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(54) **AUTOMATIC CLIMBING DEVICE FOR LIFTING STRUCTURES AND ROOFING**

(57) The invention relates to an automatic climbing device for lifting structures and roofing. The inventive device comprises heads (1 and 2) which can be joined to a support (4) with one blocking element (9) per head, said blocking element being blocked automatically and pressed continuously under the action of a counterweight (7) or spring (10). According to the invention, the climbing heads (1 and 2) are configured such that they can be adapted to the dimensions of posts or supports (4) of any size, having a T- or I-shaped cross-section, said heads being fixed to the branches of the posts using mobile clamps (11). The above-mentioned blocking element (9) can take the form of a double roller which is blocked on the support track (4) and which is pressed by the counterweight (7) which is in turn fixed to the head by a central shaft (8) that is provided with springs (10) which are fixed such as to produce the necessary blocking and return mechanisms for the operation of the device.

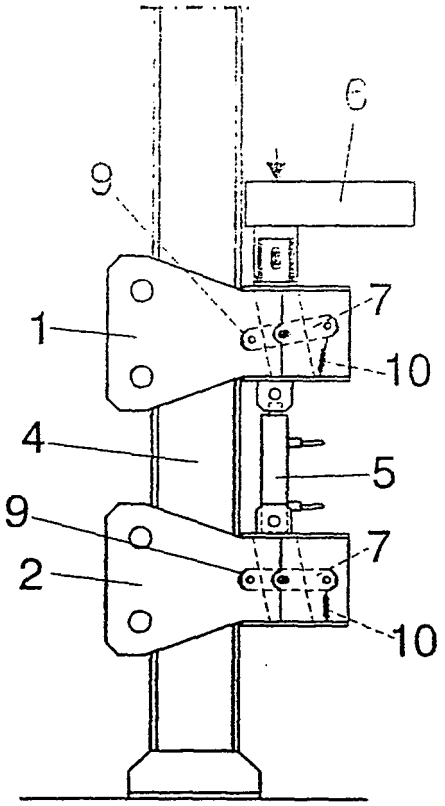


FIG. 5A

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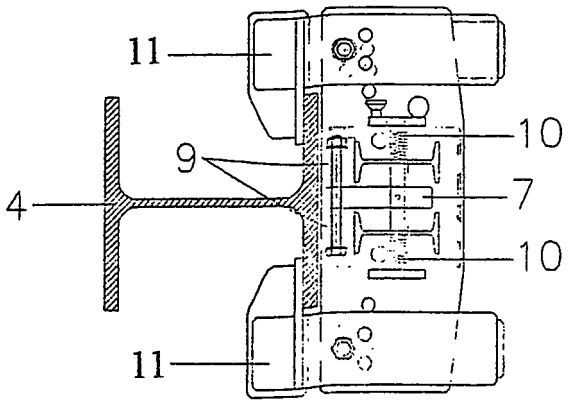


FIG.10

Description

Object of the Invention

[0001] As expressed in the title of this specification, the present invention relates to an automatic climbing device which, by means of a relative movement between a support track and the climbing heads, is intended to safely and simply lift structures and roofing previously built at a lower level using the actual construction or building as a support track, and which involves an alternative and/or improvement in this field in relation to the nature of the blocking device that it uses.

Field of the Invention

[0002] The present invention is applicable within any industrial field, especially in the construction field in general, and particularly in civil constructions, constructions of hypermarkets, of industrial premises, pavilions or sports centers, singular buildings or constructions, etc., and in all those which require lifting large structures and roofing.

Background of the Invention

[0003] As a reference to the state of the art, it must be mentioned that several methods, systems and devices are currently known which allow lifting structures and roofing of hypermarkets previously built at ground level or at lower levels.

[0004] However, most of said systems or devices require complex additional preparation structures for their application, such as the installation and placement of lifting towers, support tracks, guiding columns and/or the formation therein of teeth, notches or holes for inserting pawls or blocking elements, having blocking systems which occasionally do not provide the necessary results with regard to safety required in this field.

[0005] Thus, for example, Utility Model 1059902, relating to a "System for lifting roofing by means of multitowers, with the rise of the lifting carriage by means of a hydraulic climbing device", describes one of such systems consisting of lifting towers which are implemented at certain points of the surface to be covered incorporating a lifting carriage and outer guiding columns intended to absorb horizontal stress.

[0006] Said system therefore has the drawback of having to assemble lifting towers as well as perimetrically placing guiding towers prior to the actual lifting of the structure, which means a high cost both in materials and in time used for that purpose.

[0007] In another example of known devices of this type, patent 2092397, relating to an "automatic climbing device for a climbing scaffold", describes a system in which the climbing heads have a rotating control element and a rotating blocking element, which in the path of the control element in the support track provides a control cam and that the control element and the blocking element are coupled to one another such that in direction of the movement the control cam rotates the blocking element by means of the control element such that the blocking element abuts against the blocking cam.

[0008] This system allows the climbing heads to act in two opposite directions of movement, which can become a drawback because it may be unsafe due to any drawback in the movement or blocking of any of the parts or to an unsuitable handling.

[0009] There are also other documents describing systems related to the one at hand, with common elements to those described herein, such as the use of columns or posts of the actual building, such as patent US4832315, and of the upper and lower heads, such as patents FR23712376 and FR2239126 or application PCT WO5054604, which however claim substantially different blocking systems applied to said heads, and the climbing heads of which do not adapt to any type of profile or support of the actual construction in order to use it as a support track.

[0010] In the same way, documents GB949420 and GB667550 describe respective automatic climbing devices of the type at hand, their features being considerably different.

[0011] Specifically, the first case describes a device formed by a hydraulic cylinder and two climbing heads moving forwards over the support track, which can be the own support track of the construction, being able to adapt to different support sizes having a blocking element formed by wedges, and the second case describes a similar device having a blocking element formed by balls or roller which are blocked on the support track, pressed under the action of a spring.

[0012] It must be indicated that with the present invention, the applicant proposed an automatic climbing device for lifting structures and roofing, the technical, structural and constitutive features of which represent an alternative and/or an improvement to that known in this field, and the object of which is to solve the previously indicated drawbacks.

Description of the Invention

[0013] An automatic climbing device for lifting structures and roofing has therefore been designed with the present invention, the main innovation of which consists of allowing the use of the actual posts, metal profiles or supports of the construction or building in question without any special preparation whichever the cross-section they may have.

[0014] It can thus slide over them without needing any additional or prior preparation such as teeth, notches or holes for the purpose of inserting fixing pawls, representing an important advantage due to its easy implementation on site and due to its cost-effectiveness in materials and time.

[0015] Specifically, the device of the invention is basi-

cally formed by a support track, belonging to the actual construction as has been mentioned, to which respective climbing heads, an upper climbing head and another lower climbing head, are coupled, which climbing heads are connected by a hydraulic cylinder.

[0016] The connection between said climbing heads and the mentioned support track is carried out by means of friction force obtained by means of a blocking element which is blocked between the climbing head and the support track.

[0017] This blocking element is one of the innovative and distinctive features of the invention, it can be roller-shaped or wedge-shaped, being pressed towards the blocking under the action of a counterweight and a spring to which it is joined.

[0018] In addition, the climbing heads are unblocked under the action of the hydraulic cylinder connecting them in the direction of forward movement of the system, being blocked in the opposite direction or under the action of the load to be lifted.

[0019] Thus, the operation of the device is as follows:

[0020] During the movement, a climbing head remains fixed, connected to the support track by means of the blocking element which is pressed under the action of the counterweight or of the spring, whereas the other climbing head is automatically unblocked under the action of the hydraulic cylinder which allows the relative movement of said climbing head in relation to the support track; once the run of the climbing head has been carried out, the hydraulic cylinder stops and this climbing head is blocked, the two heads being blocked at the same time by the pressing towards the blocking of the roller or wedge caused by respective counterweights or springs; the return of the cylinder then commences, the other climbing head is therefore automatically unblocked, the blocking element of the latter being released for that purpose and the relative movement of this climbing head in relation to the support track occurs; finally, after the run of the climbing head has been carried out, the hydraulic cylinder stops and both heads are blocked, the entire process being repeated again.

[0021] In addition, the way of fixing the climbing heads to the support track by means of bolts, which allows coupling them, without needing any special preparation, to any type of profile or support, either having a cylindrical or quadrangular cross-section, belonging to the actual building, is also an innovative feature of the invention.

[0022] The device has the particularity of operating in a single direction of movement, which assures to the actual system the safety against falls or unsuitable handling.

[0023] In a second embodiment, the automatic climbing device further allows adapting it to the dimensions of posts or supports of the construction, especially those having a T- or I-shaped cross-section, along the way, at the same time as the installation of the system, thus being able to be adapted to any size that said posts may have, or size variation therein that may occur throughout their length, also avoiding possible bushings, screws or objects that it may have on the other side and that may hinder its passage while climbing, its coupling to posts of said type placed against a wall also being advantageously possible because it is only fixed at one of the sides of the post or support of the construction.

[0024] To that end, the climbing heads have an embodiment variant the coupling of which to the support track occurs only at one of their sides, being configured such that, as mobile clamps or vises, they press the side branches of the T or of the I, slightly varying the arrangement of the remaining elements collaborating in the lifting and blocking movement.

[0025] The blocking element thus takes the form of a double roller which is blocked on the support track and which is also pressed by a counterweight fixed to the head by a central shaft, respective coil springs being located at both ends of the actual shaft which are fixed such as to produce the necessary blocking and return mechanisms for the operation of the device.

[0026] The connection between said climbing heads and the mentioned support track is likewise carried out by friction force obtained by the blocking element which is blocked between the climbing head and the support track.

[0027] In addition, the climbing heads are likewise unblocked under the action of the hydraulic cylinder connecting them in the direction of forward movement of the system, being blocked in the opposite direction or under the action of the load to be lifted.

[0028] Therefore, in this second embodiment of the invention the operation of the device is the same as that described above.

[0029] In addition, the way of fixing the climbing heads to the support track is carried out by means of clamps, which allows coupling them, without needing any special preparation, to any type of T- or I-shaped profile or support belonging to the actual building.

[0030] The new automatic climbing device for lifting structures and roofing therefore represents an innovative structure with structural and constitutive features that were unknown up until now for such purpose, which reasons, in addition to its practical usefulness, provide it with the sufficient grounds for obtaining the exclusiveness privilege sought.

Description of the Drawings

[0031] To complement the description which is being made and with the aim of aiding to better understand the features of the invention, a set of drawings is attached as an integral part thereof, in which the following has been shown with an illustrative and non-limiting character:

Figure 1 shows a side elevational view of the automatic climbing device for lifting structures and roofing according to the invention coupled to a beam having

an I-shaped cross-section belonging to the construction.

Figure 2 shows a plan view of the device shown in Figure 1.

Figures 3 and 4 show respective side elevational and plan views, respectively, of the example shown in Figure 1, showing the configuration and arrangement of the blocking element housed inside each climbing head.

Figures 5-A, 5-B, 5-C and 5-D show respective side elevational views of the different phases of movement of the device.

Figures 6-A, 6-B and 6-C show respective side elevational views of the different phases of lifting a structure by means of the device of the invention.

Figure 7 shows a side elevational view of the automatic climbing device for lifting structures and roofing according to the invention coupled to an I-shaped beam belonging to the construction, in which the embodiment variant of the heads which are fitted at only one of their sides has been shown.

Figure 8 shows a plan view of the device shown in Figure 7.

Figures 9 and 10 show respective side elevational and plan views, respectively, of the example shown in Figure 7 showing the configuration and arrangement of the blocking element housed inside each climbing head.

Figure 11 shows a plan view of the device shown in Figure 7, in which the different dimensions that the support track, i.e. the post or support of the actual construction, can adopt have been shown, it being observed how the new configuration of the heads allows adapting them to any of such dimensions.

Preferred Embodiment of the Invention

[0032] In view of the mentioned figures and according to the adopted numbers, a preferred embodiment of the automatic climbing device for lifting structures and roofing comprising the parts that are indicated and described in detail below can be observed in such figures.

[0033] As observed in Figures 1 and 2, the device of the invention is thus formed by respective climbing heads, an upper climbing head (1) and another lower climbing head (2), which are coupled by means of bolts (3) to the support track (4), which already forms part of the actual construction and which in the example shown is a beam having an 1-shaped cross-section, being able to be adapted to any other type of profile.

[0034] Said climbing heads (1) and (2) are arranged at a certain distance from one another, connected by means of a hydraulic cylinder (5), the upper climbing head (1) supporting the weight of the load (6) or structure to be lifted, and have one blocking element (9) per climbing head.

[0035] This innovative blocking element (9) which can take the form of a roller, such as in the example shown, or of a wedge, and which is blocked on the support track (4) pressed under the action of a counterweight (7) fixed to the climbing head (1) and (2) by a central shaft (8), and fixed to the climbing head (1) and (2) by means of a coil spring (10) at the opposite end such as to produce the necessary blocking mechanism for the operation of the device (Figures 3 and 4).

[0036] Thus, as observed in Figures 5-A to 5-D, to cause the movement, the lower climbing head (2) remains fixed, connected to the support track(4) by means of the blocking element (9), which is continuously pushed towards the blocking under the action of the counterweight (7) or of the spring (10), whereas the upper climbing head (1) is automatically unblocked under the action of the hydraulic cylinder (5), which allows the relative movement of said upper climbing head (1) in relation to the support track (4) and therefore the upward movement of the load (6).

[0037] Once the run of the upper climbing head (1) has been carried out, the hydraulic cylinder (5) stops, actuating the blocking element (9) of this upper climbing head (1), the two climbing heads (1) and (2) being blocked at the same time, respectively pressed towards the blocking by the corresponding counterweights (7) and springs (10).

[0038] The return of the cylinder then commences, the lower climbing head (2) is therefore automatically unblocked, the blocking element (9) of the latter being released for that purpose and the relative movement of this lower climbing head (2), i.e. its rise in relation to the support track (4) occurs.

[0039] After the run of the lower climbing head (2) has been carried out, the hydraulic cylinder (5) stops and both heads are blocked, the entire process being repeated again for the following step.

[0040] The load (6) or structure is thus slowly lifted after the device has carried out, by means of the movement of the climbing heads (1) and (2), each of the described steps until reaching its final position.

[0041] As observed in Figures 7, 8, 9, 10 and 11, in a second embodiment the device of the invention is formed by respective climbing heads, an upper climbing head (1) and a lower climbing head (2), arranged at a certain distance from one another, connected by means of a hydraulic cylinder (5), the upper climbing head (1) supporting the weight of the load (6) or structure to be lifted, and which have a blocking element (9) per climbing head.

[0042] In the preferred form, said climbing heads (1) and (2), are configured such that they cover the side branches of the T or of the I in the example shown, such that they are coupled by means of respective mobile clamps (11) to the side branches of the support track (4) having an I-shaped cross-section, being fixed at only one of their sides, the opposite side being free, which allows adapting them to any dimension of said track (4).

[0043] The blocking element (9) in turn takes the form of a double roller which is blocked on the support track (4) and which is also pressed by a counterweight (7) fixed

to the head by a central shaft (8), respective coil springs (10) being located at both ends of the actual shaft (8) which are fixed such as to produce the necessary blocking and return mechanisms for the operation of the device.

[0044] The connection between said climbing heads (1) and (2) and the mentioned support track (4) is likewise carried out by means of the friction force obtained by the blocking element (9) which is blocked between them and the support track (4).

[0045] The movement thus occurs in the same manner as that described above.

[0046] Having sufficiently described the nature of the present invention, as well as a way of putting it into practice, it is stated that, within its essence, it can be put into practice in other embodiments that differ in detail from that indicated by way of example, and such embodiments will also be under the protection claimed provided that its essential principle is not altered, changed or modified.

Claims

1. An automatic climbing device for lifting structures and roofing, with at least one linear drive formed by a hydraulic cylinder (5) and at least two climbing heads (1) and (2) which can obtain a relative movement of the heads in relation to the support track (4) in the direction of the track, wherein the support track (4) is formed by the actual posts or supports of the construction in question, intended to lift structures and roofing previously built at a lower level, **characterized by** the fact that the climbing heads (1) and (2) have a blocking element (9) which is automatically blocked on the support track (4) and the climbing head (1) and (2), pressed continuously under the action of the counterweight (7) or spring (10).

2. An automatic climbing device for lifting structures and roofing according to claim 1, **characterized by** the fact that the roller (9) is blocked on the support track (4) and the climbing heads (1) and (2), carrying out the necessary friction force to cause the blocking.

3. An automatic climbing device for lifting structures and roofing according to claims 1 and 2, **characterized by** the fact that the blocking element (9) can be in the form of a roller or wedge.

4. An automatic climbing device for lifting structures and roofing according to claims 1 to 3, **characterized by** the fact that the climbing heads (1) and (2) have attachment elements by means of bolts (3) suitable for being joined to any type of profile adopted by the support track (4).

5. An automatic climbing device for lifting structures and roofing according to claims 1 to 4, **characterized by** the fact that the climbing heads (1) and (2) are unblocked under the action of the hydraulic cylinder in the direction of forward movement of the system, being blocked in the opposite direction or under the action of the load to be lifted.

6. An automatic climbing device for lifting structures and roofing according to claims 1, to 5, **characterized by** the fact that the climbing heads (1) and (2) are configured such that they can be adapted to the dimensions of posts or supports (4) of any size, having a T- or I-shaped cross-section, since they are secured covering the side branches of the T or of the I, such that they are coupled by means of respective mobile clamps (11) to the side branches of the support track (4) having an I-shaped cross-section, being fixed at only one of their sides, the opposite side being free.

7. An automatic climbing device for lifting structures and roofing according to claims 1 to 6, **characterized by** the fact that the blocking element (9) takes the form of a double roller which is blocked on the support track (4) and which is pressed by the counterweight (7) fixed to the head by a central shaft (8), respective coil springs (10) being located at both ends of the actual shaft (8) which are fixed such as to produce the necessary blocking and return mechanisms for the operation of the device.

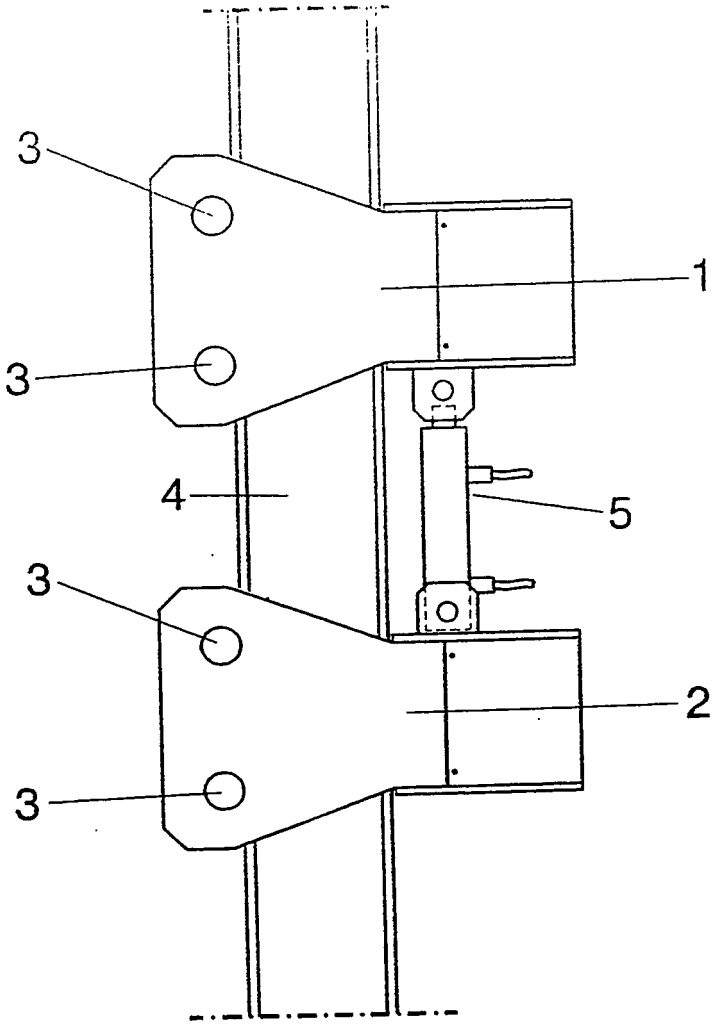


FIG. 1

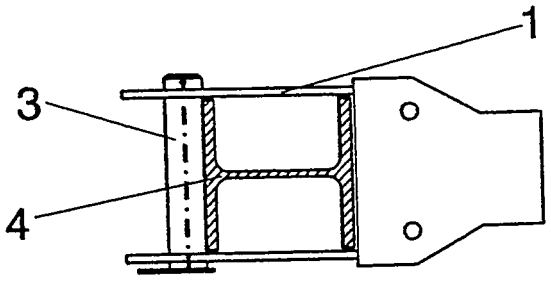


FIG. 2

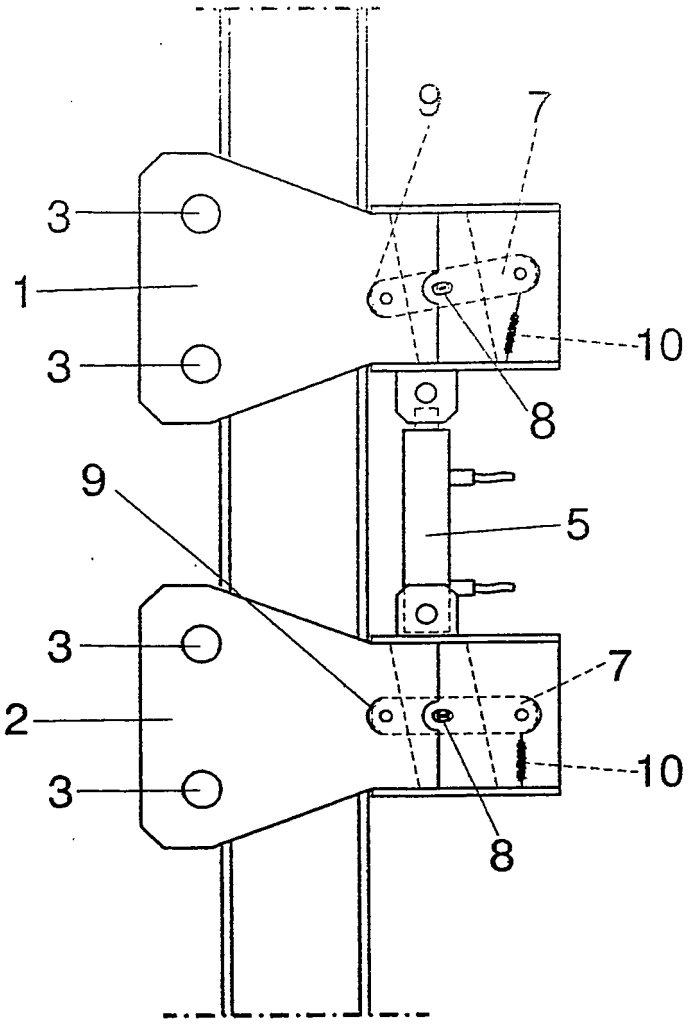


FIG. 3

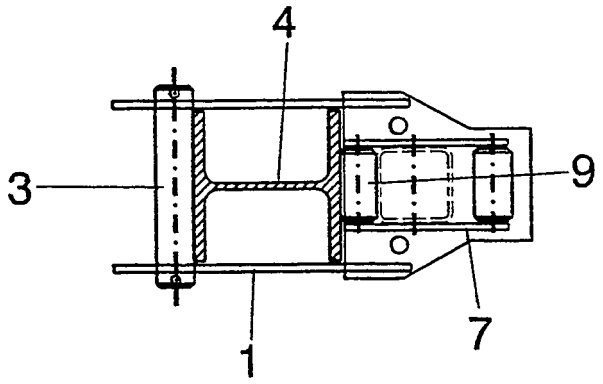


FIG. 4

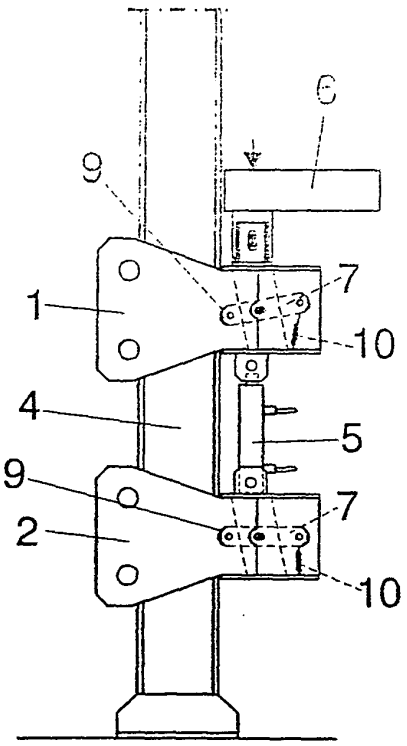


FIG. 5A

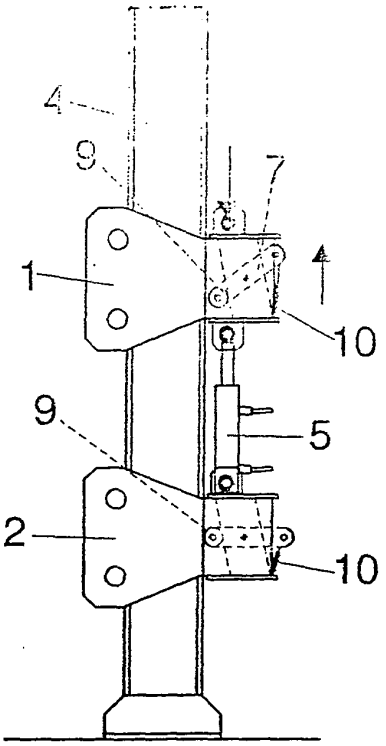


FIG. 5B

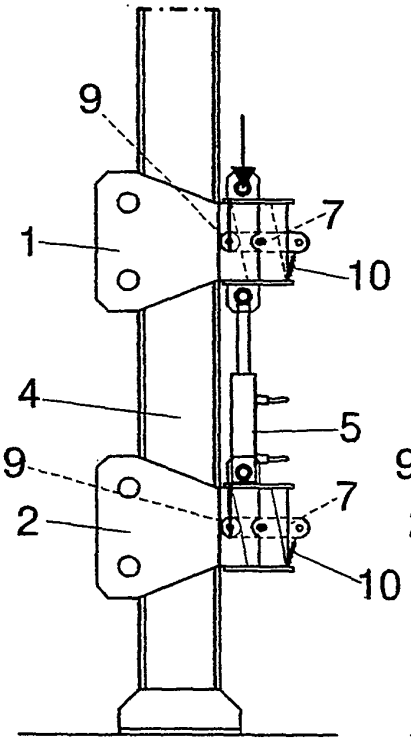


FIG. 5C

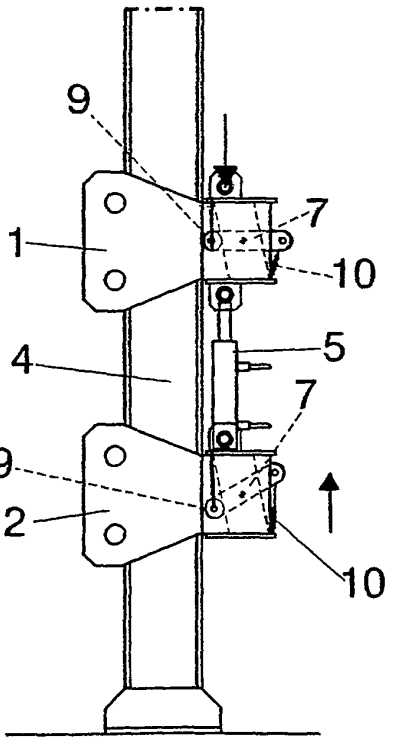


FIG. 5D

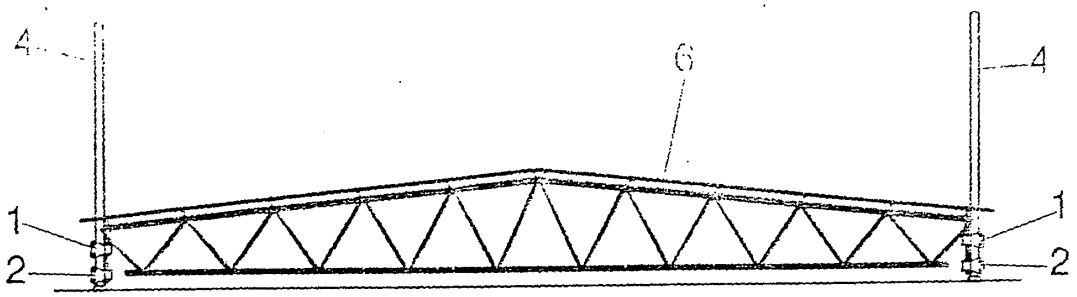


FIG. 6A

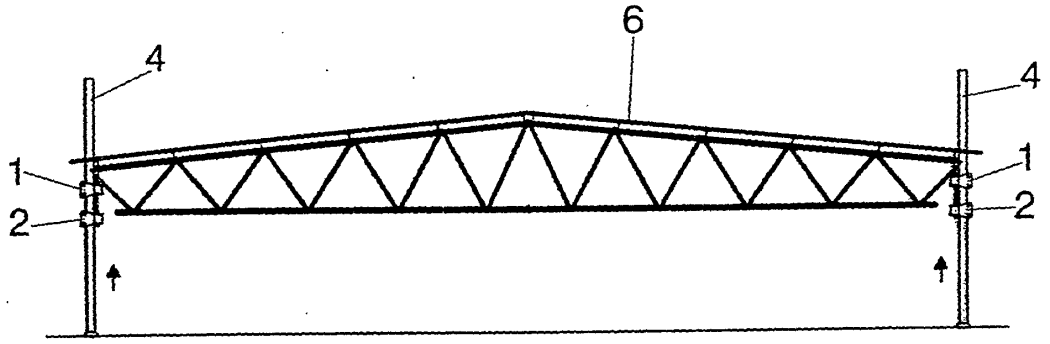


FIG. 6B

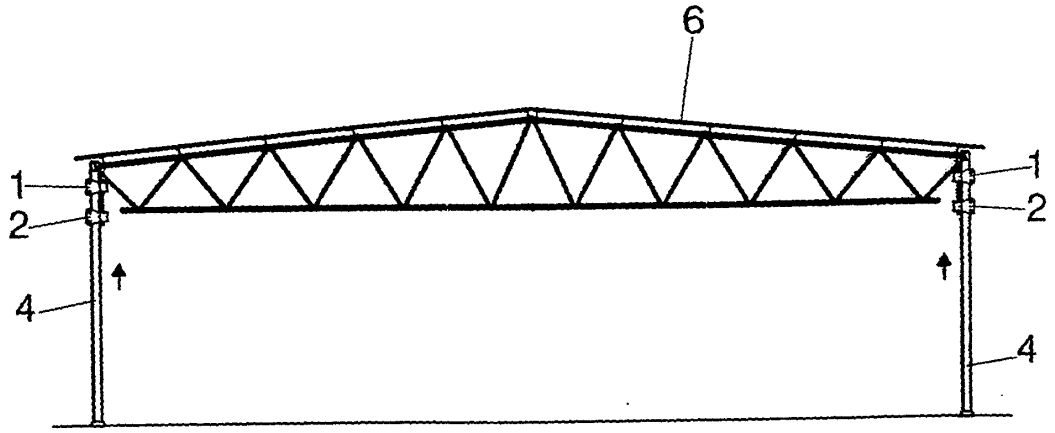


FIG. 6C

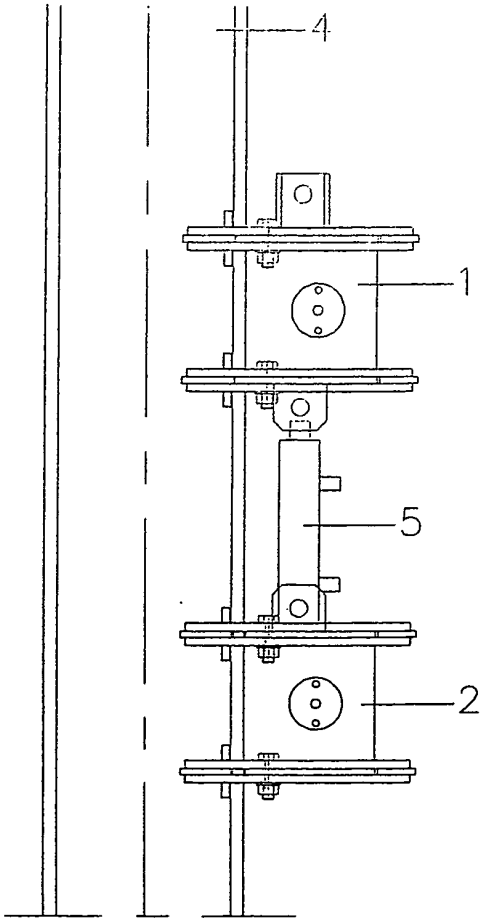


FIG.7

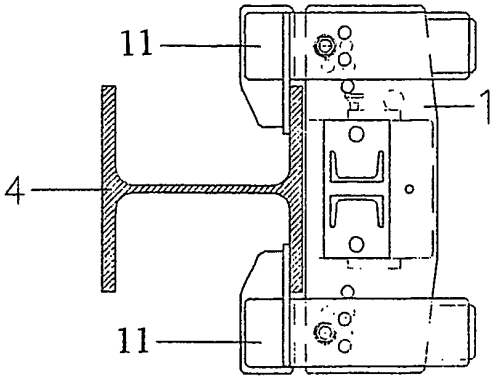


FIG.8

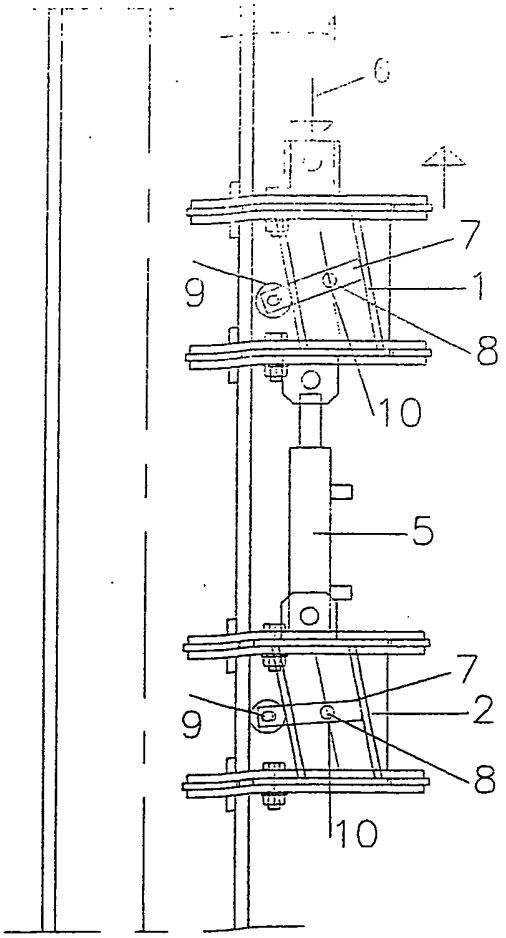


FIG.9

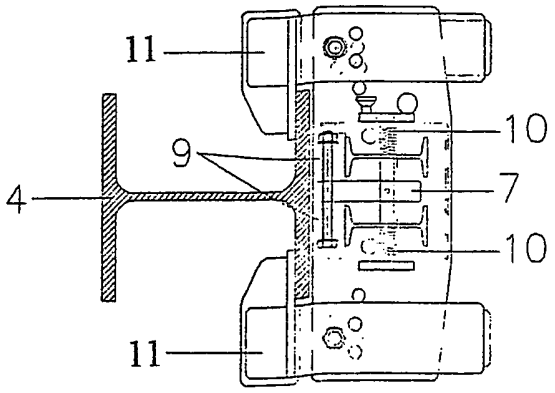


FIG.10

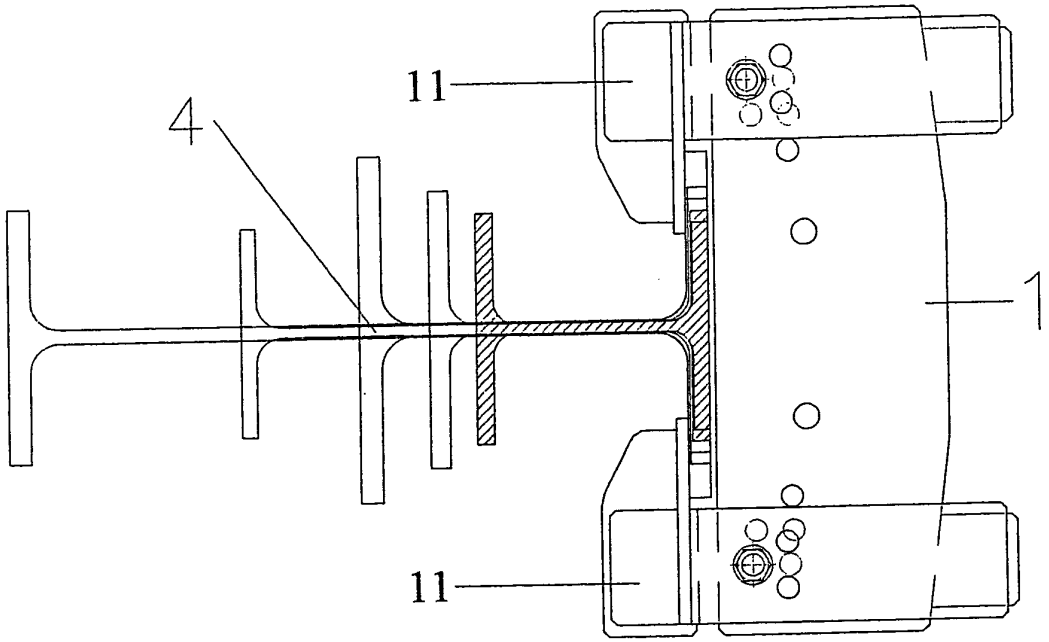


FIG.11

INTERNATIONAL SEARCH REPORT

International application No.
PCT/ ES 2006/000582

A. CLASSIFICATION OF SUBJECT MATTER

see extra sheet
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
E04G+, E02B+

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CIBEPAT,EPODOC,WPI

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	GB 949420 A (BYGGFORBATTRING AB) 12.02.1964, page 2, line 7 - page 4, line 121; abstract; figures.	1-6
Y	GB 667550 A (NILS EINAR WIKSTROEM) 05.03.1952, page 1, line 67 - page 2, line 98; abstract; figures.	1-6
A	US 5918860 A (CHO CHANG-SHENG) 06.07.1999; the whole document.	1-7
A	JP 60043572 A (FUJITA CORP) 08.03.1985, the whole document.	1-7

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
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Date of the actual completion of the international search	Date of mailing of the international search report
01 March 2007 (01.03.2007)	(19-03-2007)
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CLASSIFICATION OF SUBJECT MATTER

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