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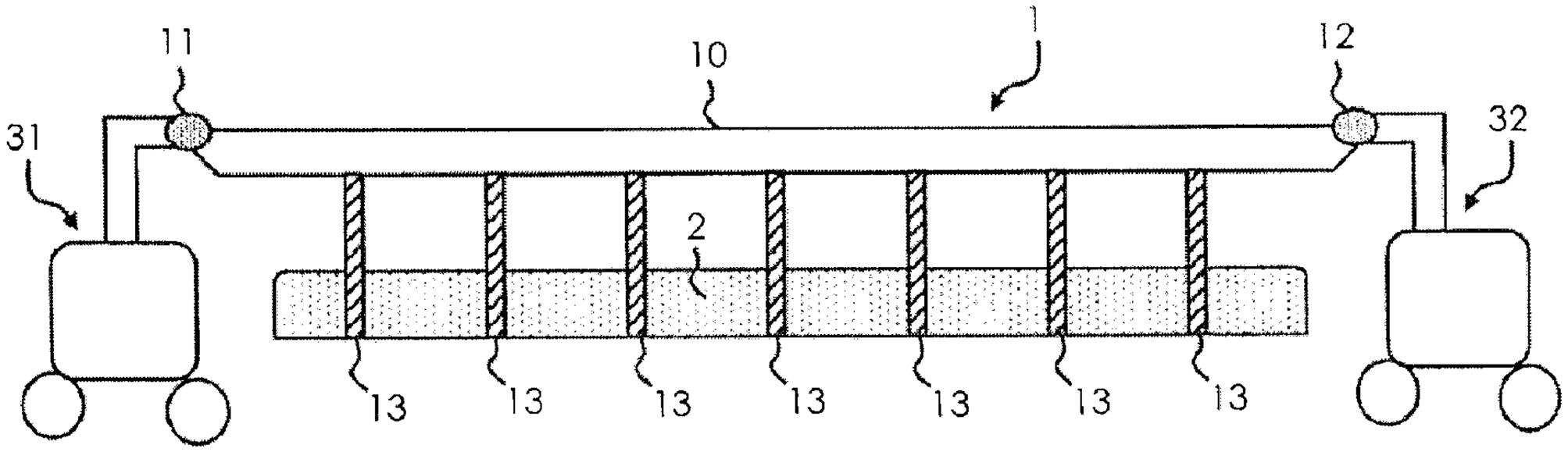
(54) Titre : POUTRE STRUCTURELLE CONVENANT A UN EQUIPEMENT DE SOUTIEN
(54) Title: STRUCTURAL BEAM SUITABLE FOR SUPPORTING EQUIPMENT



(57) Abrégé/Abstract:
A structural beam (1) adapted to support equipment (2), in particular a railway rail, said beam (1) including a longitudinal body (10) comprising a first connecting end (11) and a second connecting end (12) adapted for connecting to movement means (31, 32), and a plurality of linking elements (13), distributed along said longitudinal body (10), which are adapted to be linked to said equipment (2) in order to suspend said longitudinal body (10).

ABSTRACT

A structural beam (1) adapted to support equipment (2), in particular a railway rail, said beam (1) including a longitudinal body (10) comprising a first connecting end (11) and a second connecting end (12) adapted for connecting to movement means (31, 32), and a plurality of linking elements (13), distributed along said longitudinal body (10), which are adapted to be linked to said equipment (2) in order to suspend said longitudinal body (10).

STRUCTURAL BEAM SUITABLE FOR SUPPORTING EQUIPMENT

GENERAL TECHNICAL DOMAIN AND PRIOR ART

This invention relates to the field of installation of equipment, in particular, railway equipment (rail, switch frog, etc.) when refurbishing a railroad track.

A railroad track, also called a railway, extends longitudinally and includes two longitudinal rails resting on cross ties. Each longitudinal rail is formed of a plurality of sections which are welded together at their ends and attached to the ties.

Due to wear induced by the movement of railway vehicles on the track, the worn longitudinal rails require periodic replacement with new longitudinal rails.

With reference to patent application FR 2847917A1, it is known to use a railway train (work train) to store the new longitudinal rails and to park them in a maintenance area. When in use, such a railway train has the disadvantage of occupying a track adjacent to the track being refurbished. This is disadvantageous when two stations are only connected by two adjacent tracks, all traffic between the stations being prohibited, which is a significant inconvenience as well as a loss to the rail network operators. Because of these disadvantages, refurbishment operations of a railway are only conducted during the night, which significantly increases the duration of refurbishment operations.

Known also, by patent application FR2394641A1, is a railway vehicle comprising a beam for laying of sections supported by a lifting arm. Such a railway vehicle has a large size as well as heavy weight, which inhibits easy handling and transport of such a beam and such an arm.

The invention is therefore intended to remedy these disadvantages by proposing a beam for support of equipment, in particular a railway rail, of new design in order to facilitate its handling and transport while ensuring reliable support of the equipment even if the latter has a heterogeneous weight distribution along its length.

The invention arose in the field of railways but it can be applied in any field requiring the transport of equipment, preferably longitudinal equipment with heavy weight.

GENERAL PRESENTATION OF THE INVENTION

For this purpose, the invention relates to a structural beam suitable for supporting equipment, in particular a railway rail, said beam including a longitudinal body comprising a first connection end and a second connection end adapted to connect it to movement means, and a plurality of linking elements, distributed along said longitudinal body, which are adapted to be connected to said equipment to suspend said longitudinal body.

The structural beam may be carried by its ends, which optimizes the length of the longitudinal body able to distribute and pass on the forces received by the linking elements. Thus, to support a single piece of equipment, a support beam according to the invention may have a limited length and a reduced size in comparison to a support beam used in the prior art on work trains and held in its centre by a hoisting crane or the like.

Preferably, the longitudinal body is modular so as to permit its storage with a small footprint. Thus, the support beam can be accommodated in a road vehicle of small size, which avoids the need for a railway vehicle as in the prior art.

Preferably still, the longitudinal body includes a plurality of independent modules connected to each other detachably. Thus, the modules can be advantageously stacked to minimize their footprint significantly.

Preferably, the longitudinal body has an adjustable length to adapt to the dimensions of the equipment to be supported and to the constraints related to the path of travel of the support beam. In addition, a body adjustable in length enables it to fit places with narrow access.

The longitudinal body advantageously includes a plurality of modules articulated with each other, which facilitates adjustment of the beam's length as well as its storage.

Preferably, the longitudinal body is configured to unfold in a horizontal plane, which advantageously permits unfolding in a tunnel.

According to one aspect of the invention, at least one part of the longitudinal body is telescopic to allow quick unfolding in operating position while having a limited footprint in storage position.

According to another aspect of the invention at least one part of the longitudinal body has a scissor-like structure to allow quick unfolding while in operating position while having a limited footprint in storage position.

Preferably, the support beam is lacking, at its central part, connection means to a hoisting crane or similar, which limits its weight.

Preferably, the longitudinal body is in steel or composite materials in order to have a limited weight and significant mechanical strength, in particular, against buckling forces. Advantageously, the longitudinal body is configured to support a heavy weight, in this example, on the order of 8 tons.

Preferably, the length of the longitudinal body is on the order of 30 metres in order to stably support a piece of equipment of high weight or length.

The support beam advantageously includes independent stabilization means suitable for resting on the ground, preferably be a plurality of legs. Thus, the beam can be mounted/unfolded above the ground without difficulty by the operators. Preferably, the independent stabilization means are integrated with each module of the support beam.

The invention also relates to an assembly of a beam as presented above and a first mobile conveyor and a second mobile conveyor connected respectively to the first connecting end and the second connecting end of the beam in order to move it. Such an assembly is advantageous for moving a piece of equipment quickly and reliably without using a work train as with the prior art.

PRESENTATION OF FIGURES

The invention will be better understood from reading the description that will follow, given only as an example, and referring to the drawings attached in which:

- figure 1 is a schematic side elevation of a support beam according to the invention when supporting a longitudinal railway rail, the said support beam being carried at its ends by conveyors;
- figure 2 is a schematic side elevation of a support beam according to the invention comprising several detachable modules;
- figure 3 is an exploded view of the support beam of figure 2;
- figure 4 is a schematic side elevation of a telescoping support beam according to the invention in extended position of use;
- figure 5 is a schematic side elevation of the support beam of figure 4 in storage position;
- figure 6 is a schematic side elevation of an articulated support beam according to the invention in extended position of use;
- figure 7 is a schematic top view of the support beam of figure 6;
- figure 8 is a schematic side elevation of the articulated support beam of figure 6 in intermediate position of use;
- figure 9 is a schematic top view of the support beam of figure 8;
- figure 10 is a schematic side elevation of the articulated support beam of figure 6 in storage position;
- figure 11 is a schematic top view of the support beam of figure 10;
- figure 12 is a schematic side elevation of a scissors support beam according to the invention in extended position of use;
- figure 13 is a schematic side elevation of the support beam of figure 12 in storage position.

It should be noted that the figures disclose the invention in a detailed manner in order to implement the invention, such figures of course serving to better define the invention where appropriate.

DESCRIPTION OF ONE OR MORE EMBODIMENTS AND IMPLEMENTATIONS

The support beam according to the invention will be presented to support a piece of longitudinal railway equipment but it goes without saying that the invention is adapted to support any type of equipment (a guardrail, ramp, handrail, spar, beam, etc.) for use in any type of industry.

Such a support beam enables in particular handling of any equipment, even with unbalanced weight, that is, whose weight is not distributed uniformly along its length. With such a support beam, mechanical stresses are distributed uniformly, without risking deformation of the equipment.

With reference to figure 1, a support beam 1 according to the invention is represented schematically, transporting a longitudinal railway rail 2 between a place for storage of railway rails and a maintenance place.

Support beam 1 is called structural because it enables significant mechanical forces to be transferred and, in particular, to support a piece of equipment with heavy weight, on the order of 8 tons.

In this example, support beam 1 has a vertical height greater than its side thickness in order to have a significant resistance to buckling while limiting its footprint.

Referring to figure 1, support beam 1 includes a longitudinal body 10 with a length greater than 30 metres in order to support pieces of equipment of great length such as longitudinal rails.

Support beam 2 includes a first connecting end 11 and a second connecting end 12 adapted for connecting to movement means, in particular, mobile conveyors 31, 32 such as road or railway controllers. Preferably, each connecting end 11, 12 has a substantially spherical shape in order to form a ball-joint connection with mobile conveyors 31, 32 so as to limit any stress related to deflection of the beam 1 while it is moving. Thus, advantageously, support beam 1 is automatically balanced vertically even if conveyors 31, 32 are inclined due to the level of the ground. It goes without saying that other types of connecting ends 11, 12 could also be appropriate.

Advantageously, a connecting end including a U-shaped yoke mounted on a free pivot as well as an articulated connection allows a ball joint connection to be made in a practical way in order to limit deflection of the structural beam 1 as will be presented by the following. A spherical connecting end is particularly advantageous given that it has a limited production cost.

Such connecting ends 11, 12 allow the support beam 1 to be supported by its ends to optimize the distribution of forces induced by the equipment 2 over the entire length of the longitudinal body 10. Thus, support beam 1 can support a piece of equipment 2 with heavy weight without risk of breakage while have a reduced length.

Preferably, each end part of the longitudinal body has a section decreasing from the centre of the longitudinal body 10 to its connecting end 11, 12, as illustrated in figure 1, in order to limit deflection.

Longitudinal body 10 of support beam 1 is in steel and/or composite materials in order to have significant strength, in particular against buckling, for reduced weight. Preferably, longitudinal body 10 of support beam 1 is hollow. Advantageously, longitudinal body 10 has a protective envelope in order to avoid any risk of injury to an operator while handling the support beam 1.

Referring to figure 1, support beam 1 includes a plurality of linking elements 13, distributed along said longitudinal body 10, which are adapted to be connected to the equipment 2 in order to suspend it from longitudinal body 10. In other words, the plurality of linking elements 13 forms a tackling means, that is, means for lifting a load at several areas spaced apart from one another.

Preferably, at least one plurality of linking elements 13 are movable along the length of longitudinal body 10 so as to be able to place linking elements 13 adaptably depending on the shape and weight distribution of each piece of equipment to be carried. Preferably, the movement of linking elements 13 is motorized and, preferably, controlled by the operator.

In this example of embodiment, each linking element 13 is present in the form of a flexible loop adapted to be passed under the equipment in order to lift it. It goes without saying that linking elements 13 could have a different form.

Such linking elements 13 allow for supporting railway equipment such as half-switches or frogs, independently of their weight and/or the position of their centre of gravity. In addition, while supported, the shape, dimensions and surface condition of the equipment are not affected, which is very advantageous.

In use, support beam 10 has significant length to promote balanced and stable support of a piece of equipment 2. Conversely, when stored, support beam 10 has a reduced length in order to limit its footprint and facilitate its transport, in particular, in a road transport truck, preferably, a category 1 semi-trailer truck.

Preferably, with reference to figures 2 and 3, longitudinal body 10 of support beam 1 includes a plurality of structural modules 100 connected detachably to one another. In this example, longitudinal body 10 of support beam 1 comprises 7 modules but it goes without saying that the number of modules 100 could be different.

Advantageously, the length of a structural module 100 is less than 20 m in order to allow for storage of such a structural module in a category 1 semi-trailer.

Preferably, structural modules 100 have differing lengths so as to permit assembly of a support beam 1 of desired length.

As illustrated in figure 3, each module 100 includes on at least one of its longitudinal ends means for connecting with another module 100 of support beam 10. The connecting means advantageously permits two consecutive modules 100 to be centred. Among the connecting means, there are distinct male connecting means 101 and female connecting means 102 adapted to work together and allow the structural forces to be transferred from one module 100 to another.

By way of example, with reference to figure 3, each male connecting means 101 is in the form of a longitudinal tongue while each female connecting means 102 is in the form of a longitudinal recess (not visible in the figures) whose shape is complementary

to the tongue. Thus, when connecting two structural modules 100 together, they are accurately aligned. Again preferably, each module 100 includes locking means for assembly of two consecutive modules 100 assembled together. In this example, with reference to figure 3, each module 100 includes transversal openings 103 at its connecting means 101, 102 so as to permit locking together of two assembled modules 100 by pinning. It goes without saying that the locking means could be different. In particular, the locking means could be integrated into connecting means 101, 102.

The support beam 1 is, in this example, symmetrical. In addition, the central portion of support beam 1 has a substantially constant central section, which is advantageous for supporting a piece of equipment 2 in a balanced manner. In addition, the number of structural modules 100 of support beam 1 can be adapted depending on the length of the equipment 2 to be lifted.

Preferably, longitudinal body 10 of support beam 1 is assembled at a height relative to the ground. Longitudinal body 10 is held at a height relative to the ground by independent stabilization means (not shown) adapted to be supported on the ground.

The independent stabilization means are preferably in the form of legs in order to facilitate positioning and parking of a module 100 during its assembly. Preferably, each module 100 includes a retractable leg. Again preferably, each leg is equipped with a motorized actuator to facilitate folding/unfolding it. Still preferably, each leg includes a support shoe which is articulated to adapt to the relief of the ground on which the leg is supported.

According to another embodiment, with reference to figures 4 and 5, longitudinal body 10 of support beam 1 includes a plurality of structural modules 200 adapted to fit inside one another in order to form a telescoping beam. In this example, longitudinal body 10 of support beam 1 includes 3 modules 200 but it goes without saying that the number of modules 200 could be different. Advantageously, the length of a structural module 200 is less than 15 m, preferably 10 m, in order to permit storage of a module 200 in a category 1 semi-trailer truck.

In this example, the modules 200 have differing sections so as to enable them to fit into one another.

Advantageously, the length of such a telescopic beam can be quickly adjusted between its position of use (Figure 4) and its storage position (Figure 5). In addition, the length of the support beam 1 can be adapted depending on the length of the equipment 2 to be lifted.

According to another embodiment, with reference to figures 6 and 11, longitudinal body 10 of support beam 1 includes a plurality of structural modules 300 adapted to fold over one another as illustrated more particularly in figure 10. In this example, longitudinal body 10 of support beam 1 includes 3 modules 300 but it goes without saying that the number of modules 300 could be different. Advantageously, the length of a structural module 300 is less than 15 m in order to allow for storage in a category 1 semi-trailer.

As illustrated in figure 9, two consecutive modules 300 are connected at their longitudinal ends by articulation means 301 with another module 300 of support beam 10. In this example, the articulation means 301 are configured to permit rotation in a direction orthogonal to the longitudinal direction in which support beam 1 extends in the position of use. Preferably, articulation means 301 are configured to permit rotation in a vertical direction so as to permit folding of the support beam 1 in a horizontal plane. This is particularly advantageous for folding the beam 1 when the vertical space is limited, for example, for folding in a tunnel.

In this example, articulation means 301 is in the form of a hinge but it goes without saying that other means of articulation could suit, for example, a rod, a flexible blade, etc. Preferably, support beam 1 includes motorized folding means, in particular, cylinders.

Advantageously, the headroom, that is, the vertical distance separating the load attachment point(s) and the connecting ends, is limited, which allows significant amplitudes along the 3 axes while respecting, for example, the gauge of a railway track.

Advantageously, the length of such foldable support beam 1 may be quickly adjusted between a use position at maximum length (Figures 6 and 7), and use position of

intermediate length (Figures 8 and 9) and a storage position (Figures 10 and 11). Thus, the length of the support beam 1 may be adapted depending on the length of the equipment 2 to be lifted.

According to another embodiment, with reference to figures 12 and 13, longitudinal body 10 of support beam 1 includes a scissors structure 400 so as to fold/unfold it quickly and easily . Such a scissors structure 400 is known to the person skilled in the art and will not be presented in more detail.

Longitudinal body 10 includes end sections 401 configured to take the loads in an evenly distributed and homogeneous manner. Preferably, each end section 401 has a triangular shape of which one edge is connected to the scissors structure 400 and the apex opposite such edge includes a connection end 11, 12 as illustrated in figures 12 and 13.

Advantageously, the length of such a telescopic support beam 1 can be quickly adjusted between its position of use (Figure 12) and its storage position (Figure 13). In addition, the length of the support beam 1 can be adapted depending on the length of the equipment 2 to be lifted.

In practice, to transport a railway rail from a storage area to a maintenance area, the operators first perform a step of unloading from a road truck in which support beam 1 is stored.

Then, the latter is assembled or unfolded in order to have significant length capable of supporting a railway rail of high weight. Preferably, support beam 1 is held at height above the ground with its legs.

Mobile conveyors 31, 32 then connect to end connections 11, 12 of support beam 1 in order to lift it above the ground by its ends in order to maximize the length of support beam 1 which is able to transfer forces.

Linking elements 13 of support beam 1 are placed around the railway rail 2 resting on the ground. In this example, linking elements 13 are distributed at equal distance from one another along the length of support beam 1 given that it has a homogeneous

weight distribution along its length. Preferably, linking elements 13 are moved so as to suspend equipment 2 from support beam 1. In practice, railway rail 2 extends at least 200 cm in the vertical direction from support beam 1 while moving in order to restrict any tipping.

The mobile conveyors 31, 32 are then moved on the ground then on the railway track to reach the maintenance area. End connections 11, 12 are advantageous for absorbing the oscillations of support beam 1 during its movement by mobile conveyors 31, 32. To release the railway rail 2, linking elements 13 are lowered to set railway rail 2 on the ground which can then be mounted on the railway track.

Thanks to support beam 1 according to the invention, it is no longer necessary to resort to using a railway train nor a massive support beam with a significant footprint.

CLAIMS

1. Structural beam (1) adapted to support equipment (2), in particular a railway rail, said beam (1) including a longitudinal body (20) comprising a first connecting end (11) and a second connecting end (12) adapted for connecting to movement means (31, 32), and a plurality of linking elements (13), distributed along said longitudinal body (10), which are adapted to be linked to said equipment (2) in order to suspend said longitudinal body (1), the longitudinal body including a plurality of independent modules (100) linked to one another detachably.

2. Beam according to claim 1, in which the longitudinal body (10) is adjustable in length.

3. Beam according to one of claims 1 or 2, in which the length of the longitudinal body (10) is greater than at least 30 metres.

4. Beam according to any one of claims 1 to 3, in which the beam (1) includes independent stabilization means adapted for resting on the ground, preferably, a plurality of legs.

5. Assembly of a beam according to any one of claims 1 to 4 and a first mobile conveyor (31) and a second mobile conveyor (32) linked respectively to the first connecting end (11) and to the second connecting end (12) of the beam (1) in order to move it.

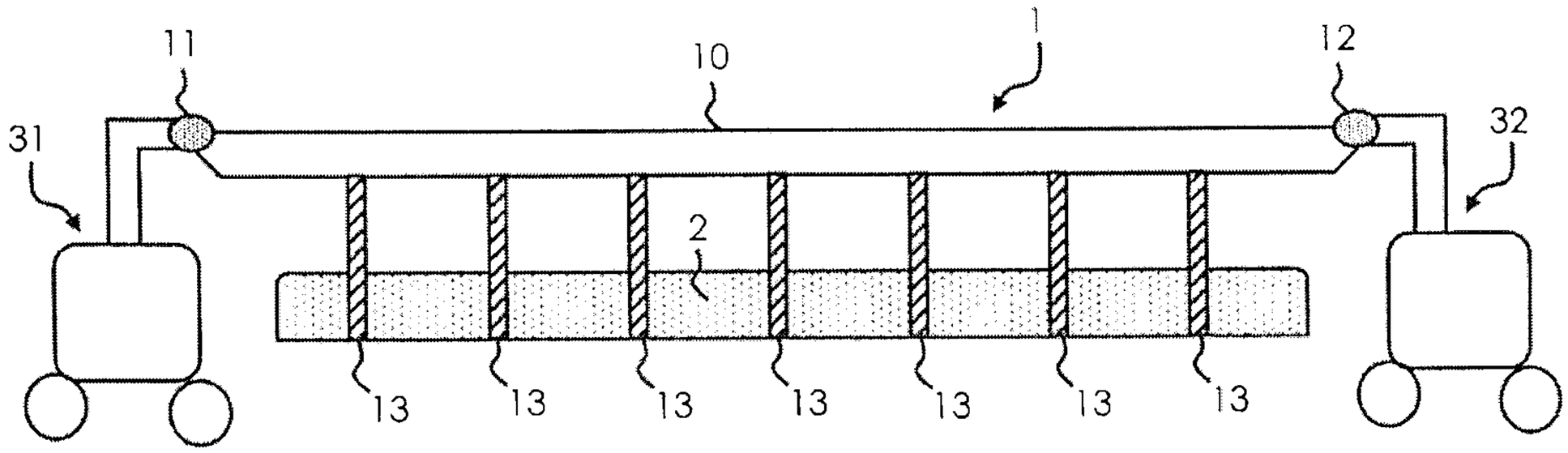


FIGURE 1

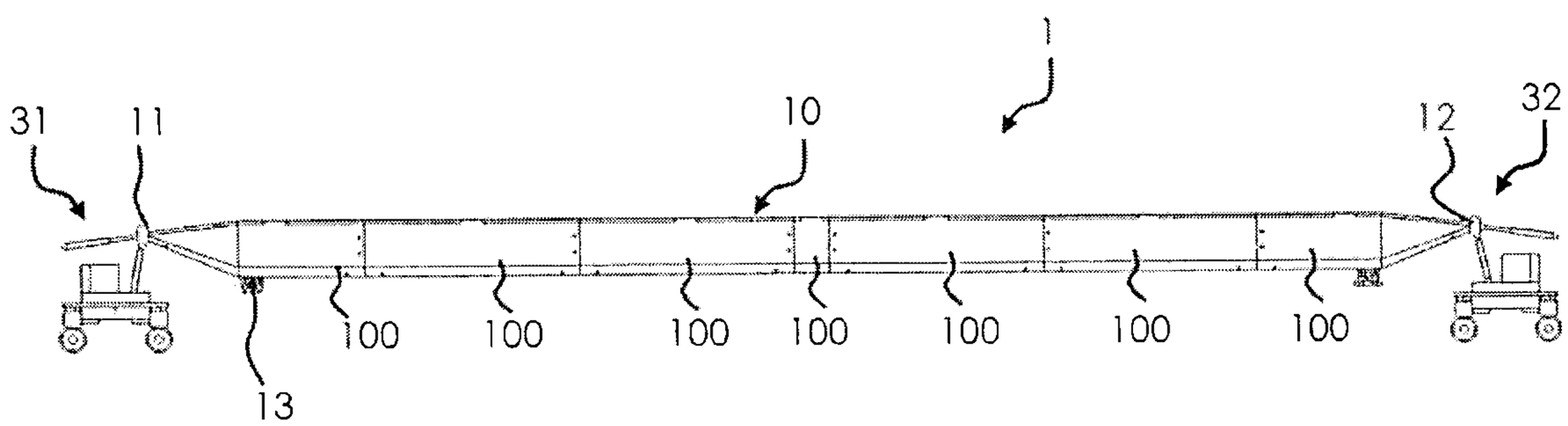


FIGURE 2

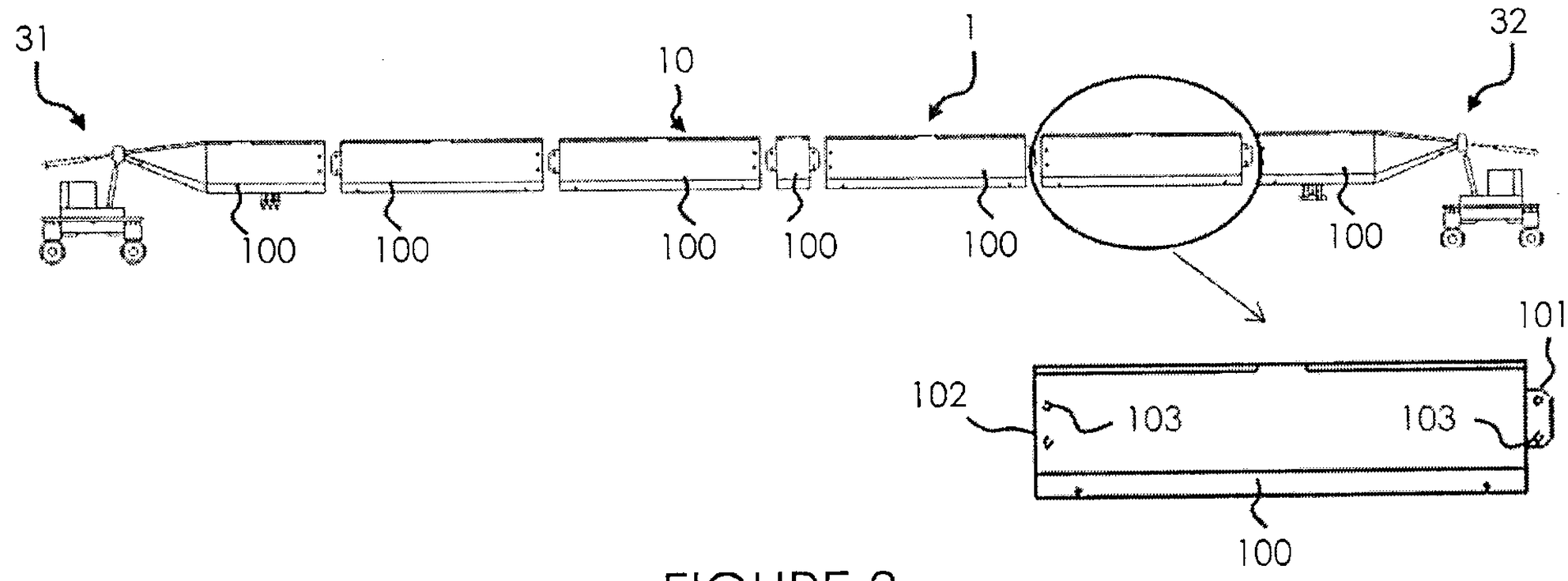


FIGURE 3

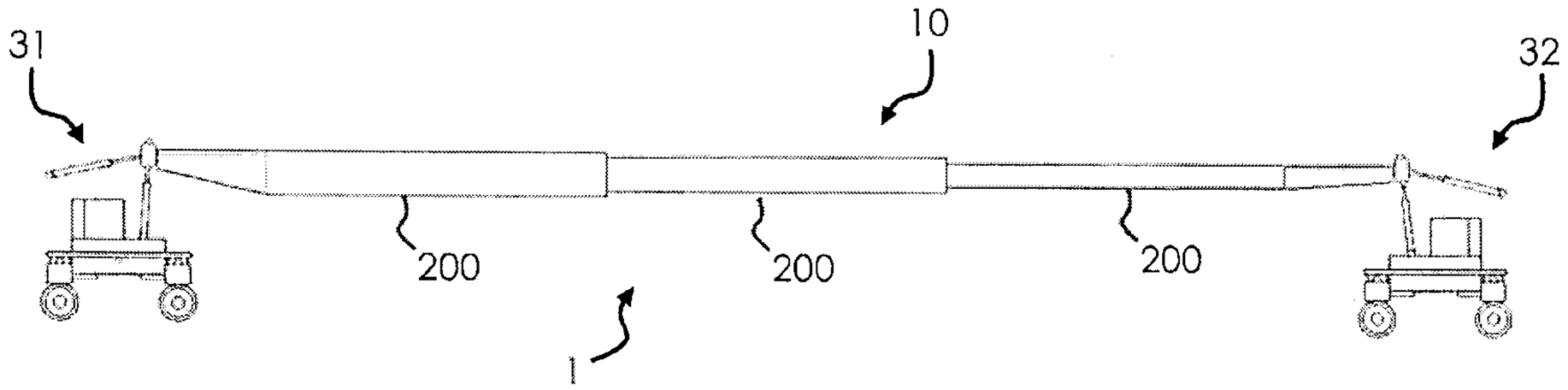


FIGURE 4

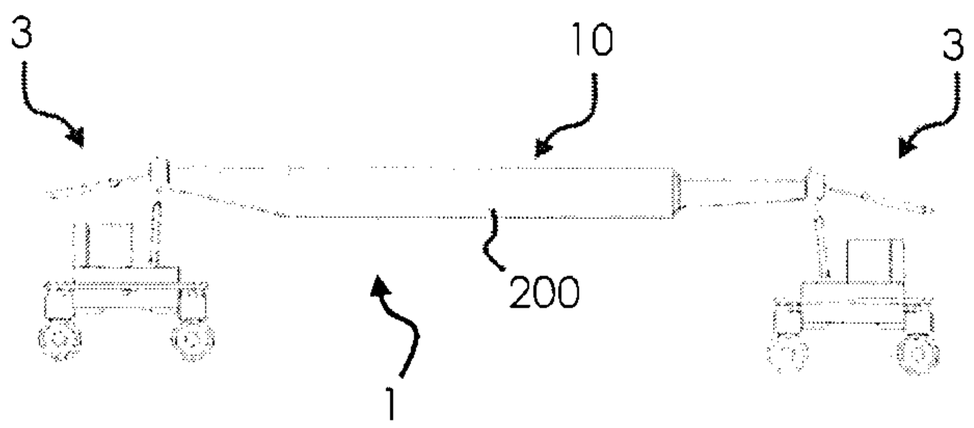


FIGURE 5

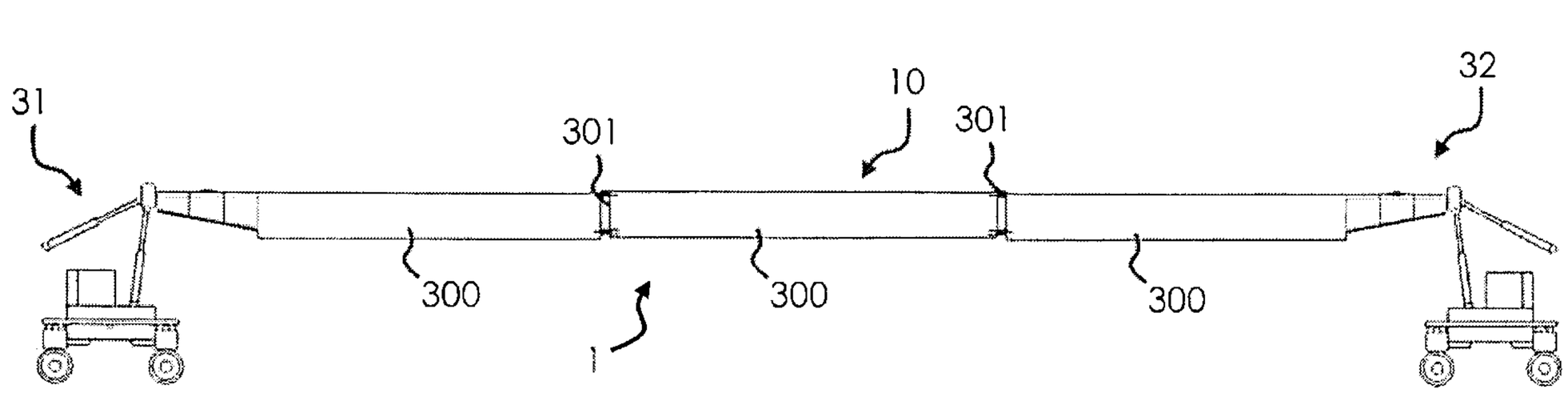


FIGURE 6

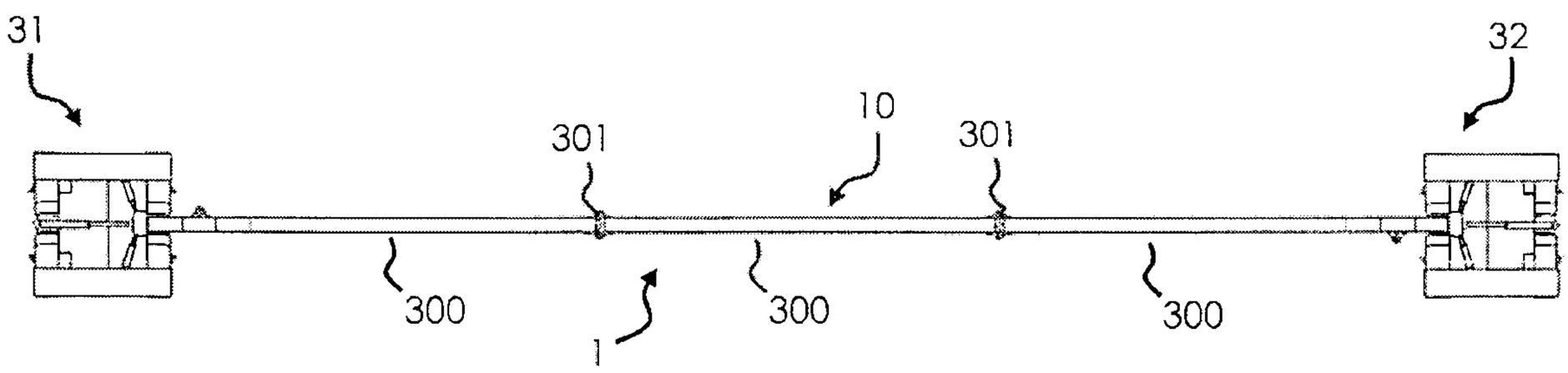


FIGURE 7

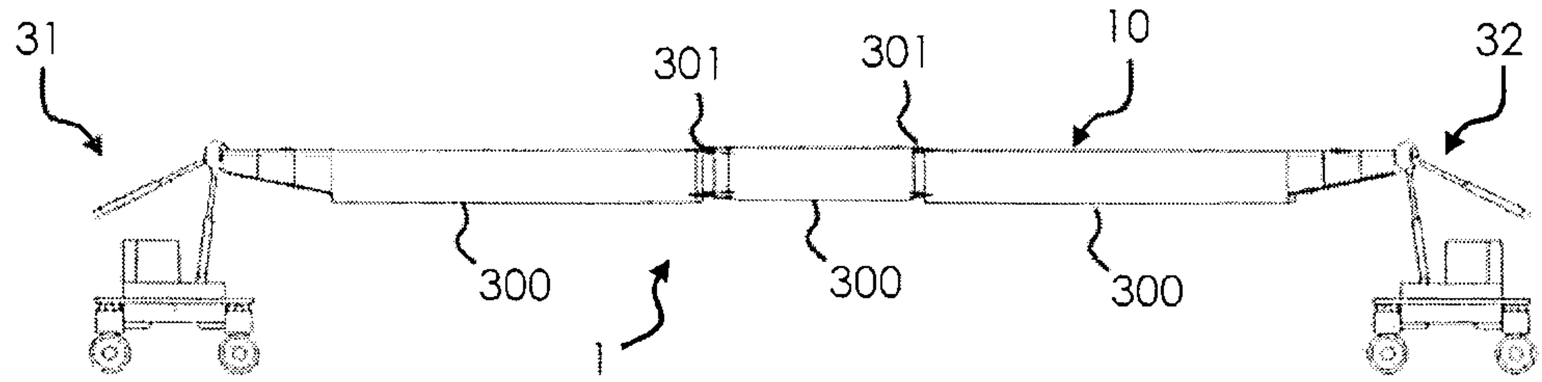


FIGURE 8

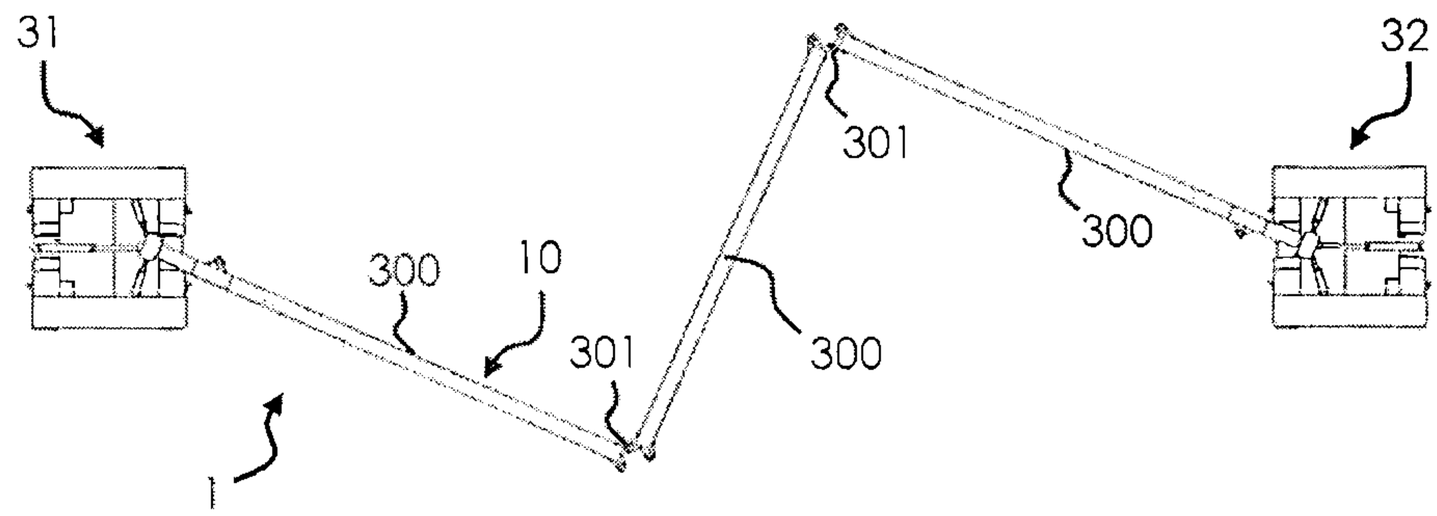


FIGURE 9

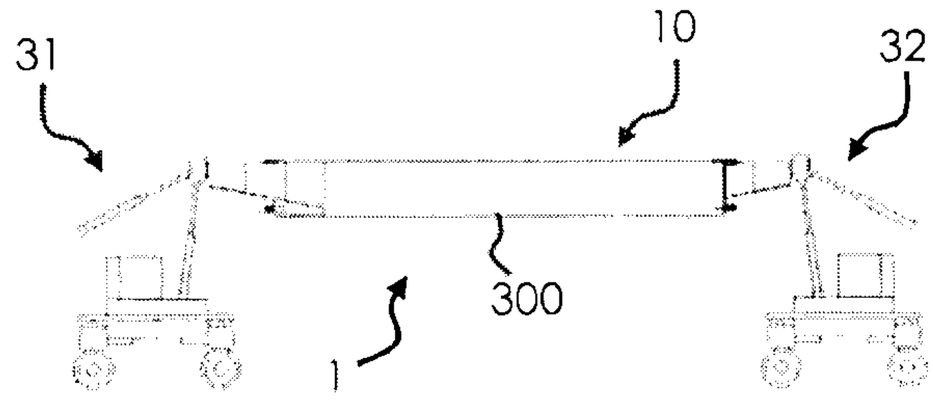


FIGURE 10

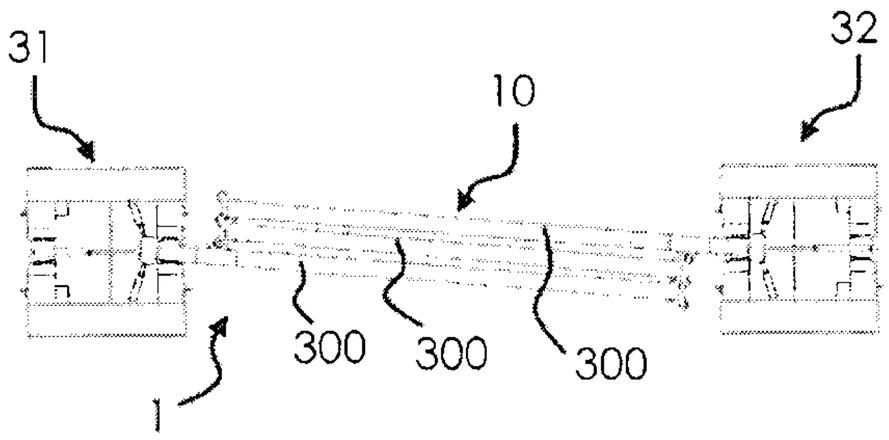


FIGURE 11

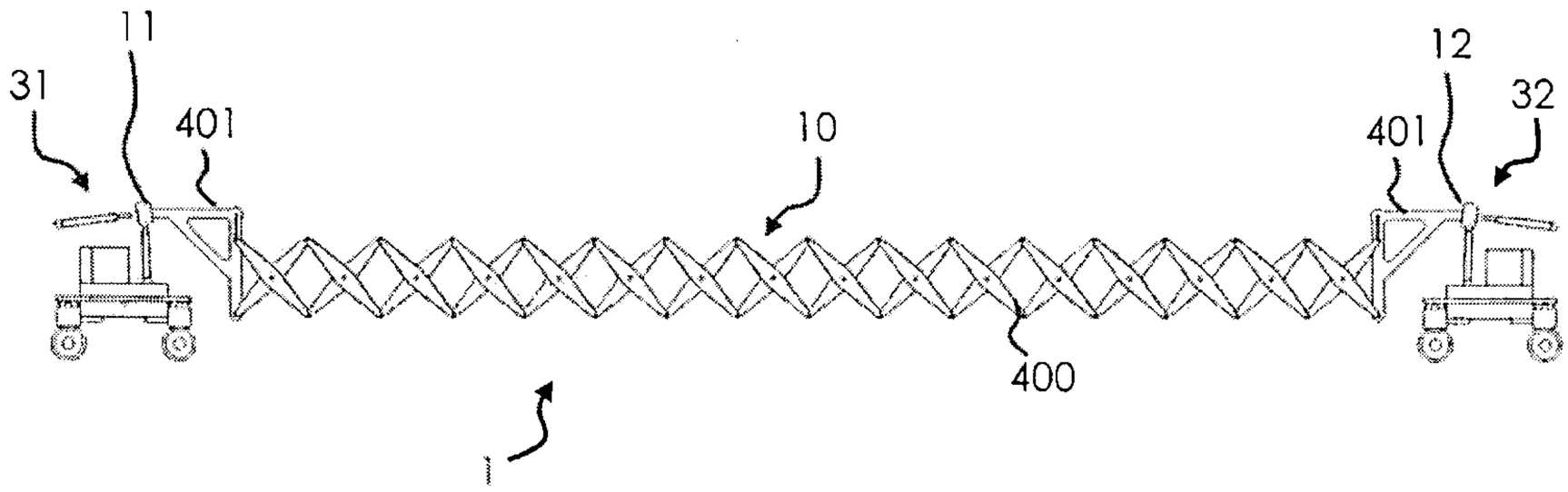


FIGURE 12

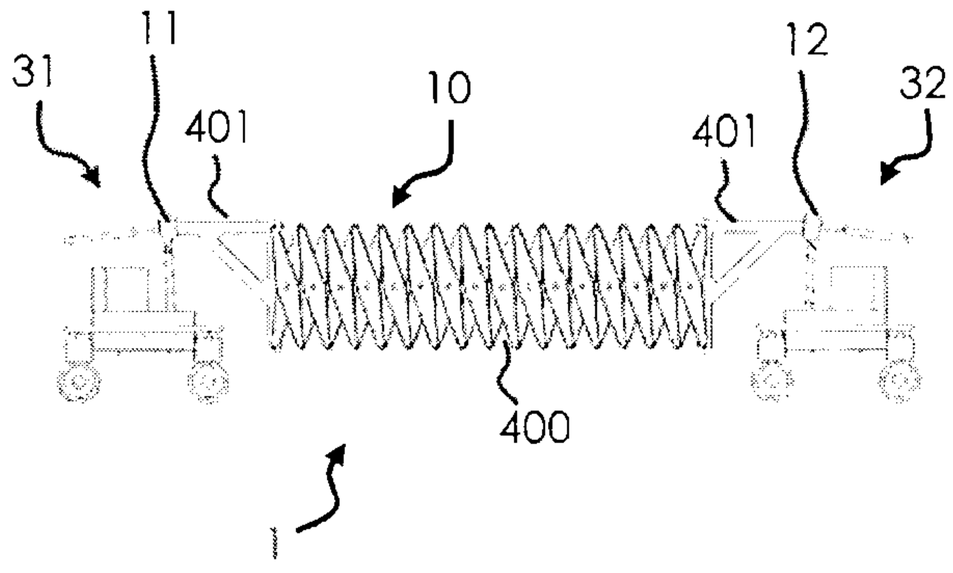
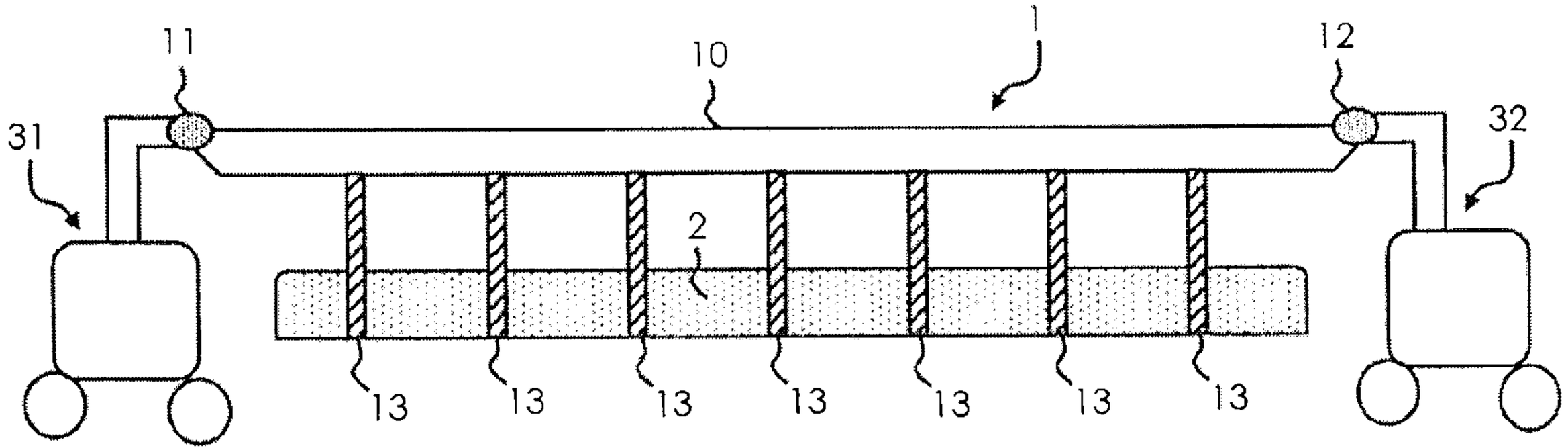


FIGURE 13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