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(54) **Movable step**

(57) Movable step comprising a rocking structure formed by a base (2) and a front (2'), the rocking of the movable step assembly being performed by means of at least one electromechanical linear actuator (8) for positioning the movable step from a position in which the movable step base is horizontally arranged, to a ramp tilted position, and vice versa.

In a preferred embodiment of the invention, the movable step comprises at least two "L"-shaped profiles, a bottom with at least one cross-beam and at least one roller guide located at the lower end of the front so that the at least one roller guide slides along at least one cross-beam when the moveable step moves from its horizontal position to its tilted position, and vice versa.

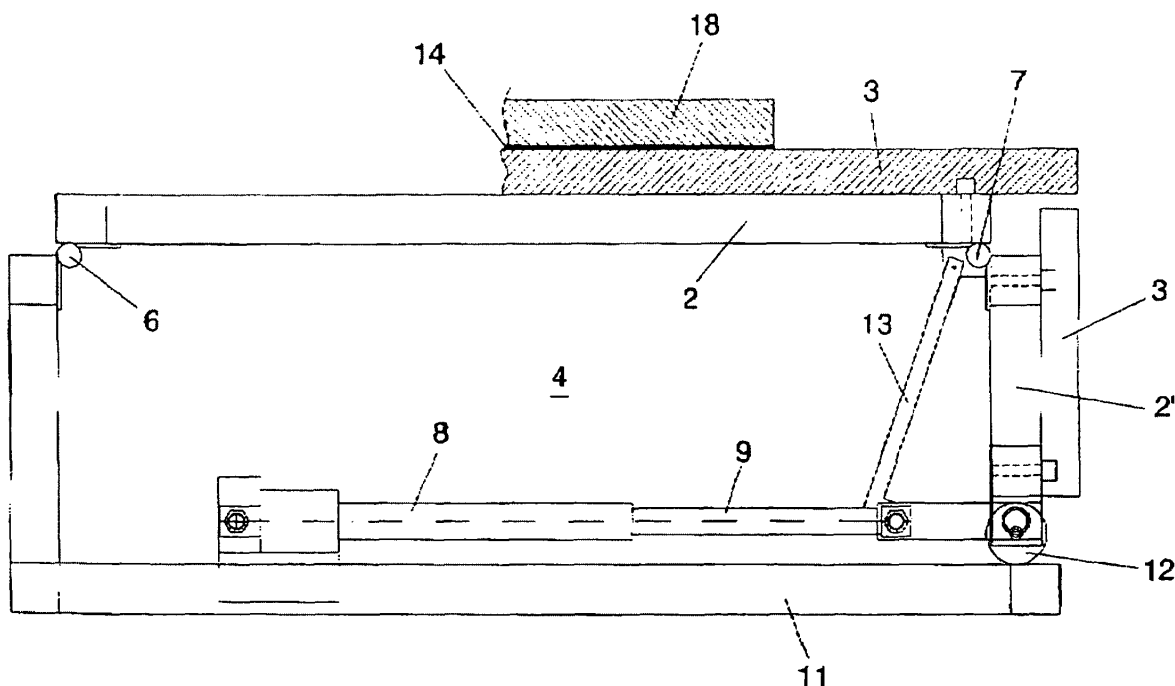


FIG. 7

Description

OBJECT OF THE INVENTION

[0001] The present invention, as this specification states in its title, relates to a movable step, which has been conceived and made in order to be capable to form a ramp or slope for allowing the entry of those people who ride a wheelchair.

[0002] The object of the invention consists of being able to eliminate at certain moments the architectural barrier imposed by the steps for those people with reduced mobility who often use a wheelchair for moving.

BACKGROUND OF THE INVENTION

[0003] As it is known, there are people with reduced mobility and/or certain physical handicap who require a wheelchair for moving, these allowing said people being able to move from one place to another.

[0004] However, although this intends to partly solve certain architectural barriers that undoubtedly exists both on the street and at the entrances to buildings, etc., however on many occasions the architectural barrier can not be overcome because there are still many shortcomings to be resolved, as is the case of many steps that have not been complemented with alternative means for allowing the entry of people who ride a wheelchair.

DESCRIPTION OF THE INVENTION

[0005] The step object of the invention has been conceived with the aim of solving the problem previously set forth.

[0006] In this regard, the movable step in question has the distinction of being movable, being capable of pivoting and hinging on two pins, one anterior with no displacement and other posterior for allowing such step to take, from its usually used horizontal position, a tilted position, and forms a ramp to enable a wheelchair covering the height difference established between two consecutive steps or, either between a lower floor level and an upper floor level, height difference of which is precisely established by one step.

[0007] In this regard, the movable step of the invention is made up from a suitable structure that may be made of metal, and which will be suitably coated, for example, with ceramic, wood, marble or the like, thus forming the corresponding stepped surface and the movable step front.

[0008] That structure is hinged on two hinge pins with bearings; one posterior that will remain with no displacement and other anterior that will be able to upwardly/downwardly move, in order to locate the assembly of said movable step structure in a horizontal position or tilted position by forming a ramp. In a preferred embodiment, the hinges will be made by using threaded rods.

[0009] The actuation for performing pivoting or hinging

movements may be performed by using an electromechanical linear actuator, such as a hydraulic or pneumatic cylinder, which can be remotely actuated.

[0010] Said linear actuator is concealed under the movable step itself, a single actuator being enough for small length steps, while for the longest movable steps, two, three or more driving actuators, mounted parallel to each other with suitable spacing between them will be necessary to ensure an even and safety movement of the corresponding movable step.

[0011] In an embodiment, the linear actuator or actuators are located into a greater gap made for this purpose in the floor, i.e. below the floor plane, while in other occasions the linear actuator or actuators will be above the upper floor level, beneath the step itself, in which case a smaller hole is made in said floor for allowing the movable step to rock.

[0012] In a preferred embodiment of the invention, the movable step has the base, the front and at least two "L"-shaped profiles. The "L"-shaped profiles are placed so that one of their ends is joined to the rear part of the base and the other end is facing the lower part of the front. Thanks to these at least two "L"-shaped profiles, the movable step structure is side opened. The bottom of the movable step is defined by a frame with cross-beams. Other characteristic of this embodiment is that there are some roller guides located at the lower part of the front, which serve to move the front, and thus the movable step can be moved to its tilted position. The roller guides slide along the cross-beams of the movable step bottom that act as guides for said roller guides. The base and front can have holes for mechanically fixing the coating.

[0013] This preferred embodiment has the advantage of reducing the weight of the movable step. Moreover, because the movable step is side opened, the mounting of the actuating elements used for moving the movable step from its horizontal position to its tilted position, and vice versa is facilitated. Another added advantage is that it facilitates screwing the coating to the base and front. The most important advantage provided by this embodiment is to improve the movements and strength of the movable step.

[0014] In an even further preferred embodiment, the actuating element is connected to at least one additional doubly hinged flat bar. This at least one additional flat bar pulls the base down when lowering the step.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] In order to complement the description that is now made and with the object of helping to a better understanding of the characteristics of the invention, a set of drawings on which basis the innovations and advantages of the movable step object of the invention will be more easily understood, is attached to the present specification.

Figure 1. - Shows a schematic side view of an em-

bodiment of the movable step of the invention wherein the actuator or actuators are located into a greater gap in the floor, in horizontal position.

Figure 2. - Shows a schematic side view of another embodiment wherein the actuator is located above a smaller gap provided in the floor for allowing the movable step to rock.

Figure 3. - Shows a schematic side view of the same movable step as the previous figure, occupying a certain position to form a ramp and allowing the entry or displacement by rolling of a wheelchair between levels separated by the movable step.

Figure 4. - Shows a plan view of a larger step with three linear driving actuators.

Figure 5. - Shows a perspective view of a preferred embodiment of the invention in which the movable step is in its horizontal position, and the base and front are shown without the coating.

Figure 6. - Shows a perspective view of the preferred embodiment shown in figure 5 but with a coating on the base and on the front.

Figure 7. - Shows a schematic side view of the movable step of the embodiment shown in figure 5.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[0016] As can be seen from the referred figures, the movable step 1 of the invention is made up from a structure made, for example, of metal formed by a base 2 and a front 2', which will be complemented with a coating 3 that may be ceramic, wood, marble or the like, both at the top for forming the stepping surface, and at the front corresponding with the height of the movable step 1 itself.

[0017] Under such movable step 1 there is an inner space 4 for locating an electromechanical linear actuator 8 (first embodiment), a greater gap 5 further existing under such movable step 1 made in the floor for locating the electromechanical linear actuator 8 in a second embodiment that will be discussed later.

[0018] In the first embodiment shown in figures 2 and 3 a smaller gap 5' also made in the floor for allowing the movement of the base 2 and front 2' of the movable step 1 assembly from the horizontal position of that base 2 to a ramp tilted position thereof has been provided, wherein the front 2' is also located in a tilted position below such base 2, the movable step 1 assembly forming a ramp as shown in figure 3.

[0019] In any case, the base 2 of the movable step 1 comprises two hinge pins with bearings; one posterior 6 and other anterior 7, so that by using the electromechanical linear actuator 8, such as it can be a hydraulic or pneumatic cylinder, as depicted in figures, opportune movements that make the movable step 1 may move, from the horizontal position of its base 2 represented in figures 1 and 2, to the ramp tilted position shown in figure 3 are performed, wherein the front 2' of the movable step 1 also moves from the vertical position to the tilted position below the base 2. As can also be seen, the stem 9

of the cylinder corresponding to the electromechanical linear actuator 8 is connected to the lower part of the front 2' of the step 1 through a short front hinge pin 10.

[0020] Therefore, and as can be seen in the figures, from the horizontal position of the base 2 of the movable step 1 shown in figures 1 and 2, if the electromechanical linear actuator 8 is actuated, the retraction of its stem 9 will result in the traction of the front 2' lower part of the step 1 structure and thus lowering and rocking thereof, until reaching a tilted position of such step 1 structure, by rocking on the posterior hinge pin 6. This tilted position of the step 1 establishes the formation of a ramp for allowing the entry or displacement by rolling of a wheelchair, which enables the unimpeded mobility for those physically handicapped people who use wheelchairs for moving.

[0021] Finally it should be mentioned that for the case of longest movable steps 1, as shown in figure 4, several electromechanical linear actuators 8 mounted parallel to each other will be placed in order to obtain a correct step retraction.

[0022] In a preferred embodiment shown in figure 5, the movable step 1 has a base 2, a front 2' and at least two "L"-shaped profiles 11. The "L"-shaped profiles are placed so that one of their ends is joined to the rear part of the base 2 and the other end is facing the lower part of the front 2'. Thanks to these at least two "L"-shaped profiles, the movable step structure is side opened. The bottom of the movable step is defined by a frame 16 with at least one cross-beam 17. Another characteristic of this embodiment is that there are some roller guides 12 located at the lower part of the front 2', which serves to move the front 2' and thus the movable step 1 can be moved to its tilted position. The at least one roller guide 12 slides along the at least one cross-beam 17 of the movable step 1 bottom, the at least one cross-beam 17 acting as guide for the at least one roller guide 12.

[0023] The base 2 and front 2' are frames and have holes 15 to mechanically fix the coating 3. In figure 6 the movable step is shown with a coating 3 on the base 2 and a coating 3 on the front 2'.

[0024] In an embodiment of the invention, a coating 3 is used, which is fixed through mechanical means to the base 2, and onto this coating 3 a second coating 18 is placed. Both coatings are fixing together by an adhesive layer 14. This is shown in figure 7.

[0025] In one embodiment of the invention shown in figure 7, the electromechanical linear actuator 8 is a cylinder having a stem 9. This stem 9 has its end hingely joined to at least one flat bar 13 having its other end hingely joined to the base 2 and to the front 2'.

Claims

1. MOVABLE STEP intended for being applied in those steps that constitutes architectural barriers for people with reduced mobility and who usually ride wheelchairs, **characterized in that** it comprises a rocking

structure formed by a base (2) and a front (2'), so that the base is rotatably coupled by its rear edge to a posterior hinge pin (6) with no displacement, while the front edge of that same base (2) is rotatably coupled to the front (2') of the movable step (1) through an anterior hinge pin (7), the rocking of the movable step (1) assembly being performed by means of at least one electromechanical linear actuator (8) for positioning the movable step from a position in which the base (2) of the movable step (1) is horizontally arranged, to a ramp tilted position and vice versa, the electromechanical linear actuator (8) being located under the structure of the movable step (1).

2. MOVABLE STEP, according to claim 1, **characterized in that** the electromechanical linear actuator (8) comprises a hydraulic or pneumatic cylinder, stem (9) of which is connected to the lower part of the front (2') of the movable step (1) through a short front hinge pin (10). 15 20
3. MOVABLE STEP, according to the preceding claims, **characterized in that** it has been provided an inner space (4) under the movable step (1) and a greater gap (5) in the floor for locating the electro- 25 mechanical linear actuator (8) and allowing the base (2) and front (2') of the movable step (1) structure to rock.
4. MOVABLE STEP, according to claims 1 and 2, **characterized in that** it has been provided an inner space (4) under the movable step (1) and a smaller gap (5) in the floor for enabling the rocking of the step (1) itself, the electromechanical linear actuator (8) being leveled with the very floor above thereof. 30 35
5. MOVABLE STEP, according to claim 1, **characterized in that** it comprises at least two "L"-shaped profiles (11), a bottom (16) with at least one cross-beam (17) and at least one roller guide (12) located at the lower end of the front (2'). 40
6. MOVABLE STEP, according to claim 5, **characterized in that**, by being the electromechanical linear actuator (8) a hydraulic or pneumatic cylinder, it comprises at least a flat bar (13) that is hingely joined through one of its end to a stem (9) of the electro- 45 mechanical linear actuator (8), and hingely joined to the base (2) and front (2') through its other end. 50
7. MOVABLE STEP, according to any one of the preceding claims, **characterized in that** the base (2) and front (2') of the movable step (1) are provided with a coating (3) that may be ceramic, marble, wood or the like. 55
8. MOVABLE STEP, according to claim 7, **characterized in that**, the coating (3) is mechanically fixed to

the base (2) and front (2') through holes (15) made in the base (2) and front (2').

9. MOVABLE STEP, according to any one of claims 7 and 8, **characterized in that** a second coating (8) is fixed to the coating (3) by applying an adhesive layer (14).
10. MOVABLE STEP, according to the preceding claims, **characterized in that** the longest movable steps (1), comprises several electromechanical linear actuators (8) for allowing the correct step retraction.

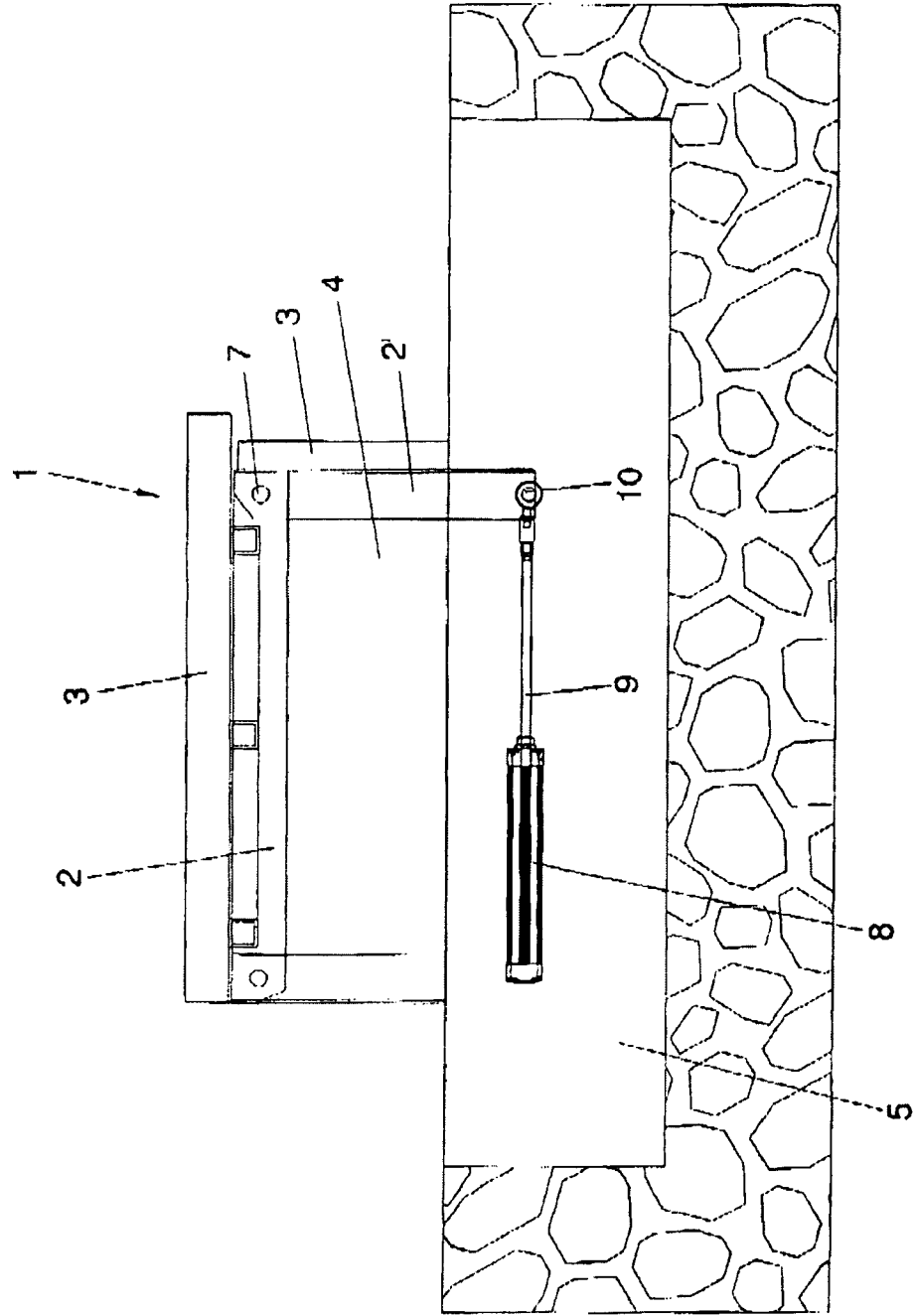


FIG. 1

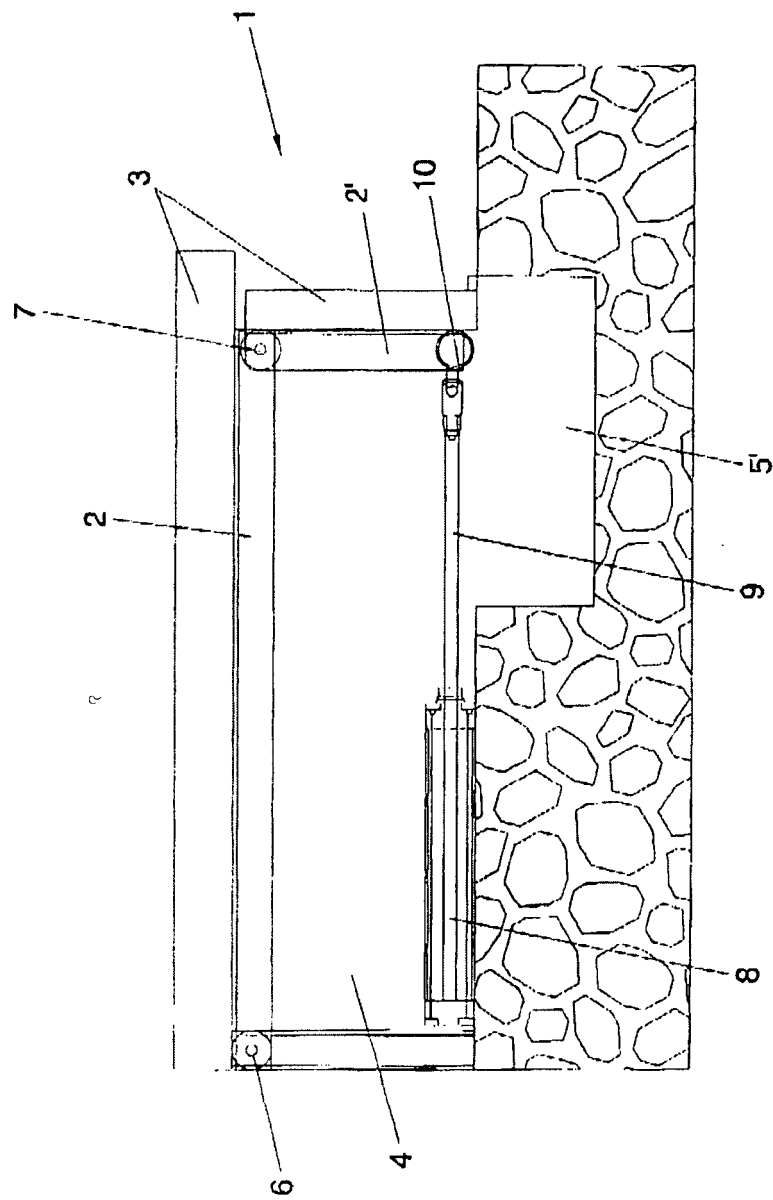


FIG. 2

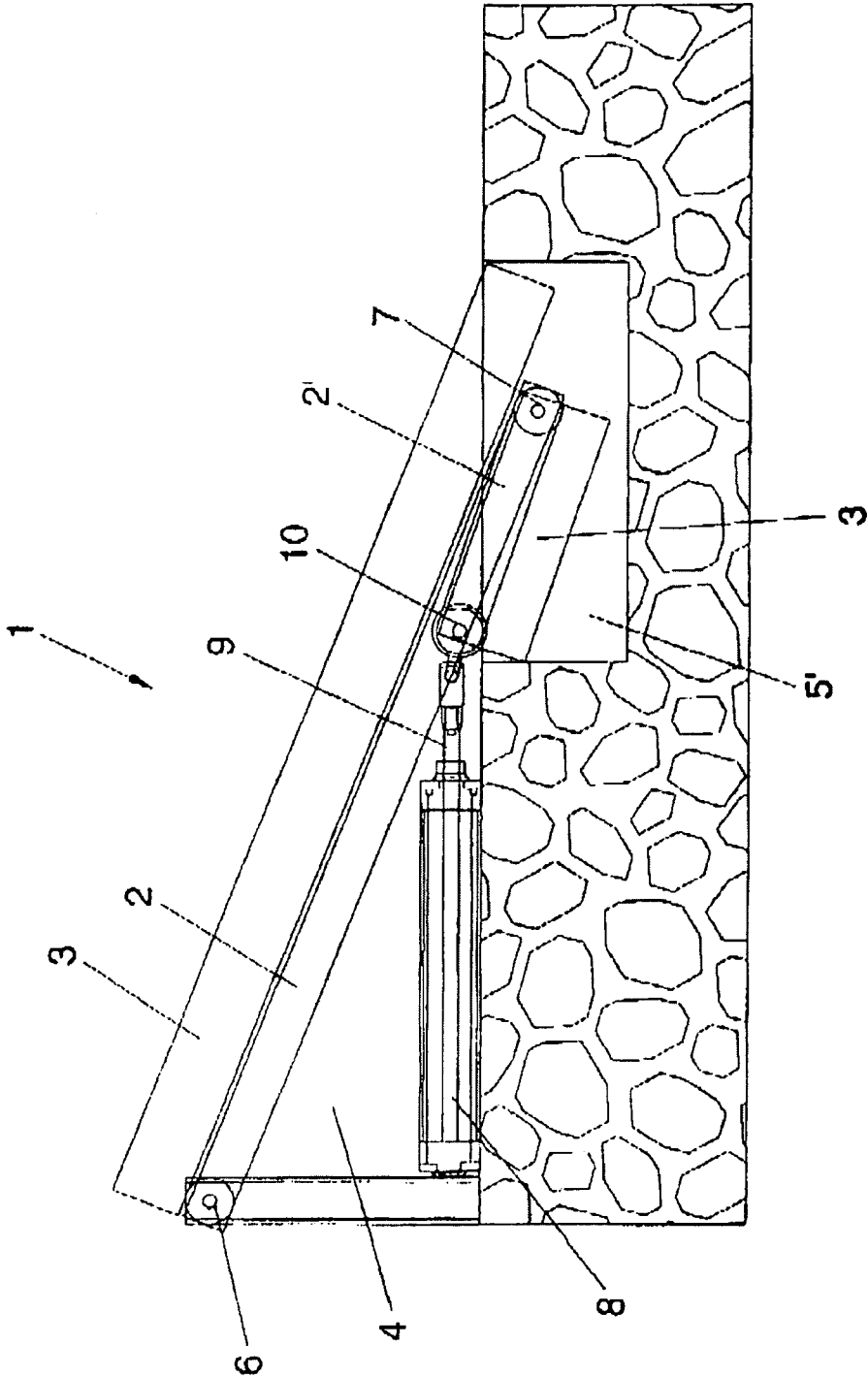


FIG. 3

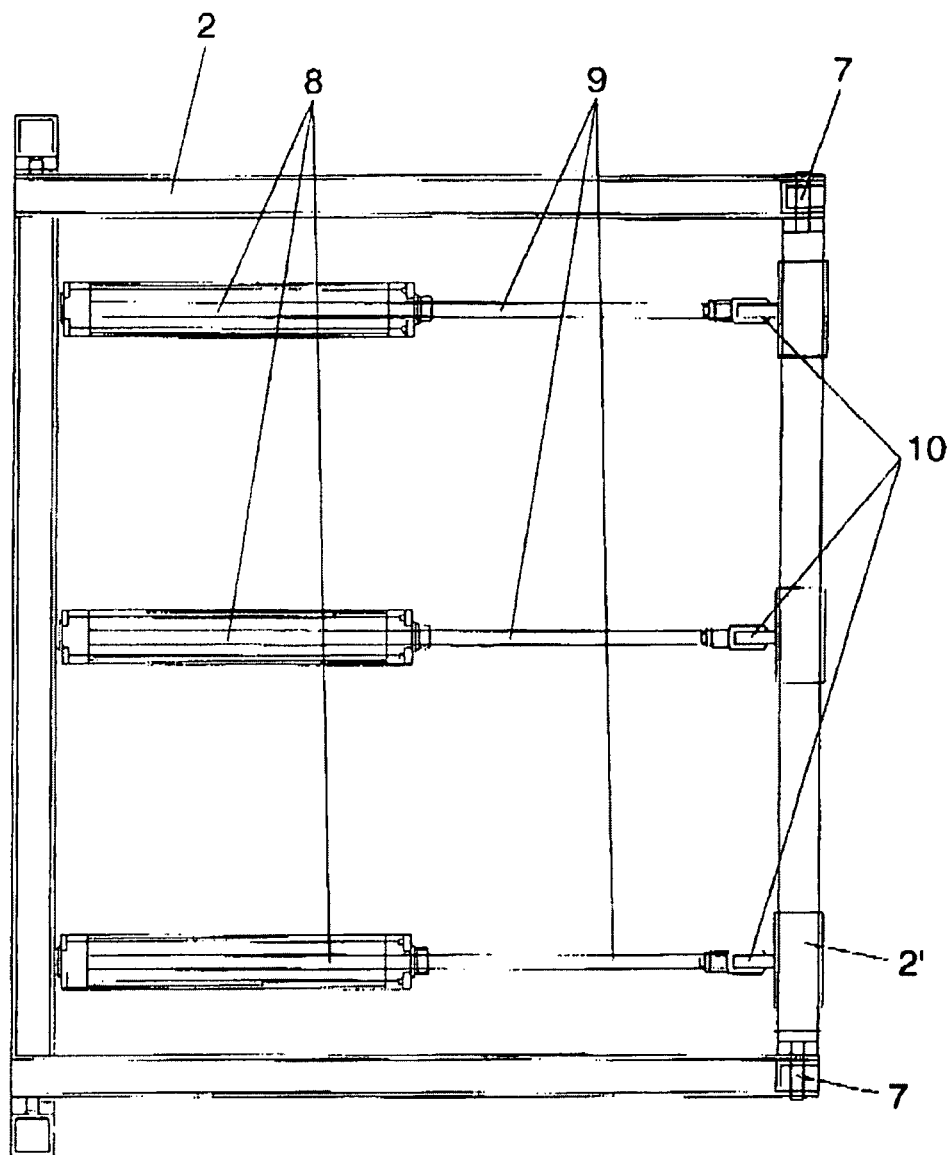


FIG. 4

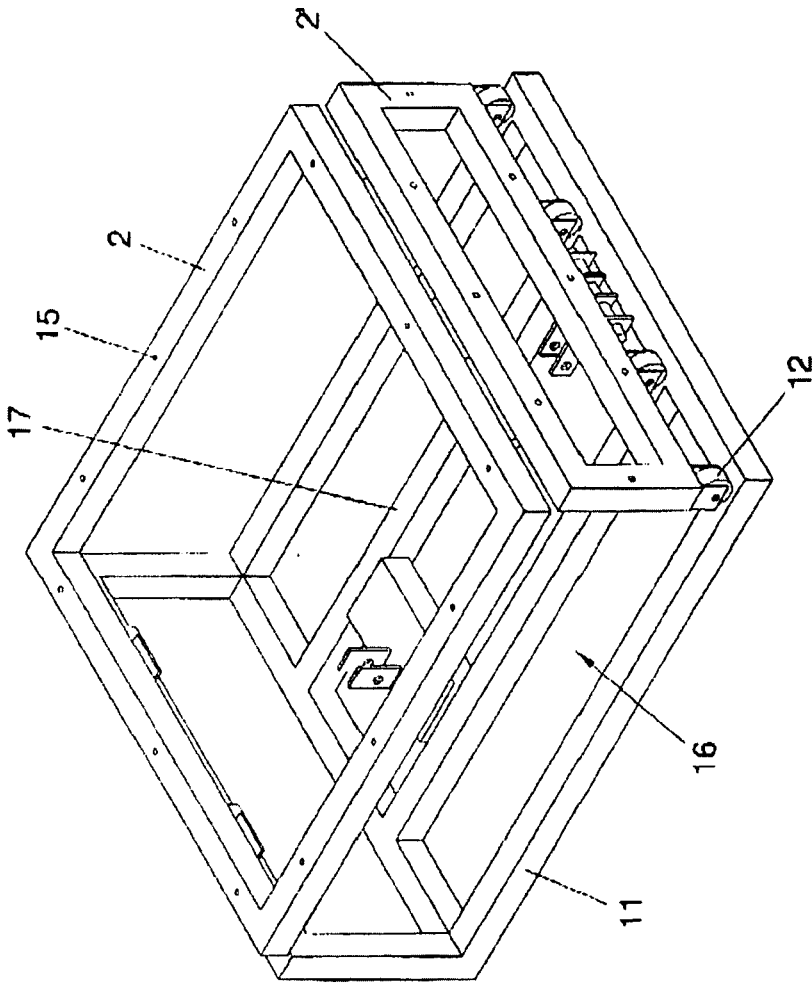
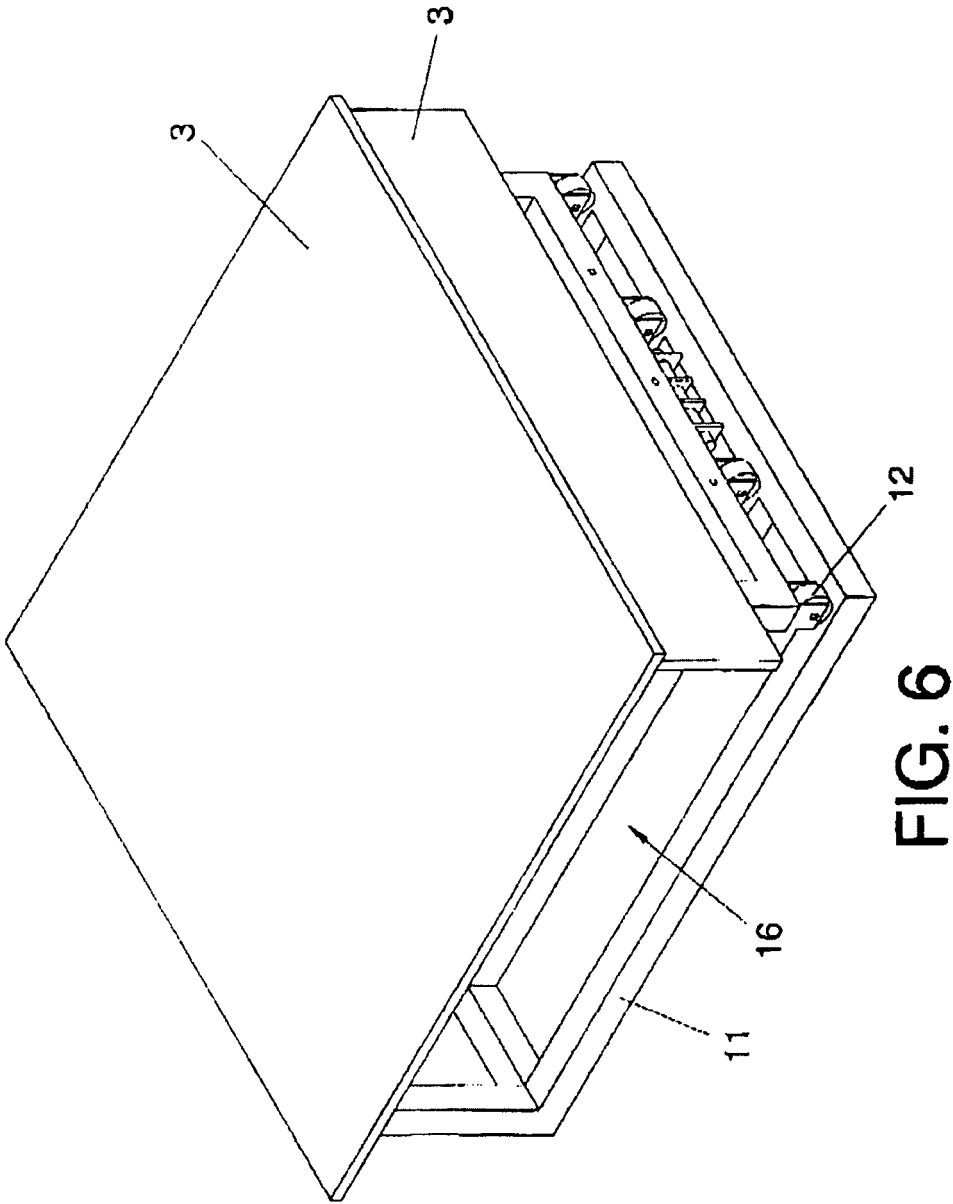


FIG. 5



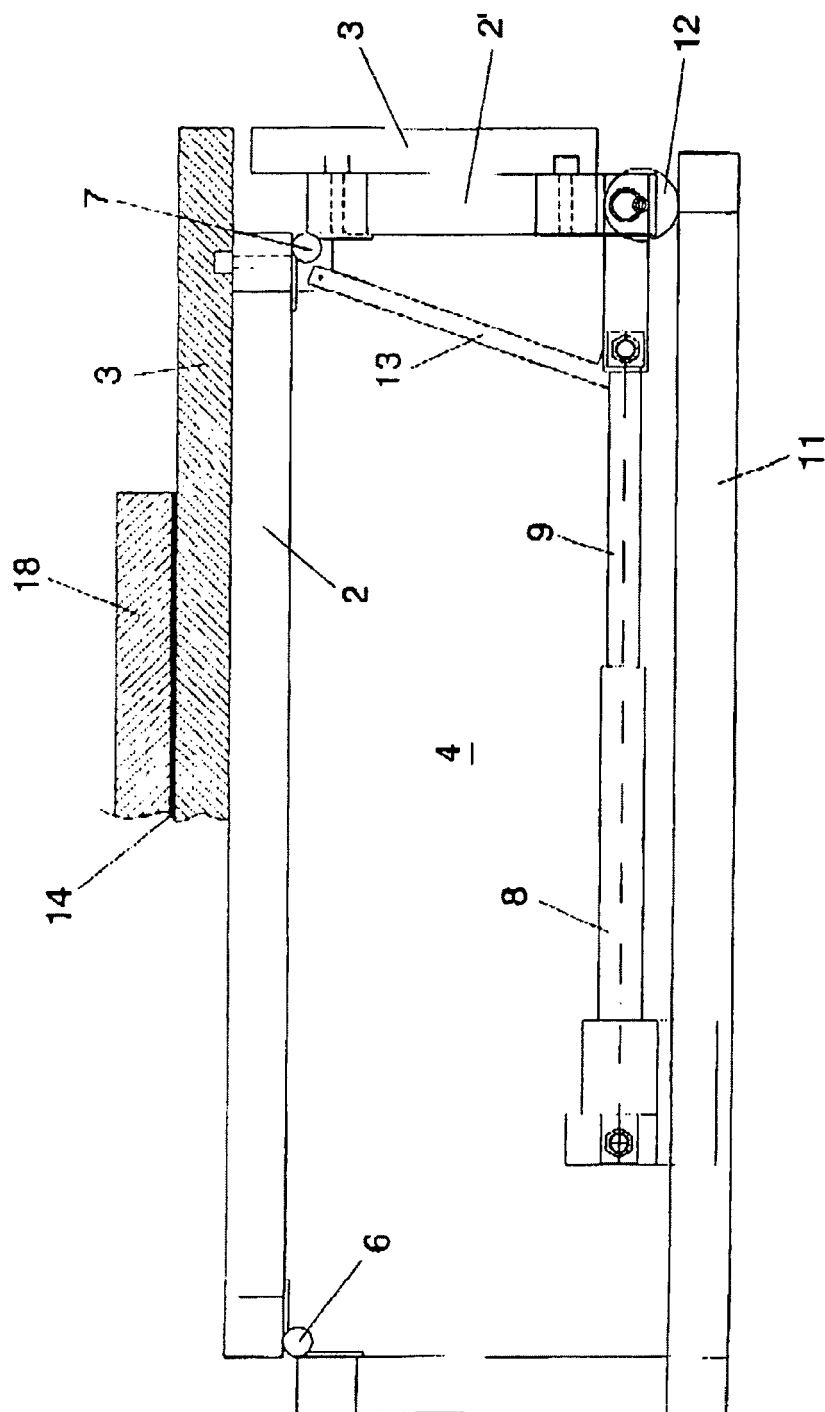


FIG. 7



EUROPEAN SEARCH REPORT

Application Number
EP 10 38 0138

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 7 010 825 B1 (FINCH SALAS BARBARA KAYE [US] ET AL) 14 March 2006 (2006-03-14) * abstract; figures 1,6,7 * -----	1-10	INV. B66B9/08
A	GB 2 387 869 A (STADDON FRANK GRAHAM [GB]) 29 October 2003 (2003-10-29) * abstract * -----	1-10	
			TECHNICAL FIELDS SEARCHED (IPC)
			B66B E04F A61G B65G
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 15 March 2011	Examiner Janssens, Gerd
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 10 38 0138

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The members are as contained in the European Patent Office EDP file on
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15-03-2011

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 7010825	B1	14-03-2006	NONE

GB 2387869	A	29-10-2003	NONE
