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### (54) CART-LIKE PLATFORM

(57) The present patent application relates to a cart-like platform which can be combined with temporary structures, preferably but not exclusively of the scaffolding type.

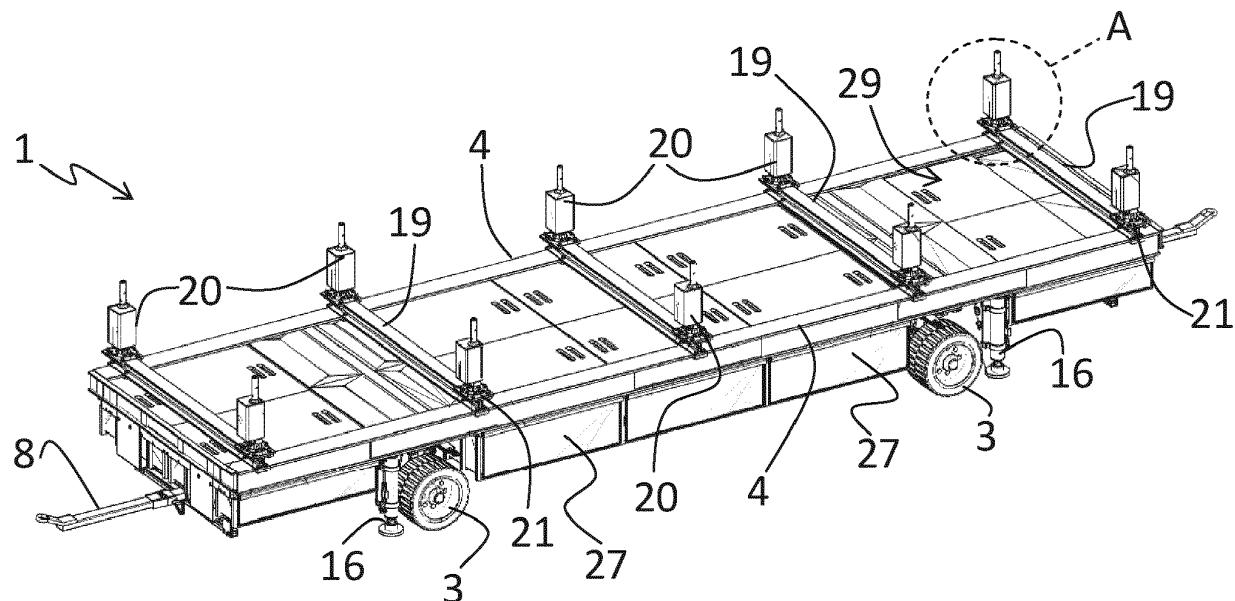


Fig. 9

## Description

**[0001]** The subject of this patent application is a cart-like platform, in particular a oleodynamically operated cart-like platform, which can be combined with temporary building elements or structures, preferably, but not exclusively, of the scaffolding type.

**[0002]** The temporary structures generally used on building sites, for conventional building work (aerial work platforms for painting work, demolition work, mortar and concrete castings, etc.), are widely known to consist of prefabricated elements which must be assembled on-site in order to form fixed scaffolding, i.e. metal elements which take up the stresses either directly, resting with bases on a surface, or via anchoring elements which are fixed to the structure on which the work is to be carried out.

**[0003]** In some types of building works the construction requirements are highly specialized and such as to require the use of temporary structures which must satisfy the need for a high load capacity, small overall dimensions in the site area, rapid installation/removal times, high adaptability to the possible problems which arise on-site, reduced impact on the work object, etc..

**[0004]** The solutions adopted so far can be grouped into two types: the first type consists of fixed prefabricated elements, known to have the feature of being extremely quick to assemble without requiring particular specialized technical expertise; moreover, said fixed prefabricated elements may be used again in many contexts.

**[0005]** By way of a non-limiting example, the fixed prefabricated elements may consist of structures which are intended to be used for partial repair work on the vaults of road tunnels.

**[0006]** The limitation of this type of structures consists in the small working area made available to the workmen and this limitation is exacerbated if there is an increase in the width of the building structure which is to be overhauled; moreover, since the structure is fixed, it has a significant volume and cannot be rapidly removed if required and/or in the event of an emergency.

**[0007]** A further drawback of the prefabricated elements is the limited load capacity and the impossibility of providing a self-supporting structure.

**[0008]** The second type consists of structures which are created ad hoc for the intended use, these being generally formed by heavy metalwork elements which have a high load capacity and have functions in addition to that of simply forming a work surface.

**[0009]** In view of the structural feature created for the specific application, the main drawback of the second type of structures is that it cannot be used again as such for other operations on the same job and with even greater difficulty on other building sites.

**[0010]** In the present state of the art, moreover, embodiments of self-supporting, overhanging, prefabricated elements which are movable on wheels are known.

**[0011]** The main drawback of this type of structure is

the limited mechanical strength of its support point - i.e. the wheels - since, if the length of the overhang or the load capacity were to be increased, the structure would be severely stressed structurally both in the terms of its staticity and its tilting capacity; moreover, it is not possible to move the structure if the surface is not perfectly horizontal.

**[0012]** In the present state of the art also known are embodiments of structures which are semi-movable on rails, namely symmetrical prefabricated structures which are able to move on rails so that works may be carried out, preferably but not exclusively, on tunnel vaults.

**[0013]** The limitation of this type of structure is the need to provide a rail on which the structure can be moved, with consequent long preparation times for the movable base which furthermore always requires the combination of two movable elements in order to ensure the necessary equilibrium for preventing overturning.

**[0014]** In the present state of the art embodiments of self-supporting metal structures are also known, for example for the demolition and reconstruction of roadway kerbs.

**[0015]** The limitation of this type of structure consists in the fact that these structures are intended for a specific work site, must be prepared by specialized workers and cannot be easily used again in other work sites, unless the structure for the work to be carried out is identical; furthermore, in order to be able to advance with the working operations, special means are need to displace the counterweight component.

**[0016]** A further drawback of the structures mentioned above is that they do not allow the work surface of the temporary structure to be kept level when there is a variation in the inclination of the ground or the support surface on which they rest.

**[0017]** The expression "keep level" is understood here, and in the description below, as meaning that the work surface is kept in a perfectly horizontal position, namely in a position perpendicular to a vertical axis.

**[0018]** Another drawback of the structures mentioned above is that these structures do not allow the position of the work surface of the temporary structure to be adjusted automatically when there is a variation in the inclination of the ground or the support surface.

**[0019]** The main object of the present invention is to overcome the aforementioned drawbacks of the state of the art, in particular by providing a movable cart-like platform which is combined with temporary building elements or structures.

**[0020]** A particular task of the present invention is to provide a cart-like platform which is able to respond easily to the very wide range of technical and safety-related problems which may arise during the course of building work.

**[0021]** A further task of the present invention is to provide a movable cart-like platform which is able to reduce the working times, drastically simplifying the preparation of the scaffolding within the time schedule of the project.

**[0022]** A further task of the present invention is to provide a movable cart-like platform which is able to ensure a high degree of adaptability to the many configurations of the scaffolding so as to deal with the various problems on the building site (high overhanging towers which can be used for work carried out on vault surfaces, the underside of roadway decks, etc.) and which reduces to a minimum the impact of the anchoring means on the work structure or more generally the space occupied on-site.

**[0023]** Another task of the present invention is to provide a movable cart-like platform which allows the working surface of the temporary structure to be kept level automatically when there is a variation in the degree of inclination of the ground or the platform support surface.

**[0024]** A further task of the present invention is to provide a movable cart-like platform which has a self-supporting structure able to counteract effectively the tilting forces.

**[0025]** The object and main tasks described above are achieved with a cart-like platform according to Claim 1.

**[0026]** In order to illustrate more clearly the innovative principles of the present invention and its advantages compared to the prior art, non-limiting examples of an embodiment of the cart-like platform will be described below with the aid of the accompanying drawings. In particular in the drawings:

- Figure 1 shows perspective view of a part of the cart-like platform according to the present invention;
- Figure 2 shows a perspective view of a frame of the cart-like platform according to the present invention;
- Figures 3 and 4 show perspective views of a part of the cart-like platform according to the present invention where respective components have been removed;
- Figures 5 and 6 show front views of a detail of the cart-like platform according to the present invention in two different operating configurations;
- Figure 7 shows a side view of the cart-like platform according to the present invention;
- Figure 8 shows a perspective view of a part of the cart-like platform according to the present invention in a particular operating configuration;
- Figure 9 shows a perspective view of the cart-like platform as a whole in an operating configuration corresponding to that shown in Figure 8;
- Figure 9a shows a front view the cart-like platform according to the present invention;
- Figures 10 and 11 show respectively a perspective view and top plan view of the cart-like platform in the same operating configuration shown in Figures 8 and 9;
- Figure 12 shows a perspective view of a part of the cart-like platform according to the present invention in an operating configuration different from that shown in Figure 8;
- Figure 13 shows a perspective view of the cart-like platform as a whole in an operating configuration cor-

responding to that shown in Figure 12;

- Figure 14 shows a perspective view of a part of the cart-like platform according to an alternative embodiment and in an operating position corresponding to that shown in Figure 12;
- Figure 15 shows a perspective view of the cart-like platform as a whole in accordance with the embodiment shown in Figure 14 and in an operating configuration corresponding to that shown in Figure 14;
- Figures 16a, 16b and 16c show, respectively, a perspective, side and front view, on a larger scale, of the detail of the cart-like platform indicated by A in Figures 7, 9 and 9a;
- Figure 17 shows a simplified side view of the platform in which the self-supporting system can be seen;
- Figure 18 shows a perspective view of a further embodiment of the cart-like platform.

**[0027]** With reference to the attached figures, the present invention relates to a cart-like platform, in particular a movable, hydraulically operated, cart-like platform, denoted overall by the reference number 1, which can be combined with temporary structures, such as scaffolding, so as to support the latter.

**[0028]** An example of a temporary structure S mounted on the platform is shown schematically in Figure 9a.

**[0029]** With reference to the attached sets of drawings, the cart-like platform 1 according to the present patent application is formed by a frame 2 (see Figure 2) which rests on at least four wheels 3 (see Figure 3), said at least four wheels 3 performing braking and steering by means of at least one steering bar 8 able to manage the direction of movement of the said platform 1.

**[0030]** In a preferred, but not exclusive embodiment, the at least four wheels 3 are of the solid rubber type and are equipped with a braking system 7, said braking system 7 being able to be operated preferably, but not exclusively, by means of a lever 34 arranged on both the long sides of the platform 1.

**[0031]** In particular, the frame 2 consists of at least two main beams 4, see Figures 1 and 2, preferably but not exclusively made of steel, connected by means of at least two secondary beams 5, preferably but not exclusively made of steel, as for example shown in Figures 1 and 2.

**[0032]** The at least two secondary beams 5 are placed transversely and in a variable position with respect to the at least two main beams 4 and are connected by means of a fully fixed joint, preferably, but not exclusively, formed by a welding seam, so as to increase the torsional rigidity.

**[0033]** As shown more clearly in Figure 4, the frame 2 made as described above has a series or plurality of reinforcing cross-pieces 15 which are also placed transversely with respect to the at least two main beams 4.

**[0034]** Interspaces 50, the function of which will be clarified in detail in the description below, are defined between two consecutive cross-pieces 15 and the main

beams 4 or between a crosspiece 15 and one of the secondary beams 5.

**[0035]** As shown in Figure 3, the frame 2 provided in accordance with the description above rests on at least a double steering axle 6 to which the at least four wheels 3 are fixed.

**[0036]** In a preferred but not exclusive embodiment, the steering bar 8 may be interchangeably mounted on the ends of the platform 1 by means of a suitable coupling system 9.

**[0037]** In a preferred, but not exclusive embodiment, the steering bar 8 is suitably designed to facilitate the possibility of using different towing means.

**[0038]** The cart-like platform 1 made as described above is also provided with a support 11 for guiding the steering bar, with a first containing compartment 12 for the main manoeuvring control system and with a second containing compartment 13 for the electric power supply system for powering the tools on site, as shown in Figures 3 and 4.

**[0039]** Moreover, the cart-like platform 1 made as described above is provided with a control panel 14 for controlling the manoeuvring operations, shown in Figure 10.

**[0040]** The cart-like platform 1 is also provided with systems 35 so that it may be visible also in poorly lit environments and with a removable access ladder 32, as shown in Figure 10.

**[0041]** The platform 1 made as described above is also provided with a stabilization and displacement system; since the structure is designed to be able to accommodate different types of temporary building elements or structures which are preferably but not exclusively of the scaffolding type, a high load capacity is required so that it may be stabilized, this being ensured by a frame transversely reinforced by means of the reinforcing cross-pieces 15, which are preferably, but not exclusively, made of steel.

**[0042]** In order to obtain the complete stability of the platform, stabilizers 16, which are adjustable heightwise and extractable and preferably, but not exclusively of the oleodynamic piston type, are provided.

**[0043]** As shown more clearly in Figures 4-6, at least two pairs of stabilizers 16 are arranged in correspondence of the supports 26 and therefore of the axles 6, namely for each axle 6 there is a pair of stabilizers 16 positioned at the ends of the axle 6.

**[0044]** The stabilizers 16 are associated rotatably with respect to the structure of the platform 1 by means of suitable mechanisms 25; with reference to Figure 5, during the movement of the platform 1 from one site area to another or from one building site to another the stabilizers 16 are positioned in a position parallel to the structure of the platform 1, while during use (see Figures 4 and 6) they are positioned at right angles with respect to the structure of the platform 1 itself.

**[0045]** The stabilizers 16, since they are preferably of the oleodynamic piston type, are extractable. In particular, when the stabilizers 16 are in the position at right

angles to the support surface of the platform 1 (see Figure 6), they are able to be moved from a rest position where they are raised from the ground into an active position, where they are in contact with the ground, and vice versa.

**[0046]** When the stabilizers 16 are in the active position the wheels 3 of the platform 1 are raised from the ground. In this operating condition, the cart-like platform 1 may be displaced in relation to or aligned with the object on which the work is to be carried out.

**[0047]** For this purpose, the stabilizers 16 are mounted on suitable box-shaped profiles 17 formed on the frame 2 along a respective axle 6. In this way the stabilizers 16 may be positioned on the outside of the profile of the frame 2 and allow the frame 2 to be displaced transversely with respect to its greater axis or aligned with respect to the object on which the work is to be carried out.

**[0048]** A double system 23 and 24 is provided for the transverse displacement of the platform 1 performed by means of the box-shaped profiles 17, in particular via the extraction elements 23 and 24 of the box-shaped profiles 17.

**[0049]** The double system 23 and 24 allows the platform 1 to be positioned precisely by operating both the box-shaped profiles 17 or correcting any manoeuvring errors by using them one at a time. The displacement is performed by a support 26 which has the task of transmitting the displacements to the platform 1. All of this is controlled by the control panel 14 which is suitably incorporated in the platform 1 and may be easily accessed for the manoeuvring operations.

**[0050]** With particular reference to Figures 8, 9, 10 and 11, a series of cross-beams 19 may be positioned on top of the at least two main beams 4 so as to form a grid system 18, said series of cross-beams 19 being preferably, but not exclusively made of steel.

**[0051]** In particular the grid system 18 associated with the frame 2 made as described above acts as a base for the construction of the temporary structures S, which are preferably but not exclusively of the scaffolding type, as shown in Figure 9a.

**[0052]** With particular reference to Figures 14 and 15, the cross-beams 19 may also have a transverse length greater than the distance between the two main beams 4.

**[0053]** Preferably, the cross-beams 19 are mounted slidably on the main beams 4, as indicated by means of the arrows T shown in Figures 12 to 15.

**[0054]** This configuration, optionally in combination with the greater transverse length of the cross-beams 19, allows the grid 18 to be adapted to various types of temporary structures S which also have dimensions different from each other.

**[0055]** The cross-beams 19 are made sliding along the main beams 4 and positioned in the desired position manually by an operator.

**[0056]** Alternatively, the cross-beams 19 may be connected to the control panel 14 which controls the automatic sliding thereof and the positioning in the desired position.

**[0057]** In a further embodiment shown in Figure 18, the frame 2 does not have cross-beams 19 arranged between the main beams 4.

**[0058]** The cart-like platform 1 also comprises at least one levelling element 20 associated directly or indirectly with the main beams 4.

**[0059]** In the case where the at least one levelling element 20 is associated indirectly with the main beams 4, as shown in Figures 7, 9-9a 10 13, 15 and 16a-16a, the at least one levelling element 20 is associated with the respective cross-beam 19; in particular, the at least one levelling element 20 is associated with the corresponding cross-beam 19, preferably but not exclusively by means of a flange 21 tightened with bolts.

**[0060]** In the embodiment shown in Figures 7, 9-9a, 10, 13, 15 and 16a-16a one pair of levelling elements 20 is provided for each cross-beam 19.

**[0061]** However, a different number of different levelling elements 20 may be provided for each cross-beam 19 depending on the constructional requirements. The number of levelling elements may also vary from cross-beam to cross-beam.

**[0062]** In general, the levelling element 20 may be positioned at any point of the cross-beam 19 without modifying the essential characteristics of that described and claimed. Therefore, each levelling element 20 is mounted slidably along the respective cross-beam 19, as shown in Figures 13 and 15.

**[0063]** Each levelling element 20 allows precise adjustment of the height of each of the base elements of the temporary structure S and is incorporated by means of a fastening element 22 which allows the rotational movements.

**[0064]** In particular, the fastening element 22 allows each levelling element 20 to be tilted with respect to the respective cross-beam 19 about a substantially horizontal axis passing through the fastening element 22.

**[0065]** Moreover, the fastening elements 22 allow the stresses to be transmitted from the temporary structure to the platform 1 and from here to the support surface.

**[0066]** In the embodiment shown in the Figures, the levelling elements 20 preferably comprise respective hydraulic jacks; however, all the levelling elements 20 may comprise also different devices, without thereby departing from the scope of protection of the present invention.

**[0067]** As shown in Figure 9a, the components of the temporary structure S, namely one or more Innocenti scaffolding pipes or other steel profiles, including also box-shaped profiles, are inserted on the respective hydraulic jacks of the levelling elements 20 so as to support the temporary structure S.

**[0068]** Advantageously, the hydraulic jacks of the levelling elements 20 may be shaped depending on the form of the components of the temporary structure S to be installed.

**[0069]** In a preferred but not exclusive embodiment, the connection between the main beams 4 and the cross-beams 19 and/or between the cross-beams 19 and the

levelling elements 20 is formed by clamping them, preferably but not exclusively using steel flanges 21 tightened with bolts.

**[0070]** Advantageously, the flange 21 is shaped so as to slide on the profile of the main beams 4 or the cross-beams 19. Equivalent sliding means, which may be easily imagined by the person skilled in the art, may also be provided instead of the flanges.

**[0071]** The connection between the levelling elements 20 and the cross-beams 19 and between the latter and the main beams 4 performed by means of the flanges 21 and the fastening element 22 is shown in detail in Figures 16a-16c.

**[0072]** This type of connection allows both the sliding of the cross-beams 19 along the main beams 4 and the sliding of the levelling elements 20 along the cross-beams 19.

**[0073]** In a manner similar to that described for the cross-beams 19, the levelling elements 20 may also be positioned manually by means of sliding along the cross-beams 19 or may be positioned automatically by means of the control panel 14.

**[0074]** According to an embodiment of the invention shown in Figure 18, in the platform 1 the main beams 4 and the levelling elements 20 may be directly connected together.

**[0075]** In this case also the connection may be performed by means of steel flanges tightened with bolts.

**[0076]** In this latter embodiment at least two levelling elements 20 mounted slidably on the main beams 4 are provided.

**[0077]** The platform made as described above is therefore provided with a levelling system which allows the working surfaces of the temporary structure S, preferably but not exclusively of the scaffolding type, to be positioned horizontally with respect to the surface supporting the platform 1 itself or with respect to the ground.

**[0078]** After the platform 1 has been stabilized, levelling is performed by positioning the base elements of the temporary structure S, preferably but not exclusively of the starting element type, such as the Innocenti pipes mentioned above, on the corresponding levelling elements 20, arranged axially aligned.

**[0079]** This means that the cart-like platform 1 according to the present invention allows the working surface of the temporary structure S to be positioned level, irrespective as to the degree of inclination of the ground or the surface supporting the platform 1.

**[0080]** The levelling elements 20 are connected to the control panel 14 (for example a PLC); preferably the cart-like platform 1 may also comprise one or more position sensors, not visible in the figures, which are also connected to the control panel 14 and configured to detect the variations in inclination of the ground.

**[0081]** The levelling operation is performed by adjusting the height of the levelling elements 20 so as to create a perfectly horizontal ideal plane which intercepts all the support bases of the temporary structure S, preferably

but not exclusively of the starting element type, installed at the desired height; all of this adjusted by the control panel 14 which is suitably incorporated in the platform 1 and may be easily accessed for the manoeuvring operations.

[0082] In particular, the control panel 14 is configured to adjust selectively and automatically the positioning height of each levelling element 20, also during the movement of the platform 1, depending on the variations in inclination of the ground or the surface supporting the platform 1.

[0083] When the sensors detect a variation in inclination, the control panel 14 repositions the levelling elements 20 selectively and automatically so as to keep level the working surface of the temporary structure S.

[0084] The platform 1 made as described above is also provided with a self-supporting system for being able to reduce to a minimum the impact on the work object.

[0085] The platform 1 made as described above is designed to support a fixed or removable weight able to counteract the tilting action of the forces involved and keep it in equilibrium.

[0086] The removable weights may be of different types, preferably but not exclusively of the steel or concrete type, with the possibility of stacking them on pallets.

[0087] As shown more clearly in Figures 7, 9 and 10, the removable weights are housed inside reinforced containers 27 which are preferably, but not exclusively, made of steel.

[0088] The reinforced containers 27 are accessible from the outside so as to allow removal thereof; in particular the containers 27 are accessible either laterally, from the side panel 28, which is preferably but not exclusively made of steel, or at the top, from the walking surface 29, which is preferably but not exclusively made of heavy-duty plywood.

[0089] With reference to this latter embodiment, the containers 27 may be positioned preferably opposite the interspaces 50 described above. The interspaces 50 are then closed at the top by the panels of the walking surface 29.

[0090] The containers 27 are in turn fixed onto the reinforcing cross-pieces 15, in a fixed or removable manner by means of slides 30, preferably but not exclusively made of steel, as shown more clearly in Figure 17.

[0091] The platform 1 made as described above is provided with a braking system in order to be able to operate safely. The braking system allows the platform 1 to be parked also on inclined working surfaces 7.

[0092] The platform 1 is provided with the double steering axle 6 both so that it may be positioned in the most precise manner with respect to the area where the work is to be carried out, and in order to reduce to a minimum the manoeuvres in confined spaces; the whole assembly is fixed to the platform by means of a heavy-duty support 31. The manoeuvres are facilitated by a steering bar 8 designed to be positioned on both sides for towing, the end 10 thereof for attachment to the towing means being

interchangeable so that it can be easily adapted to different designs.

[0093] Since both the axles 6 are steering axles it is envisaged locking one of the two axles by means of fixing pins 33 mounted on the guide for the steering bar 8.

[0094] From the above description, it is now clear how cart-like platform according to the present invention advantageously achieves the predefined objects.

[0095] In particular, it is clear how by providing the levelling elements controlled by the control panel, it is possible to keep level the working surface of the temporary structure, for example a scaffolding, when there is a variation in the inclination of the platform support surface or the ground.

[0096] Moreover, it is clear how, by providing removable weights housed inside the containers, it is possible to counteract tilting during the operations for moving the cart-like platform or adjusting the height of the levelling elements.

[0097] In the embodiment with slidable cross-beams, sliding of the cross-beams allows the configuration of the grid to be modified so that the cart-like platform can be adapted automatically to temporary structures which have different forms and dimensions.

[0098] Obviously the above description of the embodiments applying the innovative principles of the present invention is provided only by way of example of these innovative principles and must therefore not be regarded as limiting the scope of the rights claimed herein.

[0099] In particular, the characteristic features of the various solutions shown here may be combined with each other according to specific needs and wishes, as may be easily imagined by the person skilled in the art.

## Claims

1. Cart-like platform (1) formed by a frame (2) which rests on at least four wheels (3), said frame (2) being in turn formed by at least two main beams (4) and by at least two secondary beams (5) placed transversely with respect to the at least two main beams (4), said platform (1) being **characterized in that**:

45 - the frame (2) has a series of reinforcing cross-pieces (15) placed transversely with respect to the at least two main beams (4);  
- the platform (1) comprises at least one levelling element (20) associated directly or indirectly with the two main beams (4).

2. Platform (1) according to Claim 1, **characterized in that** the frame (2) rests on at least one double steering axle (6) with which the at least four wheels (3) are associated.

3. Platform (1) according to any one of the preceding claims, **characterized in that** at least two pairs of

stabilizers (16) are arranged in correspondence of the at least one double steering axle (6), said stabilizers (16) being rotatably associated with the structure of the frame (2).

4. Platform (1) according to any one of the preceding claims, **characterized in that** box-shaped profiles (17) are associated with the frame (2).

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5. Platform (1) according to any one of the preceding claims, **characterized in that** it comprises a plurality of cross-beams (19) positioned transversely and on top of the main beams (4), the connection between the main beams (4) and the cross-beams (19) and/or between cross-beams (19) and levelling elements (20) being performed by means of steel flanges (21) tightened with bolts.

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6. Platform (1) according to any one of Claims 1 to 4, **characterized in that** the direct connection between main beams (4) and levelling elements (20) is performed by means of steel flanges (21) tightened with bolts.

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7. Platform (1) according to any one of the preceding claims, **characterized in that** it is provided with a series of reinforced containers (27).

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8. Platform (1) according to any one of the preceding claims, **characterized in that** the wheels (3) are steered by means of a steering bar (8), said steering bar (8) being interchangeable on the ends of the platform (1) by means of a suitable coupling system (9) and **in that** it is provided with a support (11) for guiding the steering bar (8), with a first containing compartment (12) for the main manoeuvre control system and in a second containing compartment (13) for the power supply system for powering tools on-site and with a control panel (14).

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9. Platform (1) according to any one of the preceding claims, **characterized in that** it is a oleodynamic platform.

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10. Platform (1) according to Claim 1, **characterized in that** it comprises a plurality of cross-beams (19) positioned transversely and on top of the main beams (4).

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11. Platform (1) according to Claim 10, **characterized in that** said cross-beams (19) are slidably mounted on said main beams (4).

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12. Platform (1) according to Claim 10, **characterized in that** at least one pair of levelling elements (2) is provided for each cross-beam (19), said levelling elements (20) being slidably mounted on the respective cross-beams (19).

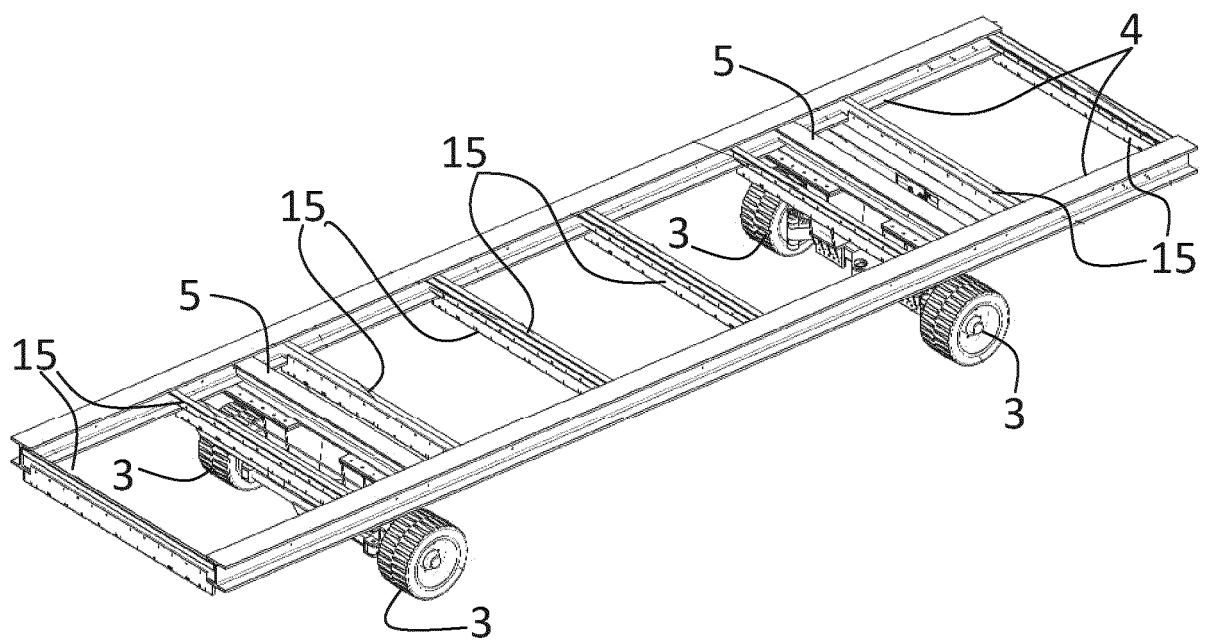


Fig. 1

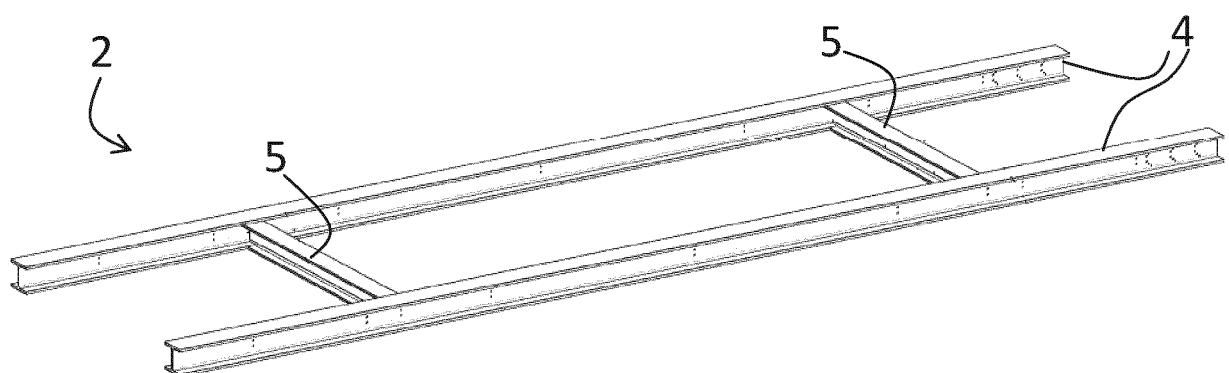


Fig. 2

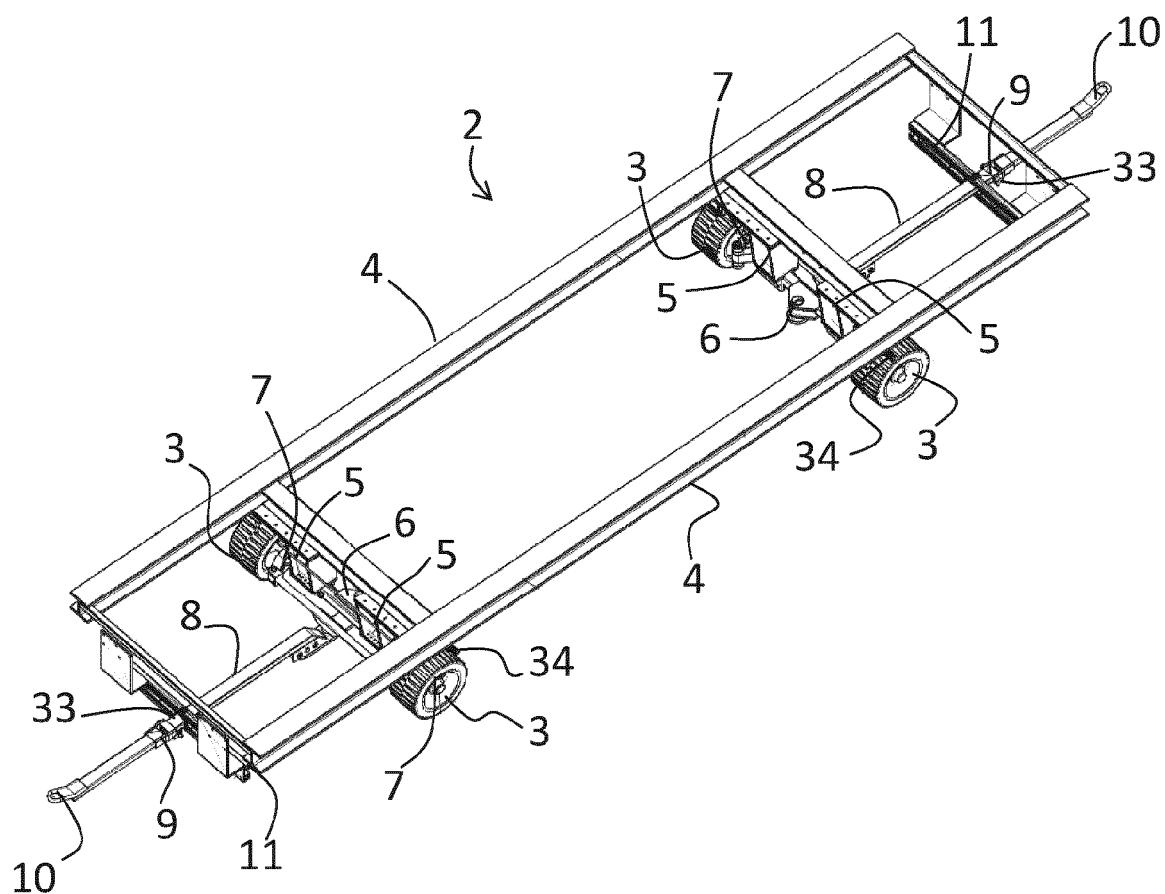


Fig. 3

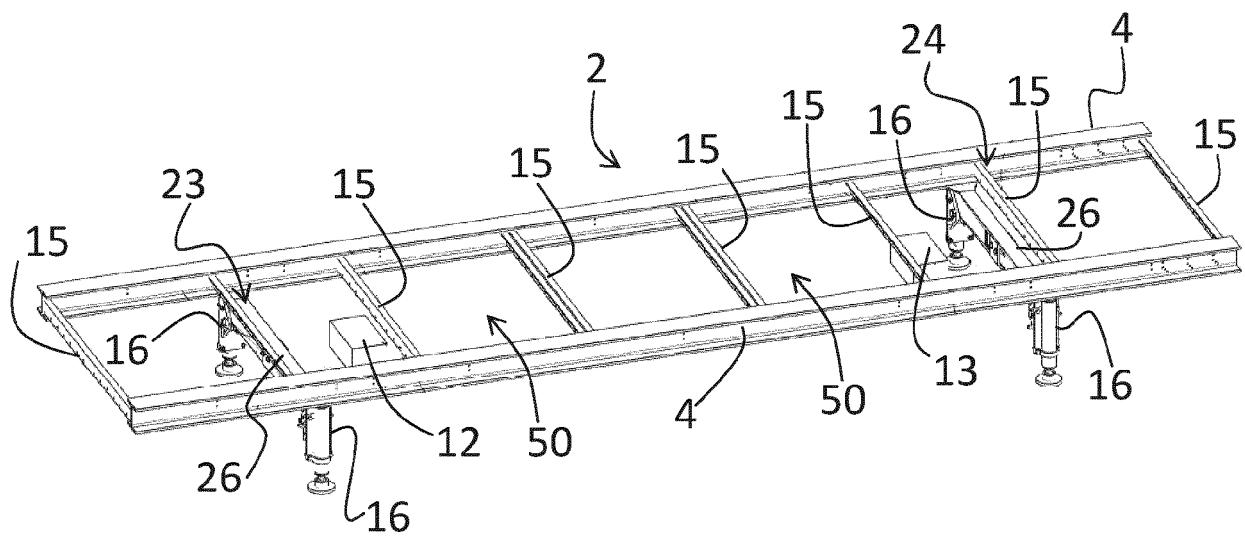


Fig. 4

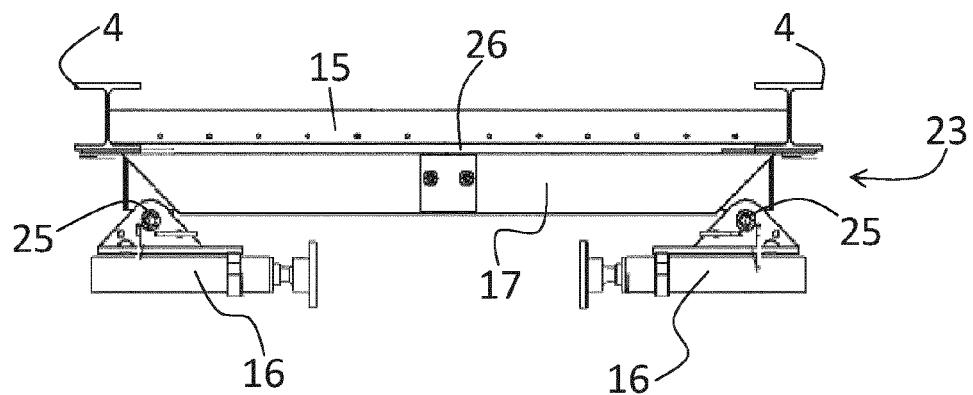


Fig. 5

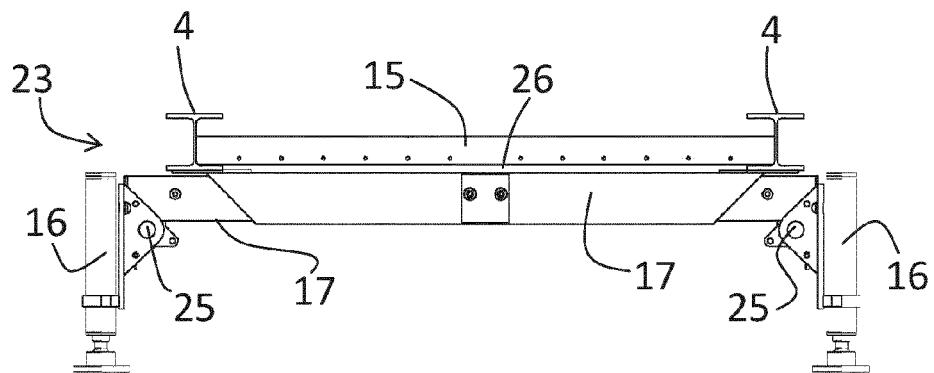


Fig. 6

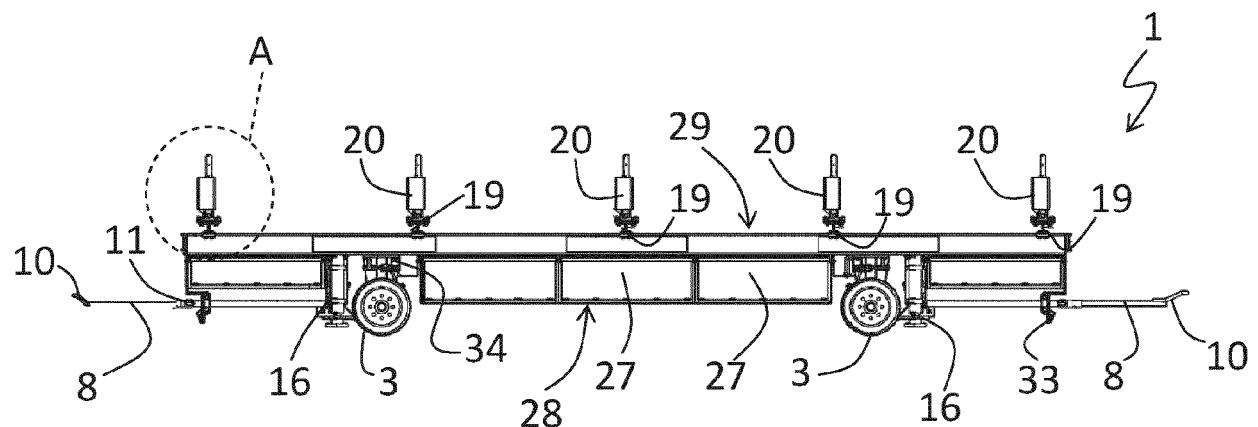


Fig. 7

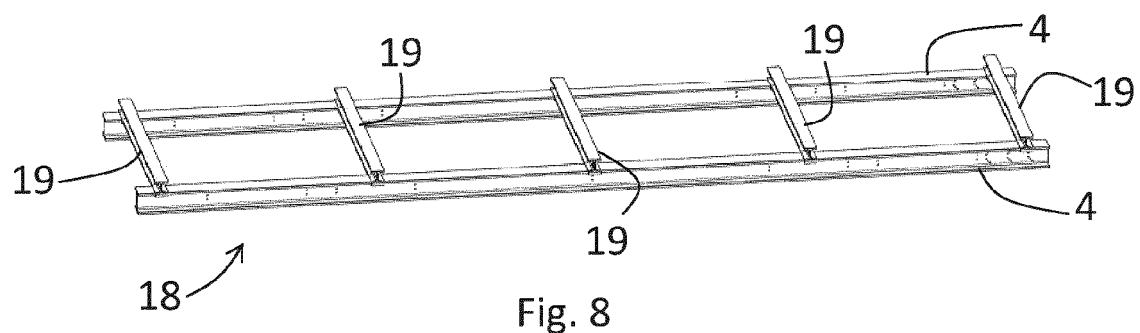


Fig. 8

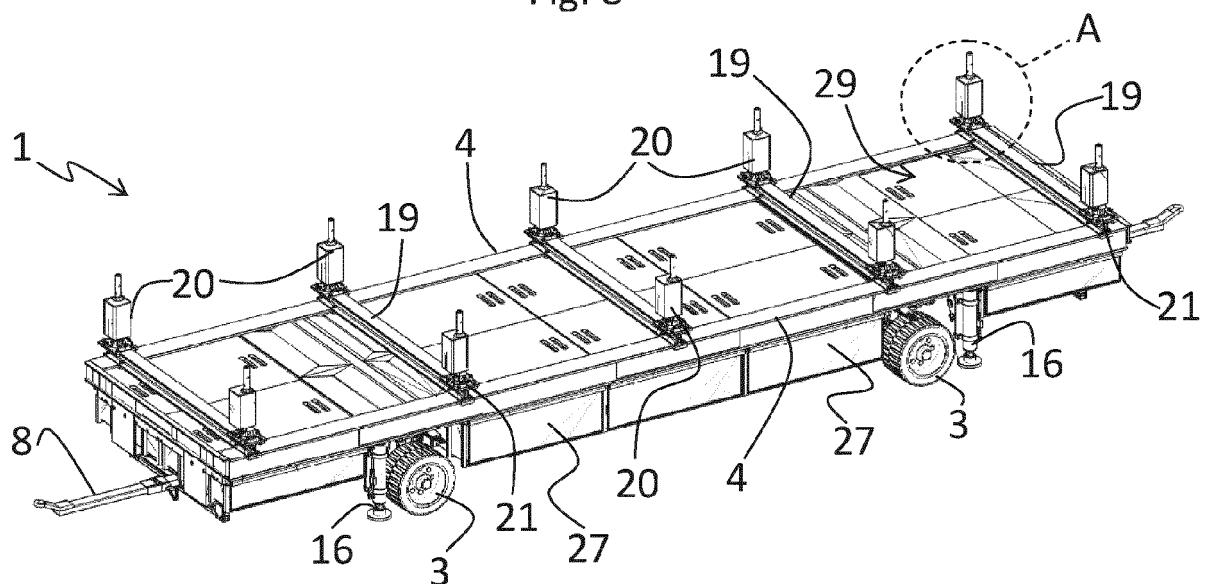


Fig. 9

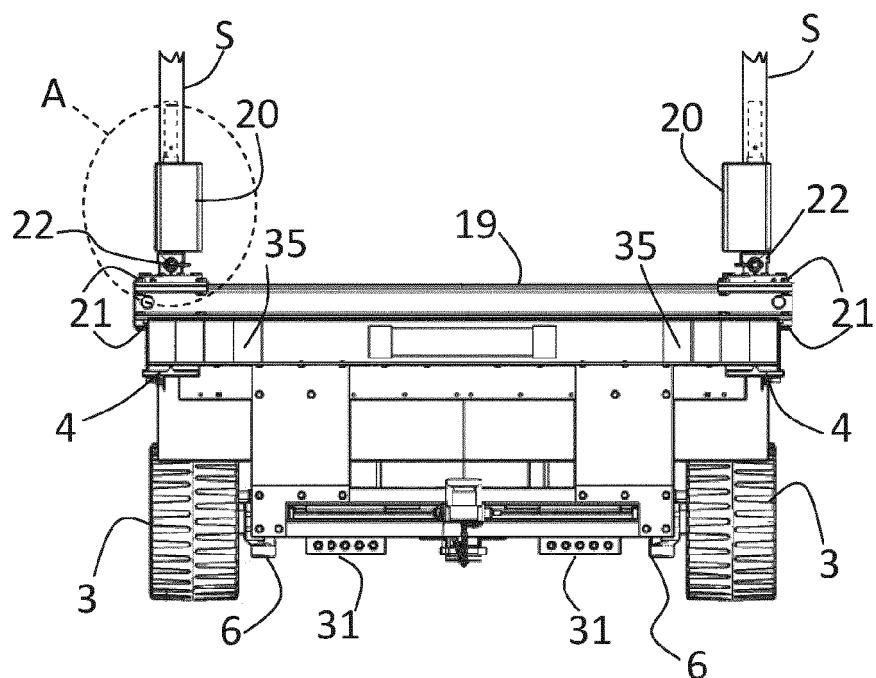


Fig. 9a

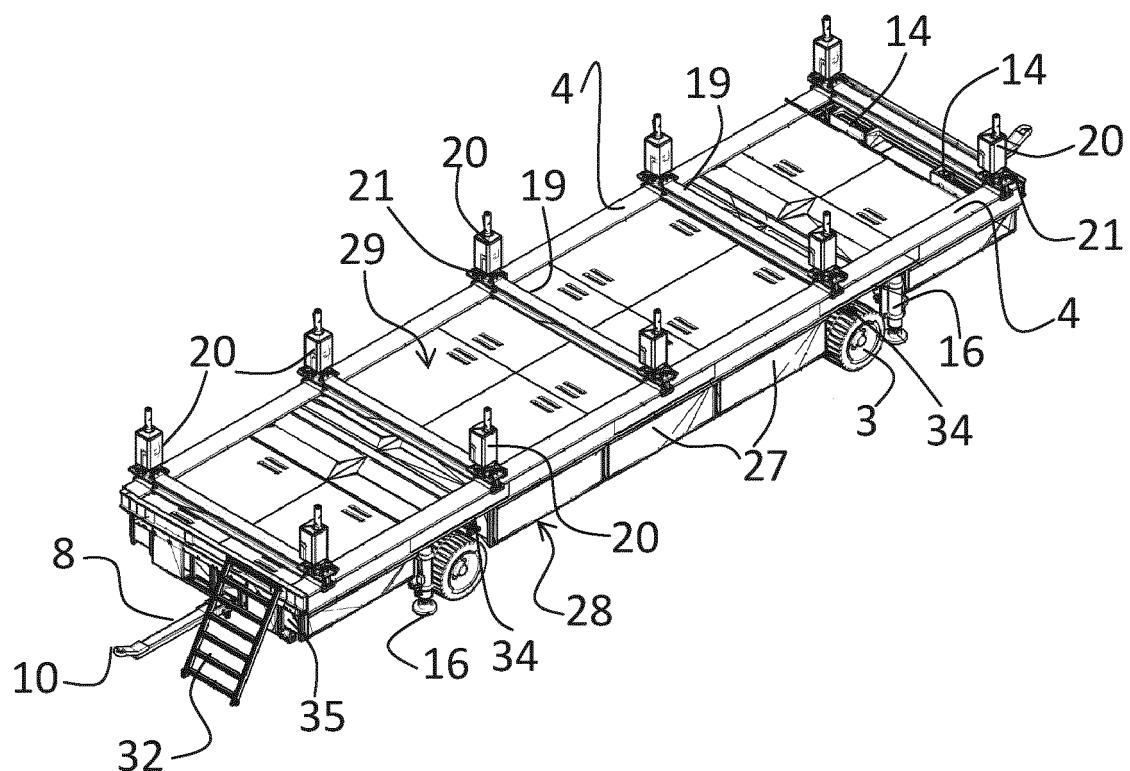


Fig. 10

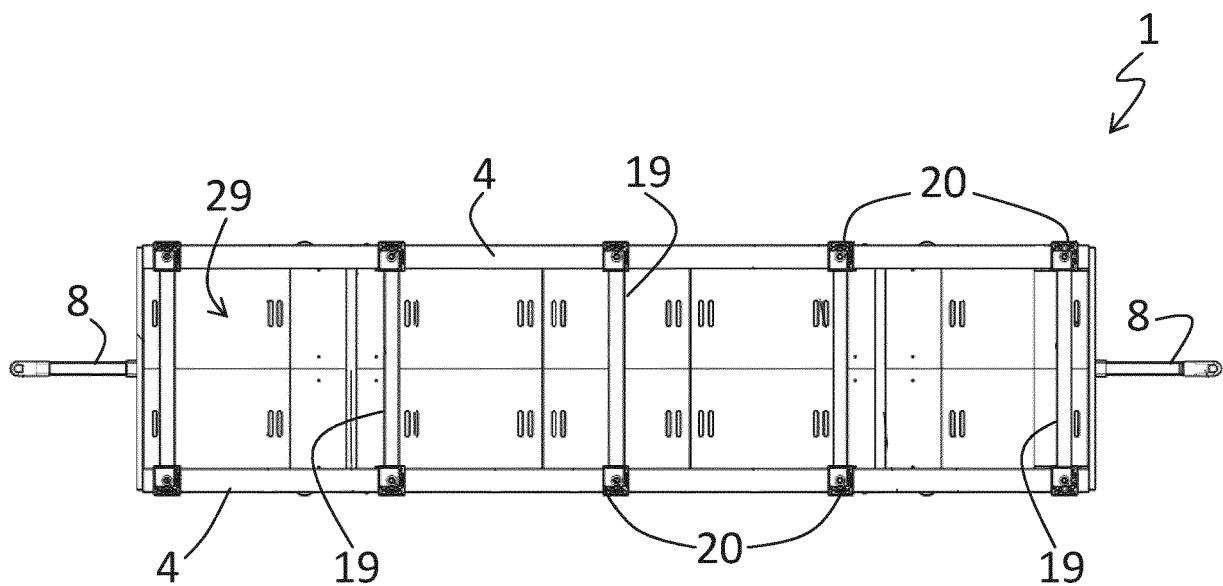


Fig. 11

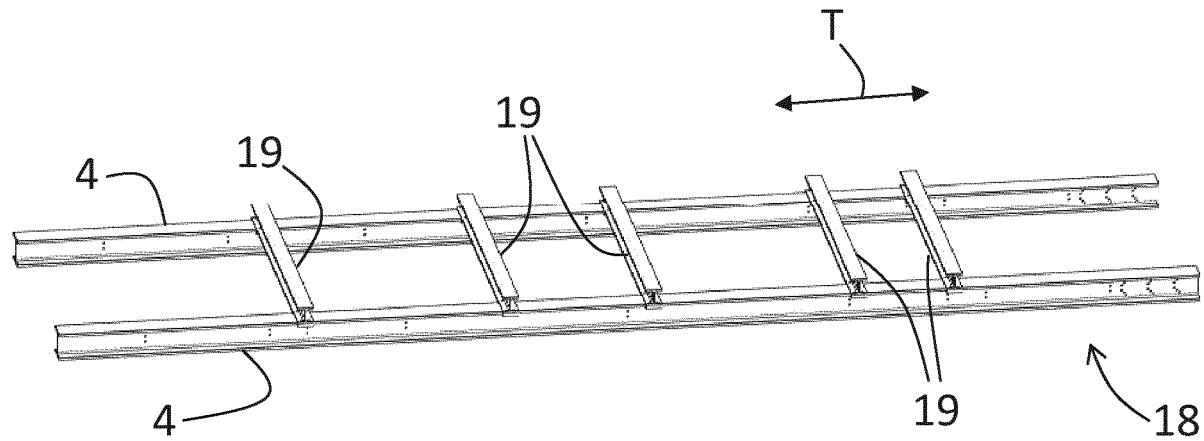


Fig. 12

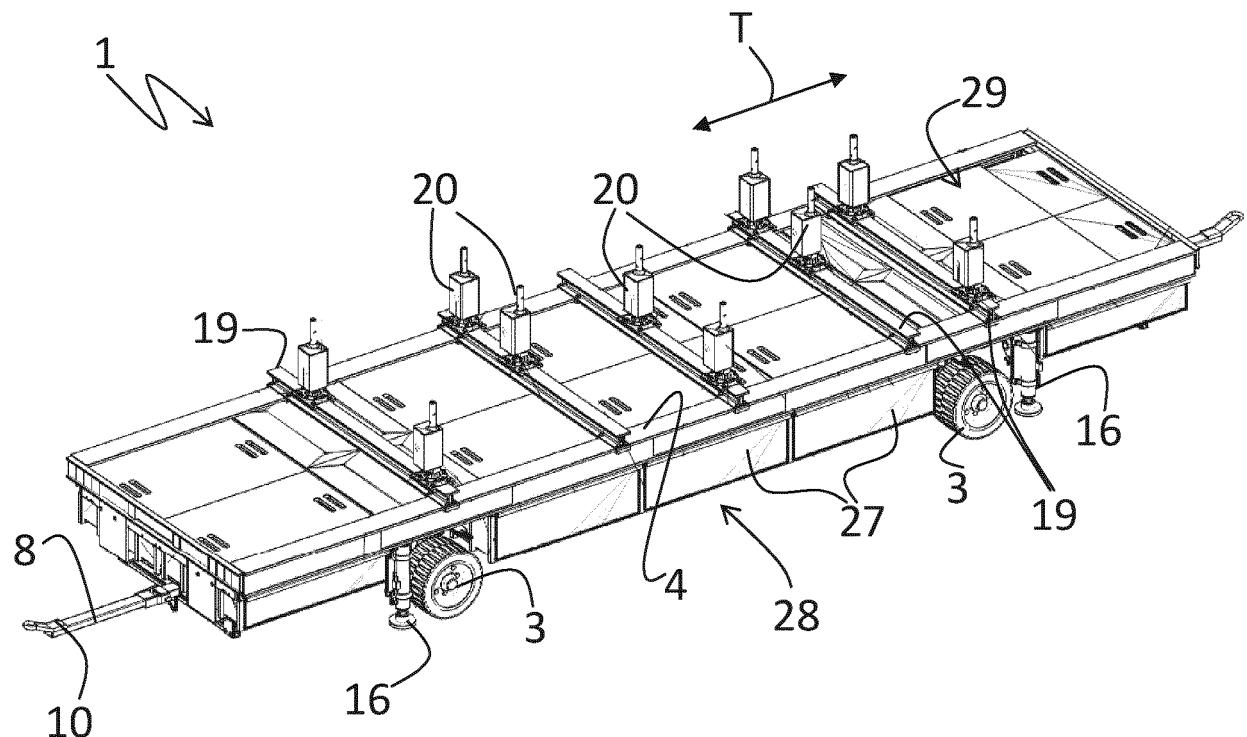


Fig. 13

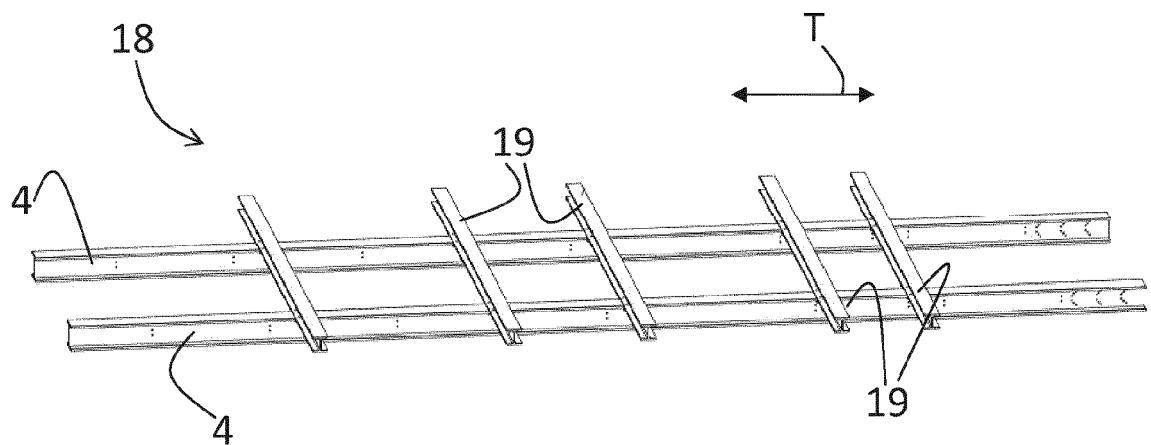


Fig. 14

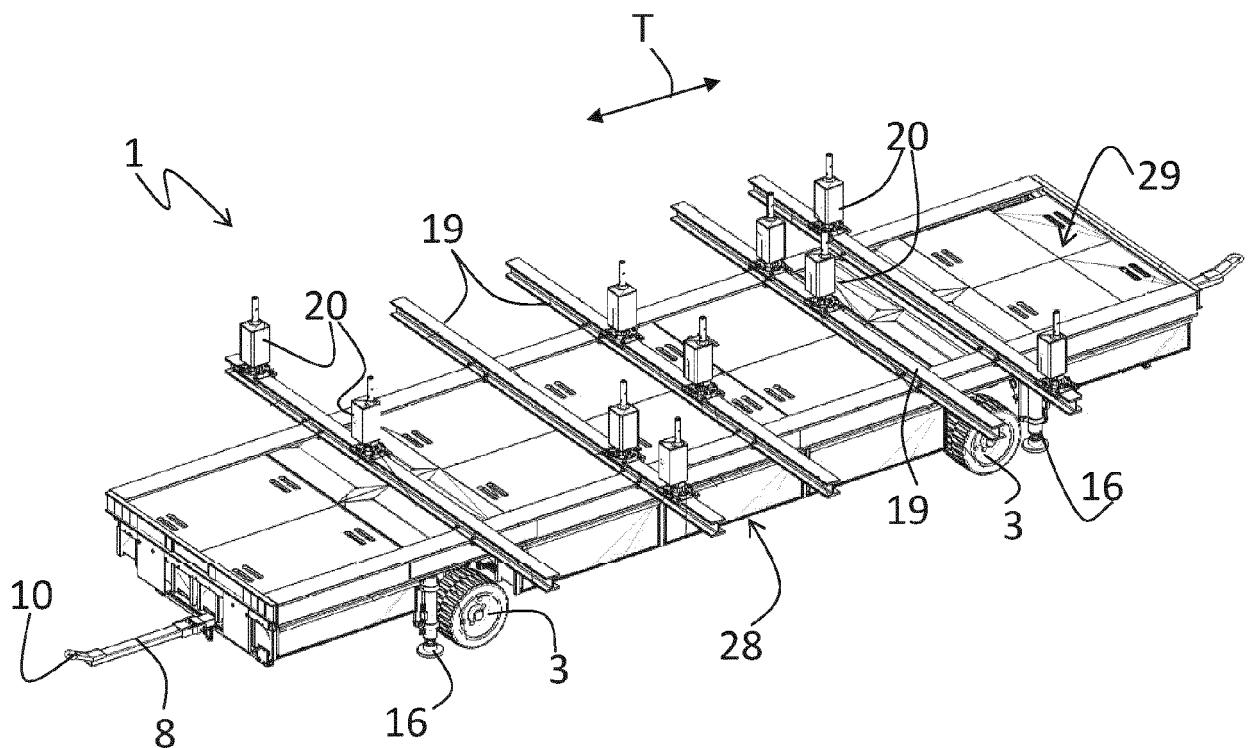


Fig. 15

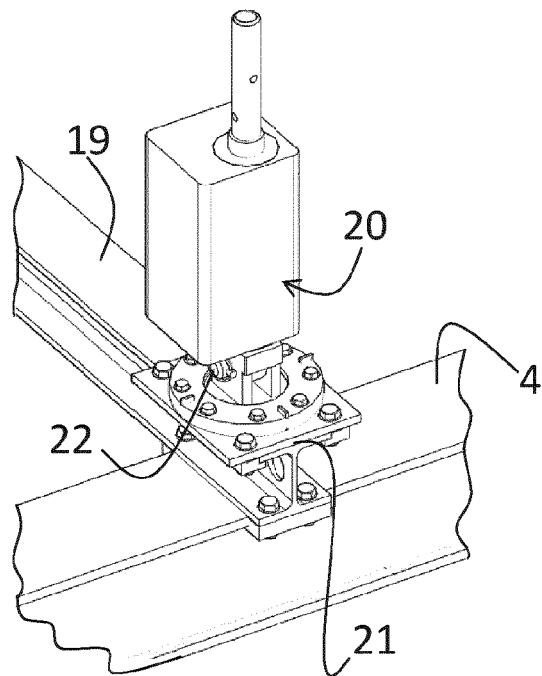


Fig. 16a

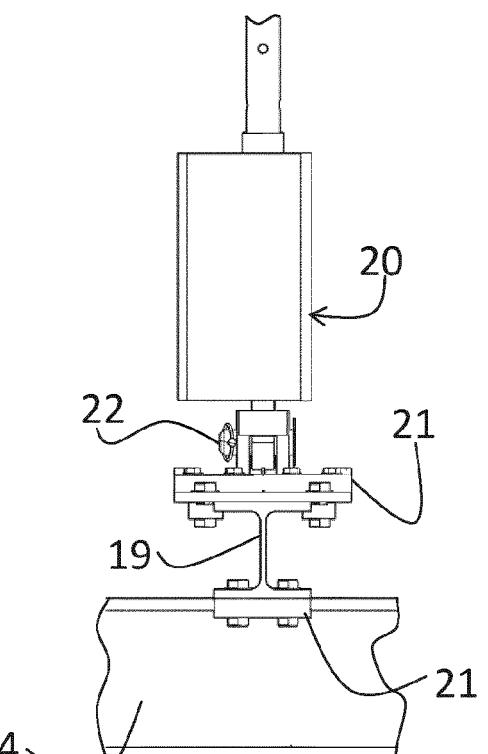


Fig. 16b

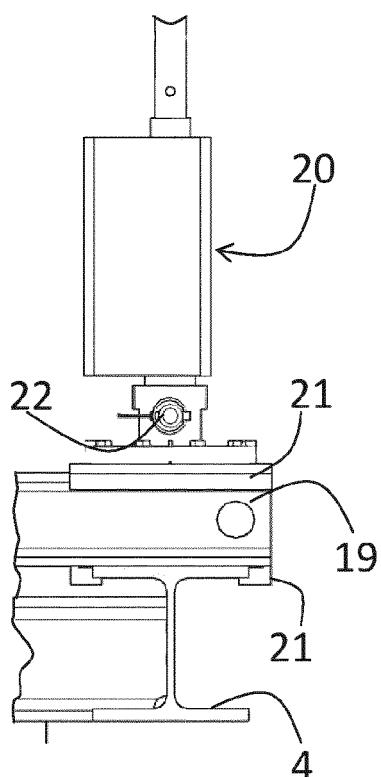


Fig. 16c

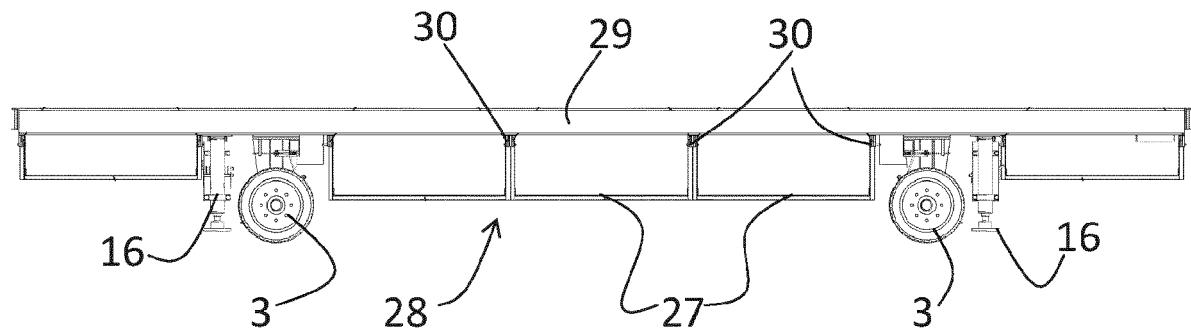


Fig. 17

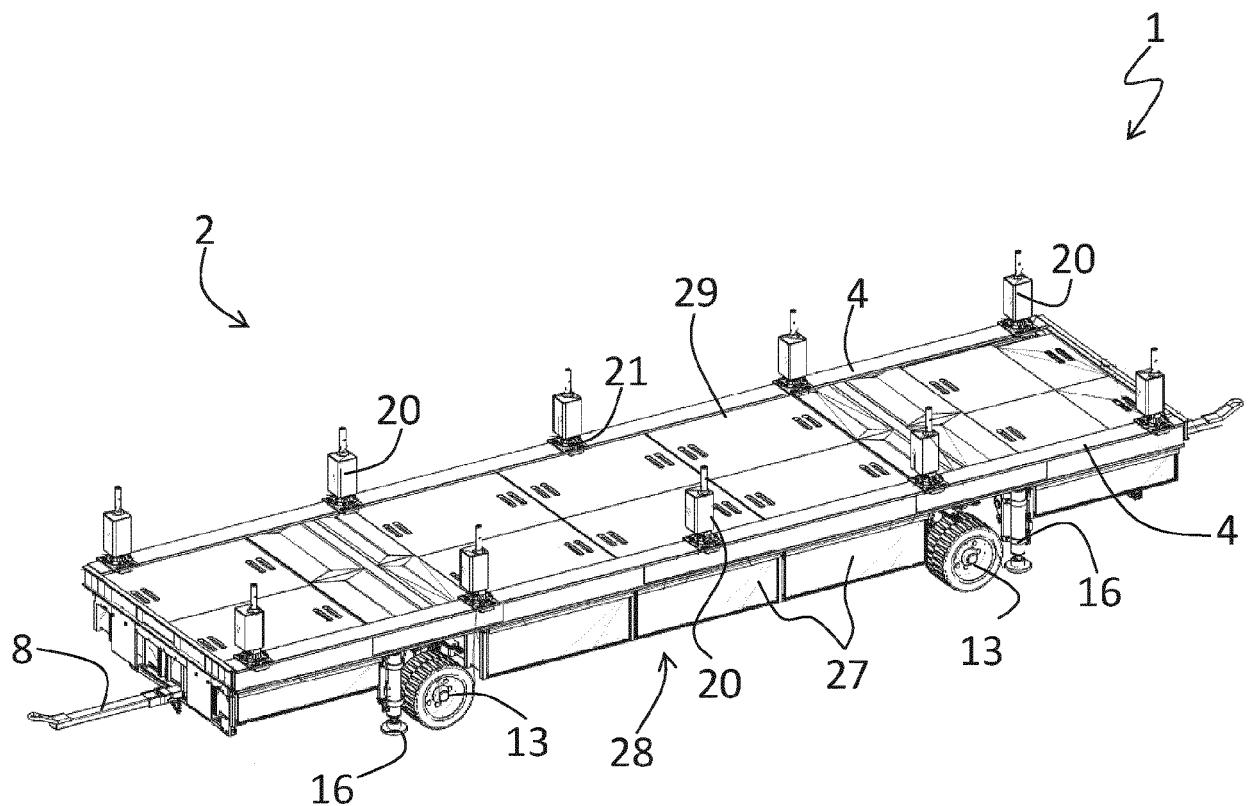


Fig. 18



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Application Number

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5

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50 1	The present search report has been drawn up for all claims		
55	Place of search The Hague	Date of completion of the search 8 May 2020	Examiner Manera, Marco
CATEGORY OF CITED DOCUMENTS		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	
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			

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