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(54) **Angle compensator device for lifting platforms**

(57) An inclination compensator device for lifting platforms comprises: an anchoring portion (2), which can be stably connected to a fixed structure; a supporting portion (3), connected to the anchoring portion (2) and able to move relative to it so as to adopt a plurality of different operating positions. The supporting portion (3) can be operatively connected to a portion of the lifting platform (100) to form an adjustable support for the portion of the lifting platform (100). The device (1) also comprises locking means (11), acting between the supporting portion (3) and the anchoring portion (2) to stably hold them in a plurality of different positions relative to each other.

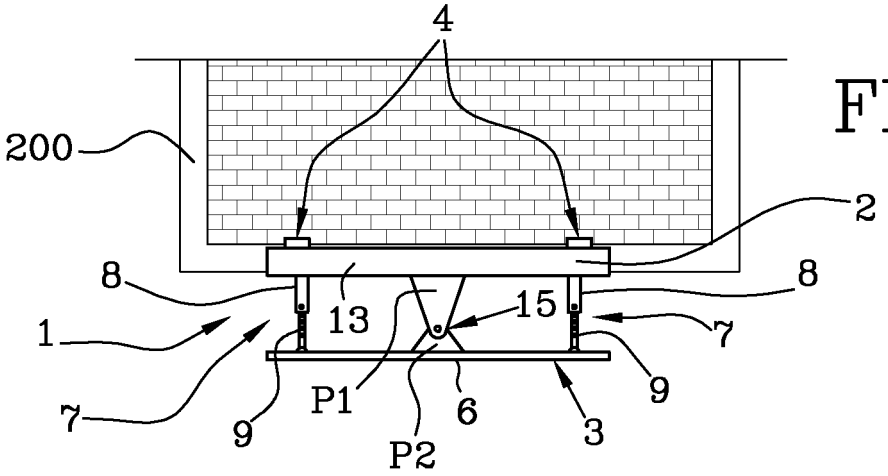

FIG 2a

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Description

[0001] The present invention relates to an inclination compensator device for lifting platforms, in particular for platforms for lifting goods, such as platforms used for removals or for maintaining structures which are a long way from the ground.

[0002] It is know that prior art lifting platforms comprise a generally extendable element, in particular a ramp, which slidably supports a carriage having a support or deck designed to support a predetermined quantity of material or goods. During operation, the carriage acts as a shuttle between a level close to the ground, for example a pavement, and a level high above the ground, for example a high storey of a building.

[0003] Ramp operating positioning is achieved by extending the ramp and abutting its upper end close to or at the site to be reached. This is usually done by resting said end of the ramp on a balcony railing or a windowsill or, even, on an edge of a terrace, to allow goods to be loaded onto and unloaded from the deck.

[0004] Disadvantageously, sometimes the lower portion of the ramp, that is to say, its portion close to the ground, cannot be placed in a favourable position, for example due to inaccessibility caused by parked vehicles, road signs, lamp-posts or impediments such as yards, etc.

[0005] In such circumstances, the orientation adopted by the ramp during operation is such that it does not allow its upper end to rest correctly against a corresponding portion of the building to be reached. In particular, an inclination may be created between an end surface of the ramp and an outer surface of the building which produces reduced contact between them, for example contact only at one point defined by a corner of the ramp. This results in very unstable ramp resting on the building, with consequent abnormal bending and/or twisting movements by the ramp which, in terms of its construction, is very slender. As a result, there is a high risk factor linked the instability of the carriage which travels along the deformed ramp, and in particular the instability of the load transported, which may fall on an area below with obvious risks for people and/or objects.

[0006] At present, said disadvantage is overcome using temporary solutions such as blocks, for example made of wood, or other fillers (such as rolled up covers) which are inserted between the upper end of the ramp and the surface of the building on which it rests, so as to temporarily fill the gaps left between them due to misalignment of the ramp relative to the building.

[0007] Obviously, such solutions do not comply with safety regulations and are very precarious and inadequate since they are often prepared immediately by operators whose job is to move the carriage and they are fixed to the portion of the building or to the upper end of the ramp in a very rudimentary way. Moreover, said blocks cannot normally be reused because the inclination of the ramp varies on each occasion according to ramp space and orientation requirements. Therefore, new blocks must be prepared each time the lifting platform is installed.

[0008] In this context, the main technical purpose of the present invention is to provide an inclination compensator device for lifting platforms which is free of the above-mentioned disadvantages.

[0009] In particular, the present invention has for an aim to provide an inclination compensator device for lifting platforms which allows the ramp to rest correctly and completely against a respective portion of the building.

[0010] The present invention also has for an aim to provide an inclination compensator device for lifting platforms which guarantees compliance with safety requirements.

[0011] Another aim of the invention is to provide an inclination compensator device for lifting platforms which allows significant operating flexibility.

[0012] The technical purpose indicated and the aims specified are substantially achieved by an inclination compensator device for lifting platforms comprising the technical features described in one or more of the claims herein.

[0013] Further features and advantages of the present invention are more apparent in the detailed description below, with reference to a preferred, non-limiting, embodiment of an inclination compensator device for lifting platforms, illustrated in the accompanying drawings, in which:

- Figure 1 is a perspective view of a lifting platform connected to a device in accordance with the present invention;
- Figures 2a, 2b are schematic views of a first embodiment of a device in accordance with the present invention in two different operating configurations;
- Figures 3a, 3b are schematic views of a second embodiment of a device in accordance with the present invention in two different operating configurations;
- Figure 4 is a perspective view of the device illustrated in Figures 2a and 2b;
- Figure 5 is a perspective view of the device illustrated in Figures 3a and 3b.

[0014] With reference to the accompanying drawings, the numeral 1 denotes as a whole an inclination compensator device for lifting platforms in accordance with the present invention.

[0015] The device 1 is used in particular for compensating inclinations between lifting platforms and fixed structures on which such platforms rest, for example, lifting platforms used for removals, as shown in Figure 1.

[0016] In Figure 1, the platform (labelled 100 as a whole) comprises a base 101 and a telescopic ramp 102 rotatably mounted on the base 101. The ramp 102 can also be tilted relative to a horizontal plane, driven by an actuator, not illustrated, to reach an upper storey of a building E. In this situation, the ramp 102 is active be-

tween a first level close to the ground and a second level raised above the ground.

[0017] The lifting platform 100 also comprises a carriage 104 having a horizontal supporting surface 105 designed to support a predetermined quantity of goods and slidably mounted on the ramp 102 so that it moves like a shuttle between a lower end 102a of the ramp 102 and an upper end 102b of the ramp 102 in order to transfer goods between the ground and an upper storey of the building E.

[0018] In the situation illustrated in Figure 1, the storey of the building E reached by the ramp 102 has a railing or rail 200 projecting from an outer profile of the building E. In any case, what is described will also apply in the case of railings or rails which do not project, that is to say, which are aligned with the outer profile of the building E.

[0019] The device 1 in accordance with the invention is located in an intermediate operating position between the ramp 102 and the rail 200. In more detail, as shown in Figures 2a to 5, the device comprises an anchoring portion 2 which can be stably connected to the rail 200, and a supporting portion 3 which can engage, preferably by simply resting against it, with a portion of the lifting platform 100, and in particular with the upper end 102b of the ramp 102. In the embodiments illustrated, the anchoring portion 2 comprises a rigid frame which can be anchored to the rail 200 using brackets, labelled 4 in Figures 2a to 3b, or by means of a curved edge of the anchoring portion 2 which encompasses a corresponding edge of the rail 200. Moreover, in the embodiments illustrated, the supporting portion 3 comprises a flat element 5 which has a flat front surface 6 designed to engage with the upper end 102b of the ramp 102, the latter simply resting against it. The upper end 102b of the ramp 102 may be equipped with rolling elements 106 designed to slidably engage on the flat front surface 6 of the flat element 5 so as to absorb any ramp 102 usual settling movements and/or deformations during its positioning.

[0020] Advantageously, the anchoring portion 2 and the supporting portion 3 are kinematically connected to each other to allow a reciprocal movement and, in more detail, a movement of the supporting portion 3 relative to the anchoring portion 2, the latter preferably being stably connected to the rail 200.

[0021] As shown in the accompanying drawings, the supporting portion 3, and therefore the flat element 5, can rotate relative to the anchoring portion 2, preferably only about a hinging axis X. After operating positioning of the device 1, said hinging axis X is parallel with an outer surface of the building E and, preferably, vertical. In this way, the flat front surface 6 can oscillate about a vertical axis and adopt a plurality of different operating positions, allowing adjustment of the orientation of the flat front surface 6. The vertical oscillation of the flat element 5 allows the absorption of variations in positioning between the upper end 102b of the ramp 102 and the flat front surface 6, creating a correct connection between them.

[0022] Advantageously, the device 1 also comprises locking means 11, acting between the anchoring portion 2 and the supporting portion 3 to stably hold said portions 2, 3 in different positions relative to each other. In the embodiments illustrated, the locking means 11 comprise at least one extendable element 7 rotatably inserted between the anchoring portion 2 and the supporting portion 3 to stably connect them to each other and, preferably, to support the supporting portion 3 relative to the anchoring portion 2. The extendable element 7 preferably comprises a telescopic arm having a first half-arm 8 rotatably connected to the anchoring portion 2 and a second half-arm rotatably connected to the supporting portion 3. The two half-arms 8, 9 are connected to each other by a sleeve-style connection 10. The two half-arms 8, 9 of the extendable element 7 can rotate, relative to the anchoring portion 2 and to the supporting portion 3, about respective axes of rotation which are parallel with each other and, preferably, parallel with the hinging axis X.

[0023] Advantageously, each half-arm 8, 9 is designed to be stably held in a plurality of different extended configurations, each defining a corresponding overall length of the extendable element 7, and therefore a corresponding operating position of the device 1 supporting portion 3.

[0024] As shown in Figures 2a to 3b, at least one of the two half-arms 8, 9 has a plurality of holes 12a arranged in sequence and aligned along a direction in which the half-arms 8, 9 slide relative to each other. The locking means 11 also comprise at least one pin 12b which can be inserted in one of the holes 12a so that, once the pin has been inserted, it prevents any further sliding of the two half-arms 8, 9 relative to each other at least along a direction in which they move towards or away from each other.

[0025] In accordance with the preferred embodiment of the invention illustrated, the device 1 comprises two extendable elements 7 of the type described above. Each extendable element 7 acts on an opposite side of the supporting portion 3 relative to the axis X, so as to effectively and stably lock, and preferably support, the supporting portion 3.

[0026] In accordance with an embodiment of the device 1 not illustrated, the two extendable elements 7 have different dimensions, that is to say, they have different lengths, to allow a more pronounced adjustment towards one side of the device 1. In other words, one of the two extendable elements 7 is longer than the other and, therefore, has both a minimum length and a maximum length which are greater than the other extendable element 7. This means that, when the two extendable elements 7 are in a centred position, the supporting portion 3 is not aligned with the rail 200 but is set at an angle to the rail 200 and in more detail is closer to the rail 200 near the shorter extendable element 7. As a result, said configuration allows a significant increase in the device 1 propensity to absorb misalignments, between the ramp 102 and the rail 200, mainly in a predetermined direction.

[0027] In accordance with alternative embodiments, the extendable elements may comprise fluid-dynamic actuators, of both the powered and non-powered type, screw and nut screw mechanisms, snap-on mechanisms or, more generically, linear elements or actuators designed to adopt a plurality of different extended and/or retracted positions.

[0028] In accordance with another embodiment, not illustrated, the locking means 11 comprise at least one rigid arm having one end connected to the anchoring portion 2 and the other end connected to the supporting portion 3. Said rigid arm in itself stably locks the supporting portion 3. Therefore, the rigid arm is advantageously removable, so that it can be substituted with another rigid arm that has different dimensions, and in particular, a different length, allowing the supporting portion 3 to be stably locked in a different operating position. In other words, the rigid arm is interchangeable, meaning that it can be substituted with one or more rigid arms having different lengths.

[0029] Advantageously, the device 1 can be connected to rails 200 which are linear or which have an angular shape. To allow the same advantages on both types of rail 200, in a first embodiment of the rigid frame of the anchoring portion 2 the rigid frame comprises a linear element 13 designed to engage, using the brackets 4, with the rail 200, which has a substantially linear shape. Alternatively, the linear element 13 has an "L" or "C"-shaped cross-section which allows it to be evenly connected to the rail 200 along an entire length of the linear element 13.

[0030] In a second embodiment of the rigid frame it comprises an angular element 14 designed to engage with the rail 200 by means of the brackets 4. Alternatively, the angular element 13 has an "L" or "C"-shaped cross-section which allows it to be evenly connected to the rail 200 along an entire length of the linear element 13.

[0031] In a third embodiment of the rigid frame, not illustrated, it comprises a jointed element able to adopt at least one substantially linear configuration, to engage with a straight rail 200, and at least one angular configuration, to engage with an angular portion of a rail 200. The jointed element preferably comprises two linear stretches which are hinged to each other so that the anchoring portion 2 adopts a plurality of different angular configurations according to the angle between the linear stretches (usually between 0° and 90°).

[0032] In the latter embodiment, the device comprises a removable element (not illustrated) which can be connected to one of the portions, anchoring 2 and supporting 3, preferably to a central portion of them, and forms a removable portion connecting the supporting portion 3 and the anchoring portion 2. In more detail, the removable element is connected to one of the above-mentioned portions 2, 3 when the anchoring portion 2 is connected to a substantially straight rail 200. In said circumstance, a maximum distance is established between the corresponding central portions of the anchoring and supporting portions 2, 3 (similarly to what is illustrated in Figures 2a, 2b) which must be bridged to allow a correct connection between the portions 2, 3, whilst said distance is decidedly reduced if the anchoring portion 2 must be connected to an angular portion of a rail 200 (similarly to what is illustrated in Figures 3a, 3b) and in the latter case the removable element is preferably removed from the device 1.

[0033] In accordance with the accompanying drawings, the rotation of the supporting portion 3 relative to the anchoring portion 2 is achieved by means of a pivot 15 which extends about the axis X and keeps the two portions 2, 3 connected to each other, allowing them to move relative to each other only with a rotation about the axis X. The pivot is obtained by connecting to each other in a hinge style two portions P1, P2 respectively rigidly connected to the anchoring portion 2 and to the supporting portion 3. However, it is possible that the rotation by the anchoring portion 2 and the supporting portion 3 relative to each other is obtained by means of a simple connection made by resting the portions 2, 3 against one another. In particular, in said solution (not illustrated in the accompanying drawings) one of the two portions, anchoring 2 and supporting 3 has a projection, preferably located in a central part of the portion 2, 3, extending towards the other portion 2, 3 and which can engage with a corresponding groove in the other portion 2, 3 so as to form a hinge designed to promote rotation of the anchoring portion 2 and the supporting portion 3 relative to each other about the axis X. Therefore, in the latter solution the groove and the projection engage with one another by simply resting against each other and the function of supporting the supporting portion 3 relative to the anchoring portion 2 may advantageously be carried out by the extendable elements 7.

[0034] Finally, it should be noticed that if the frame is made in accordance with the third embodiment described above (that is to say, equipped with a jointed element), the removable element, which allows the supporting portion 3 pivot point to be moved away from the anchoring portion 2, performs the same function as the portion P1 in Figures 2a and 2b.

[0035] When the device 1 disclosed is operating, the anchoring portion 2 is stably connected to the rail 200, then the supporting portion 3 is orientated, that is to say, rotated about the vertical axis X, until the flat front surface 6 is orientated in the desired position, that is to say, in a position in which it can evenly engage with the upper end 102b of the ramp 102 of a lifting platform 100.

[0036] Following rotation of the supporting portion 3, there is a corresponding extension or a corresponding shortening of the extendable elements 7 which connect the supporting portion 3 to the anchoring portion 2. Then, locking of the extendable elements 7 in the position previously reached ensures that they hold the supporting portion 3 so that it maintains the desired orientation, that is to say, in the position previously reached, so as to stably maintain the orientation of the flat front surface 6.

This provides a stable support for the upper end 102b of the ramp 102, which therefore is not subject to settling movements relative to the rail 200.

[0037] The present invention achieves the preset aims, overcoming the disadvantages complained of in the

prior art.

[0038] The supporting platform ramp may be positioned wherever is most suitable, since the possibility of adjusting the orientation of the flat outer surface allows a stable support to be provided for the upper end of the ramp, distributed along said upper end and preventing any ramp twisting and/or deformation. This also eliminates the risks linked to lifting platform carriage irregular movement, thus eliminating the risks of the load accidentally falling to the ground below the carriage, and so complies with the safety regulations in force.

[0039] The possibility of stably setting the orientation of the flat front surface of the supporting portion in a plurality of different operating positions increases the operating flexibility of the device disclosed, since it allows the device to be used in a wide range of applications, and more particularly in applications in which the ramp has to be installed relative to a building with misalignments that vary greatly each time.

[0040] Another advantage of the device disclosed is the possibility of fixing the entire device to the fixed structure, without having to stably connect any of its parts to the lifting platform ramp. This avoids increasing the suspended masses, that is to say, the ramp masses, which would increase the risks of ramp structural instability.

[0041] It should also be considered that connection of the anchoring portion to the fixed structure, and in particular to the rails, does not require permanent work on the fixed structure. This avoids the need for permanent structural and/or aesthetic changes such as holes or other devices which in the prior art were needed to stably fix blocks or other elements designed to cover variations in alignment between the fixed structure and the upper end of the ramp.

Claims

1. An inclination compensator device for lifting platforms, **characterised in that** it comprises:

   - an anchoring portion (2), which can be stably connected to a fixed structure;
   - a supporting portion (3), connected to the anchoring portion (2) and able to move relative to it so as to adopt a plurality of different operating positions, there being the possibility of operatively connecting the supporting portion (3) to a portion of a lifting platform (100) so as to form an adjustable support for said portion of the lifting platform (100);
   - locking means (11), acting between the supporting portion (3) and the anchoring portion (2) to stably hold them in a plurality of different positions relative to each other.

2. The device according to claim 1, **characterised in that** the supporting portion (3) can move by rotating relative to the anchoring portion (2).

3. The device according to claim 1 or 2, **characterised in that** the supporting portion (3) and the anchoring portion (2) can rotate relative to each other only about an axis (X).

4. The device according to claim 3, **characterised in that** the axis (X) is vertical.

5. The device according to one or more of the foregoing claims, **characterised in that** the locking means (11) comprise at least one extendable element (7), acting between the anchoring portion (2) and the supporting portion (3) and able to rotate relative to them so as to stably connect the supporting portion (3) to the anchoring portion (2) in each of the operating positions, there being the possibility of stably configuring said at least one extendable element (7) according to a plurality of different extended configurations, each defining a corresponding operating position of the device (1) supporting portion (3).

6. The device according to claim 5, **characterised in that** the extendable element (7) comprises a telescopic arm having two half-arms (8, 9) connected to each other by a sleeve-style connection (10), one of the half-arms (8, 9) being connected to the anchoring portion (2) and the other half-arm (8, 9) being connected to the supporting portion (3).

7. The device according to claim 6, **characterised in that** at least one of the half-arms (8, 9) has a plurality of holes (12a) arranged in sequence and aligned along a direction in which the half-arms (8, 9) move relative to each other, the locking means (11) also comprising at least one pin (12b) which can be inserted in one of the holes (12a) to prevent said movement of the two half-arms (8, 9) relative to each other.

8. The device according to claims 3 and 5, **characterised in that** it comprises two extendable elements (7) acting on opposite sides relative to the axis (X).

9. The device according to one or more of the foregoing claims from 1 to 4, **characterised in that** the locking means (11) comprise at least one rigid arm, acting between the anchoring portion (2) and the supporting portion (3) to stably connect the supporting portion

(3) to the anchoring portion (2) in at least one of the operating positions, the rigid arm being removable from the portions, anchoring (2) and supporting (3), so that it can be substituted with at least one other rigid arm having different dimensions.

10. The device according to claims 3 and 9, **characterised in that** it comprises two rigid arms acting on opposite sides relative to the axis (X).

11. The device according to one or more of the foregoing claims, **characterised in that** the supporting portion (3) has a flat front surface (6) designed to engage with the portion of the lifting platform (100), the latter resting against it.

12. The device according to one or more of the foregoing claims, **characterised in that** the anchoring portion (2) comprises a linear element (13) which can stably engage with a substantially straight portion of the fixed structure.

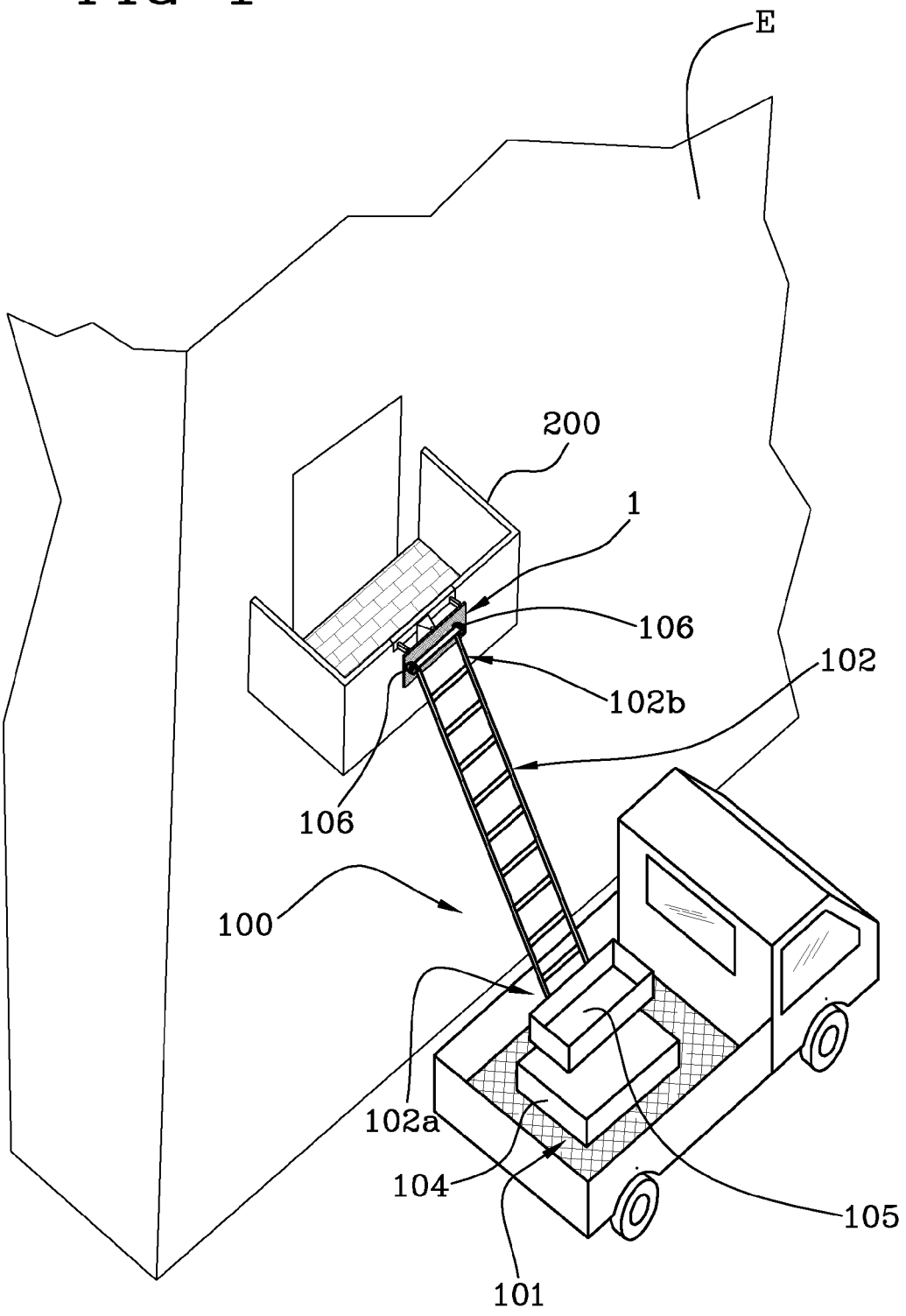
13. The device according to one or more of the foregoing claims from 1 to 11, **characterised in that** the anchoring portion (2) comprises an angular element (14) which can stably engage with an angular portion of the fixed structure.

14. The device according to one or more of the foregoing claims, **characterised in that** one of the portions, anchoring (2) and supporting (3), has a projection which engages, by resting against it, with a corresponding groove in the other of the portions, anchoring (2) and supporting (3), thus forming a hinge designed to promote rotation of the two portions (2, 3) relative to each other about an axis (X).

15. The device according to one or more of the foregoing claims from 1 to 11, **characterised in that** the anchoring portion (2) comprises a jointed element designed to adopt a plurality of different configurations so that it can be connected to different fixed structures.

16. The device according to claim 15, **characterised in that** it comprises a removable element which can be connected to one of the portions, anchoring (2) and supporting (3), to form a connection between the two portions (2, 3) at least when the anchoring portion (2) is in a configuration which can be connected to a substantially straight fixed structure.

FIG 1



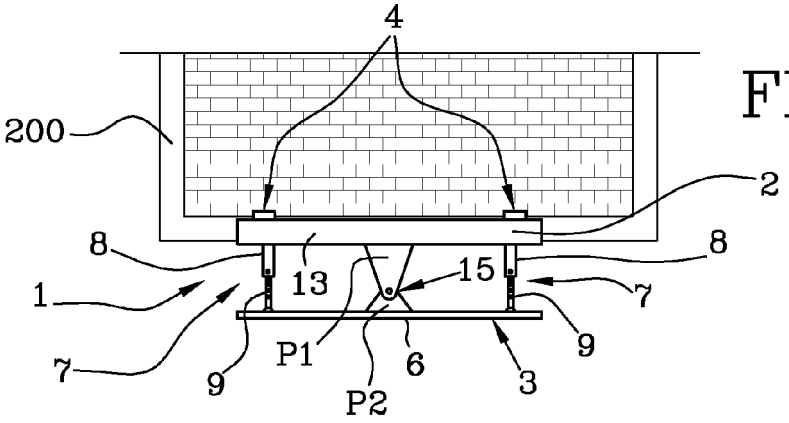


FIG 2a

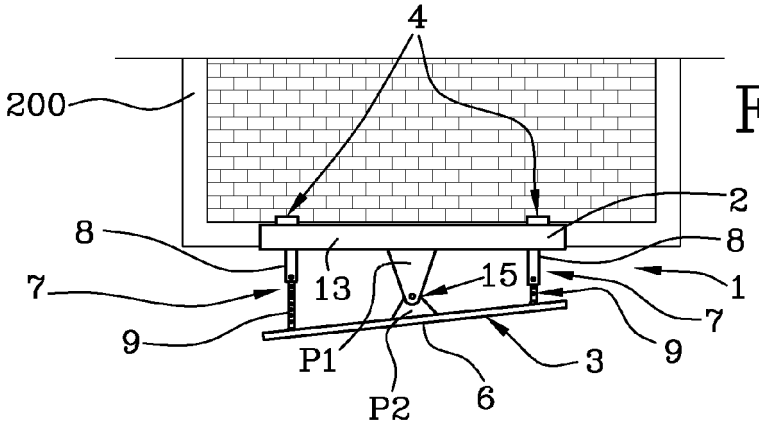


FIG 2b

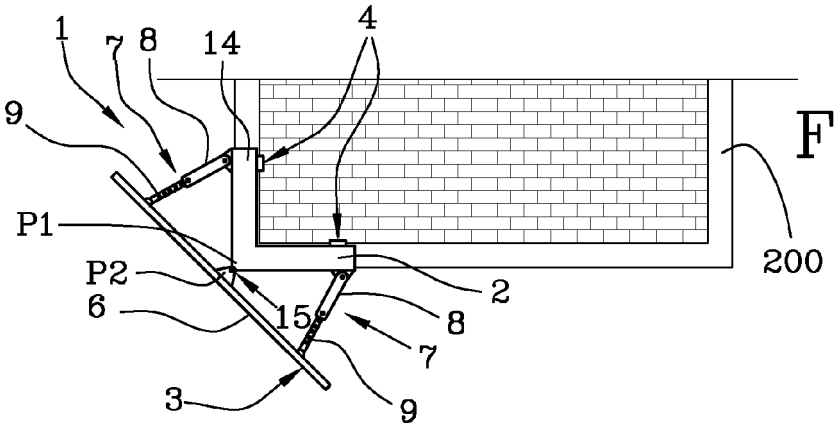


FIG 3a

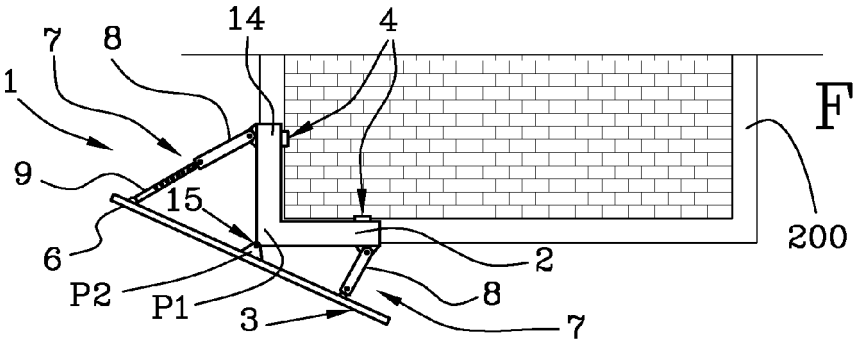


FIG 3b

FIG 4

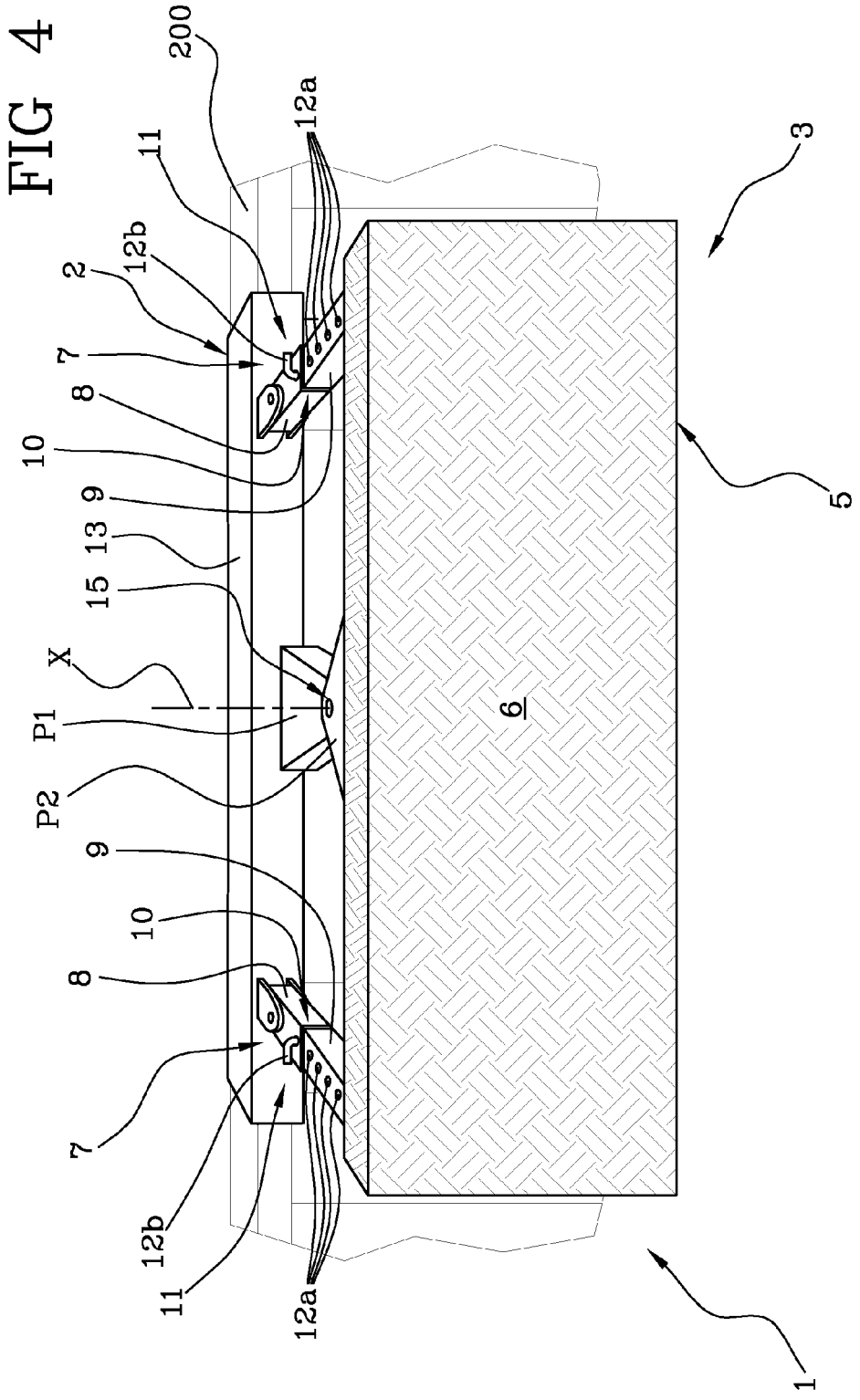
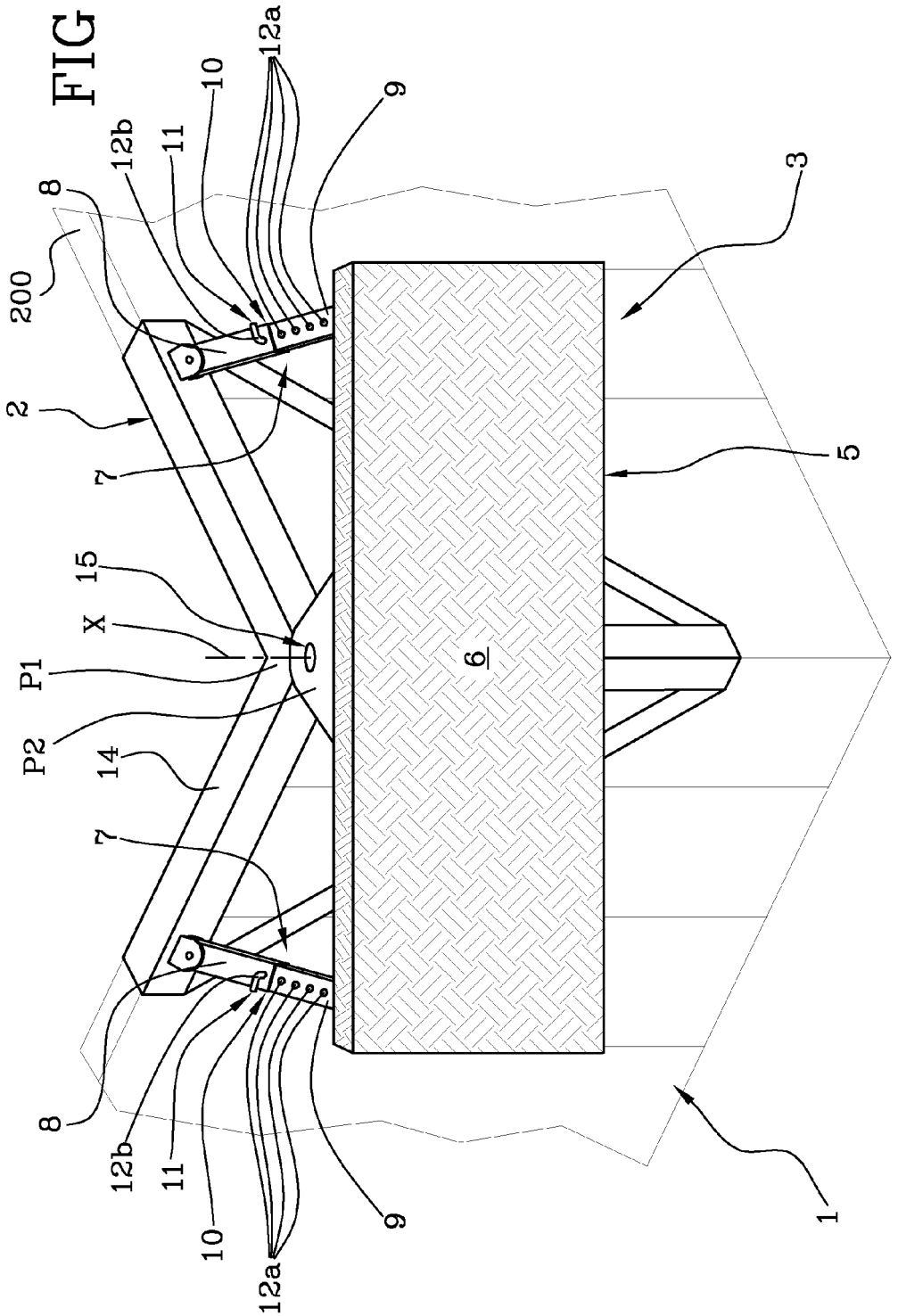


FIG 5



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EUROPEAN SEARCH REPORT

Application Number
EP 08 15 4302

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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TECHNICAL FIELDS SEARCHED (IPC)

E06C
B66F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	5 August 2008	Blumenberg, Claus

CATEGORY OF CITED DOCUMENTS

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 08 15 4302

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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