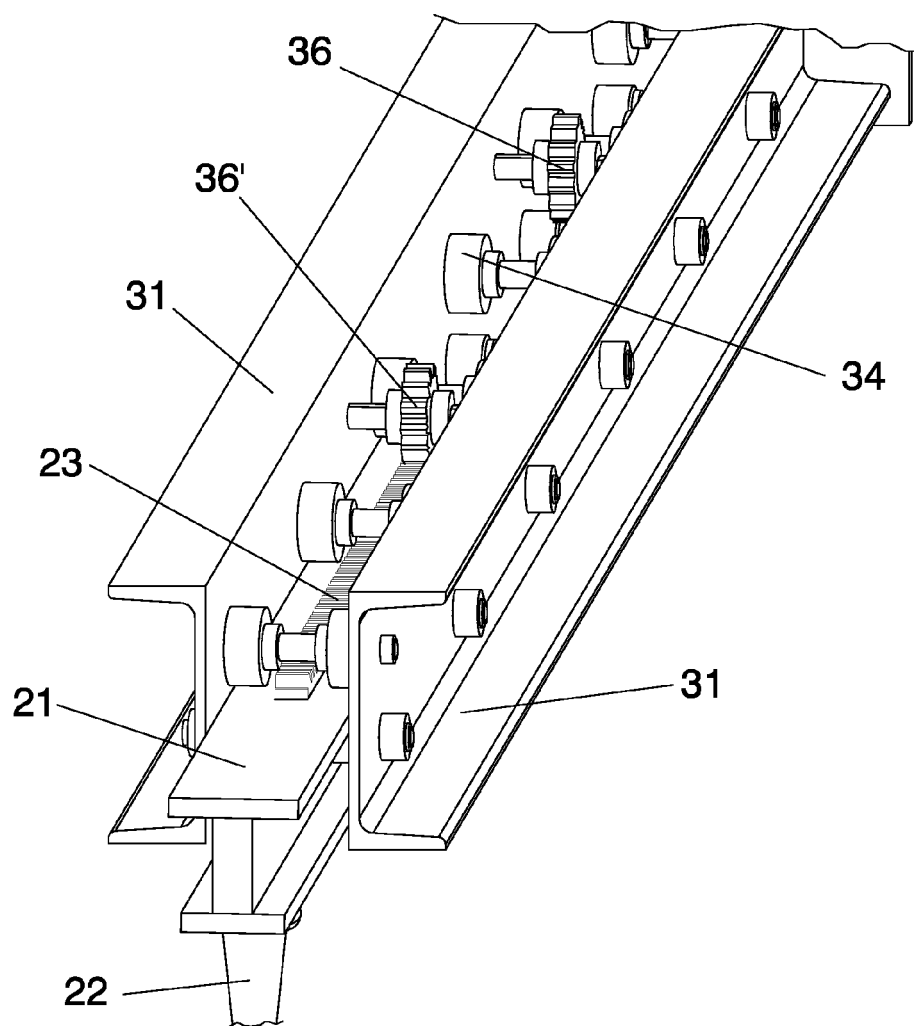


FIG. 4

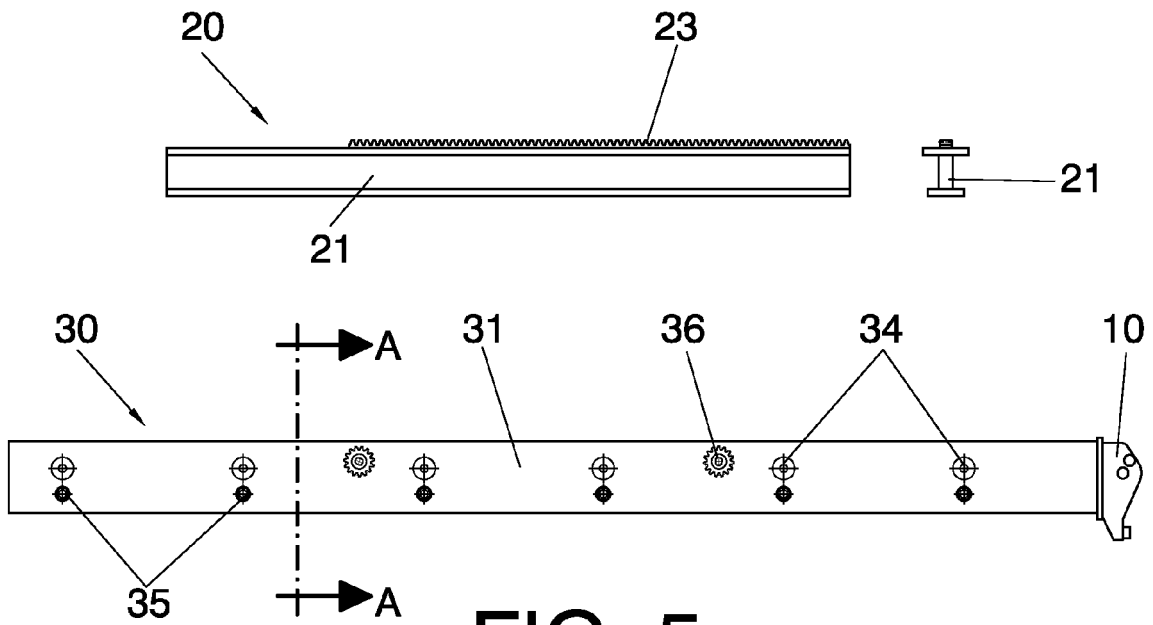


FIG. 5

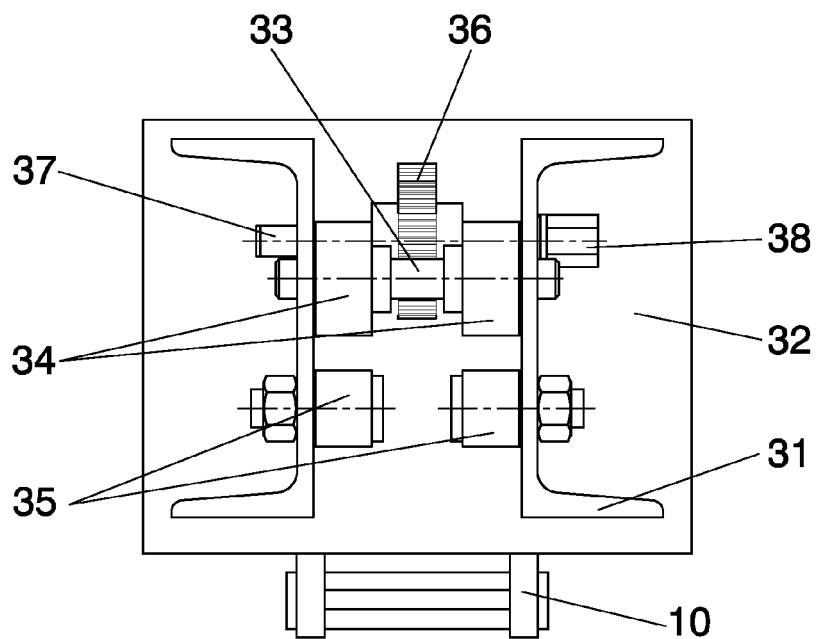


FIG. 6

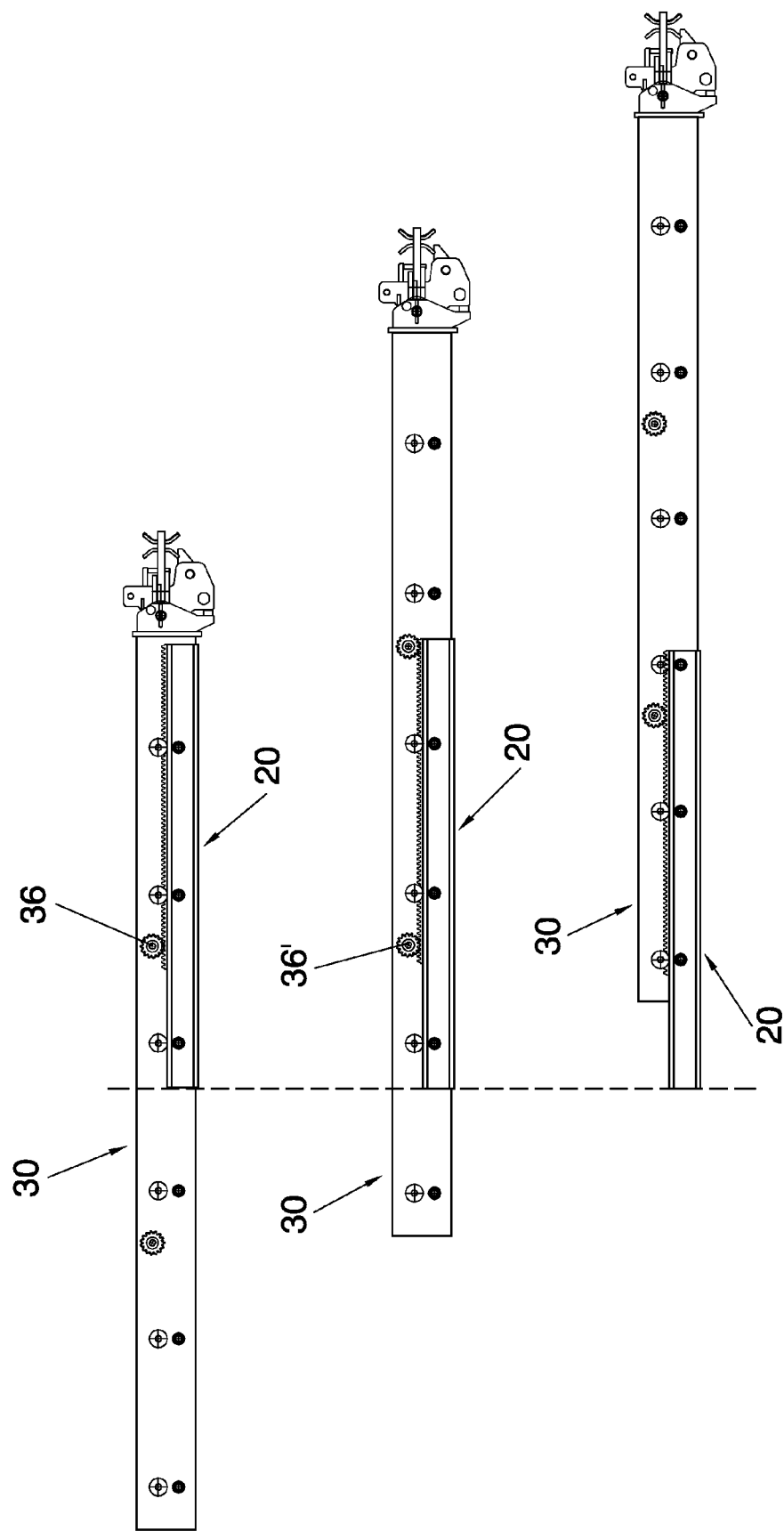


FIG. 7

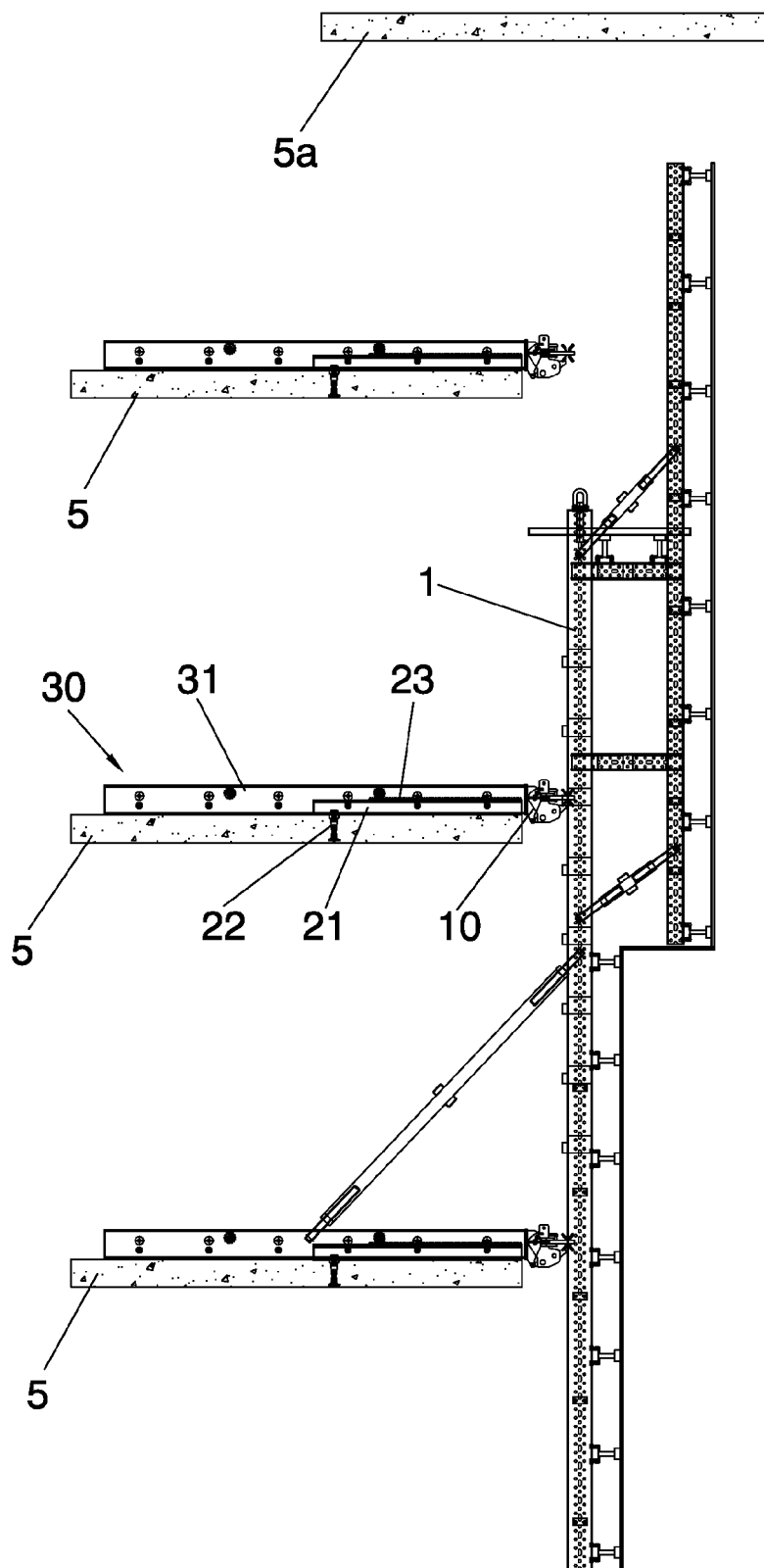


FIG. 8a

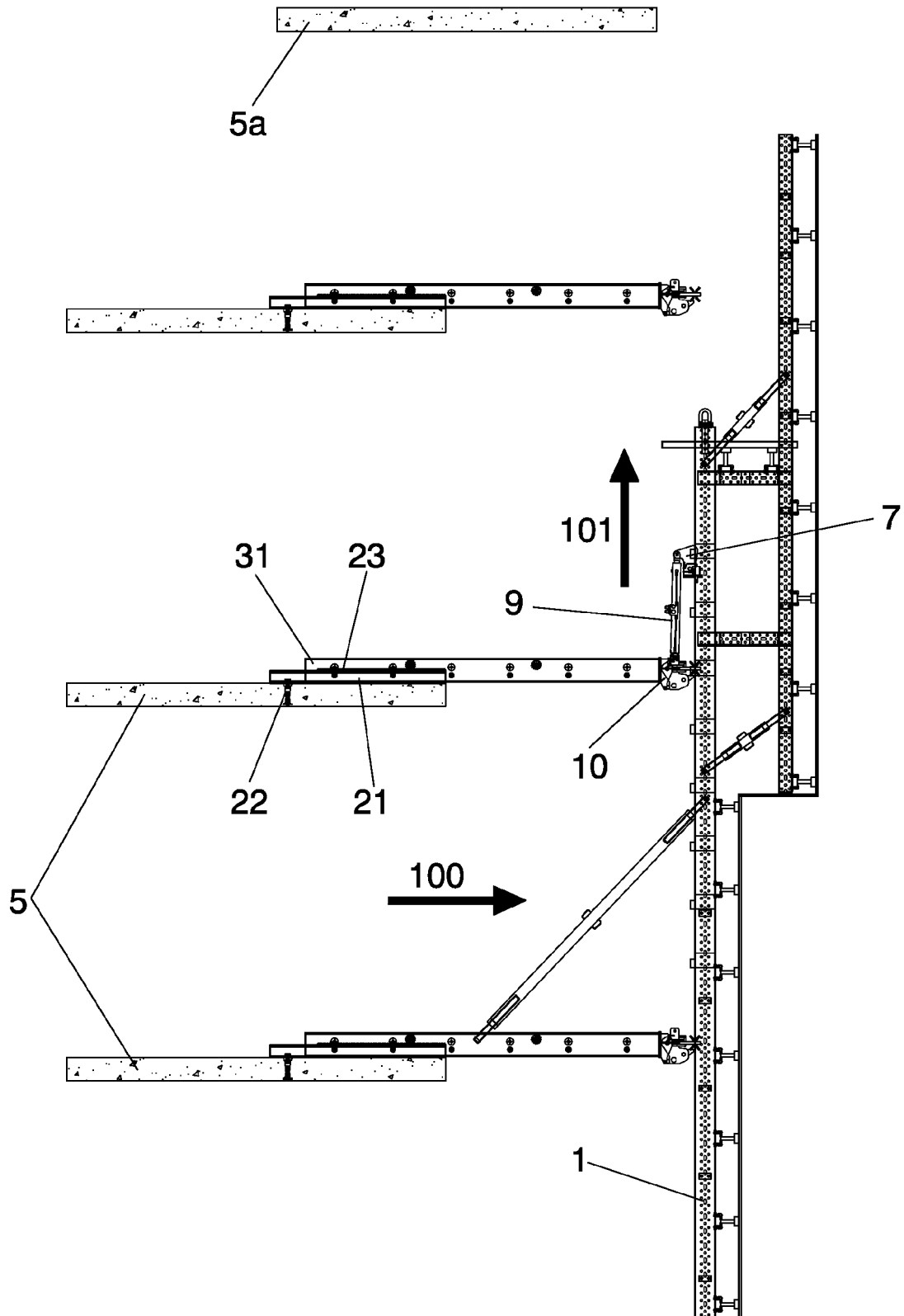


FIG. 8b

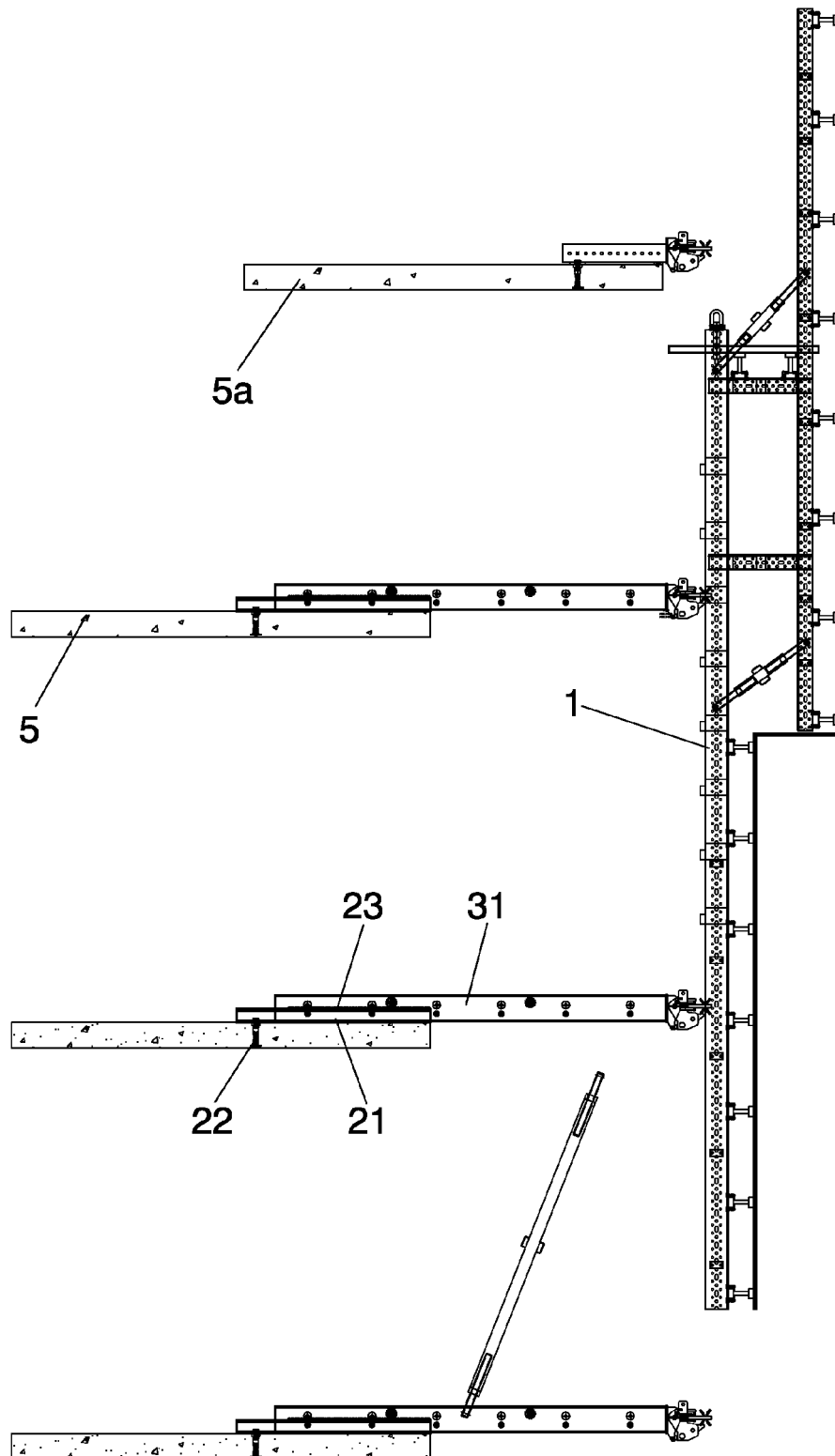


FIG. 8c



EUROPEAN SEARCH REPORT

Application Number
EP 11 38 2078

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 01/53630 A1 (AXESS SYSTEMS LTD CONST [GB]; HUME JAMES [GB]; LEAF STEPHEN [GB]) 26 July 2001 (2001-07-26)	1-3,5,7,8	INV. E04G21/32
A	* page 5, line 24 - page 6, line 23 * -----	4,6	
X	WO 2011/007949 A1 (KUM KANG INDUSTRY CO LTD [KR]; HONG YOUNG KUN [KR]) 20 January 2011 (2011-01-20) * abstract; figures 19-22 * -----	1,7,8	
			TECHNICAL FIELDS SEARCHED (IPC)
			E04G
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 30 August 2011	Examiner Saretta, Guido
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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 11 38 2078

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30-08-2011

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
WO 0153630	A1	26-07-2001	AU 2537501 A	31-07-2001
WO 2011007949	A1	20-01-2011	KR 20110007306 A	24-01-2011

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- WO 2004020766 A [0004]
- WO 2007036300 A [0004]
- EP 10382052 A [0004] [0005] [0023] [0026]