

[54] **FRAMEWORK FOR TRAVELLING CRANE**
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[22] Filed: **July 27, 1972**

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[21] Appl. No.: **275,554**

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[30] Foreign Application Priority Data

Aug. 3, 1971 Switzerland 11392/71

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[52] U.S. Cl. 212/13, 212/5
 [51] Int. Cl. B66c 5/02
 [58] Field of Search 212/10, 5, 6, 13, 14, 15,
 212/16, 11, 12; 104/98, 137; 105/148, 157
 R, 407, 163 R

[57] ABSTRACT

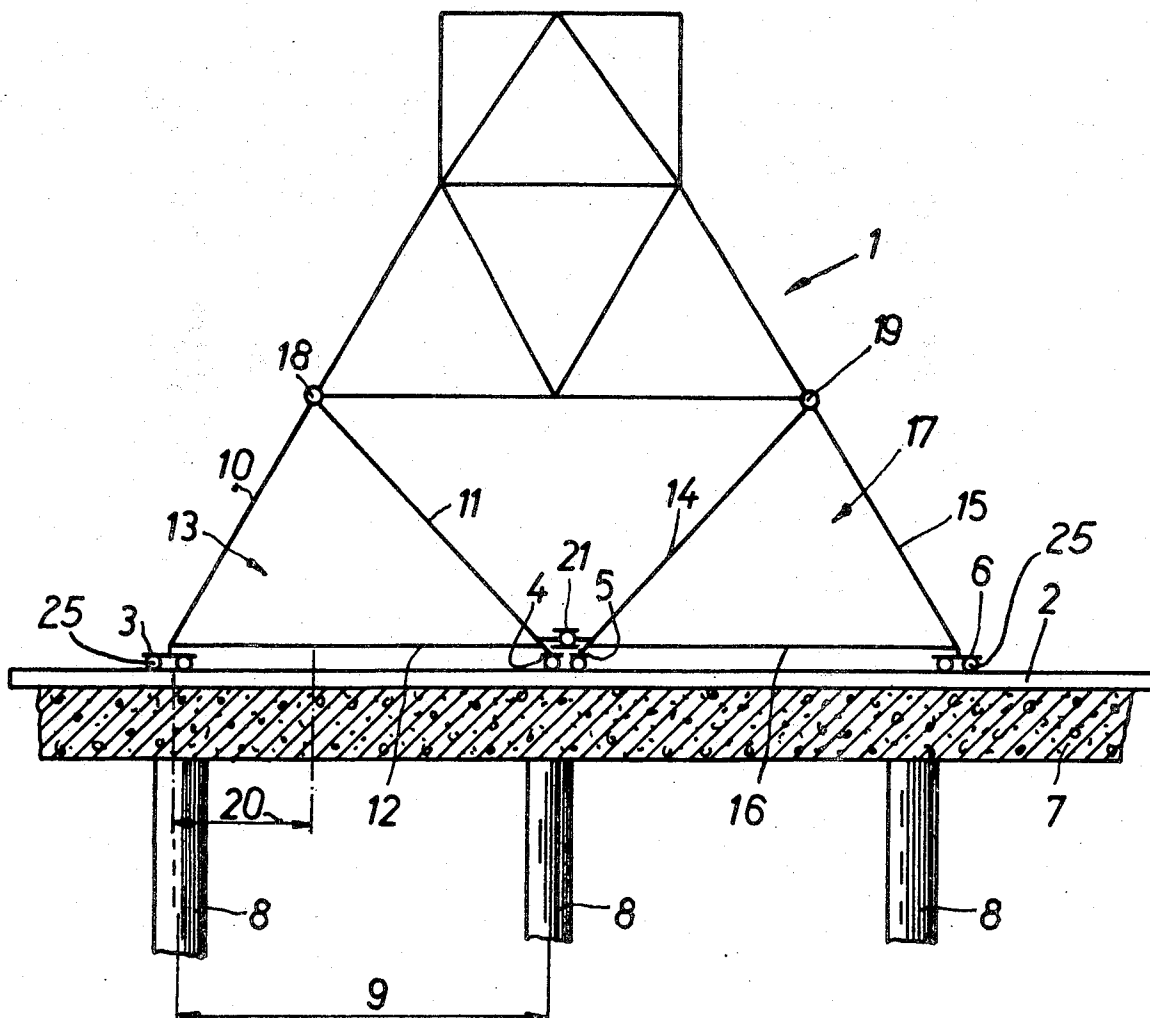
A framework for a travelling crane comprising a number of frame struts assembled together into articulated supports intended to travel upon rails.

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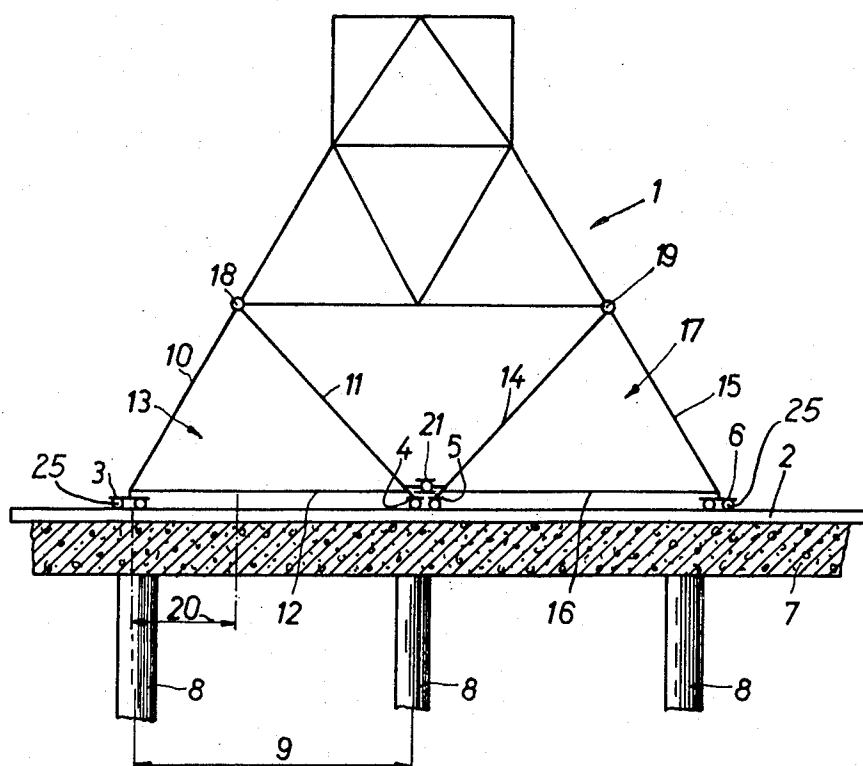
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4 Claims, 1 Drawing Figure



PATENTED MAR 11 1975

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FRAMEWORK FOR TRAVELLING CRANE

BACKGROUND OF THE INVENTION

The present invention relates to a new and improved construction of framework or frame for a travelling crane.

In the case of cranes travelling along rails upon a quay, it is oftentimes a problem to support the great weight of the crane upon the substructure of the quay in such a manner that there are present permissible surface loads of the quay. To this end it is known to construct each support location of the rigid support frame of the crane as broad as possible by providing a number of balance supports and a multiplicity of travelling wheels to distribute the weight of the crane over a broad area of the quay. If a plurality of such balance supports are provided then considerable problems arise since it is not readily possible to avoid by means of such support locations lateral forces within the support frame owing to the prevailing moments caused by the uneven cause of the rails. Notwithstanding the use of a great many travelling wheels at such previously mentioned wheel supports, the surface load can still be much too great for some quay installations. This means that a great many quay installations cannot be desirably equipped with heavy-duty cranes. Moreover, the characteristics of the relevant quay also determines to a great extent the size of the crane which can be installed, which of course is unsatisfactory.

A quay surface bearing upon a number of piles, statically considered, constitutes a continuous beam which is loaded by one or a number of load pairs. These pairs of loads result from the support locations of the crane frame along a rail. In the case of older quay installations, there were previously employed driven piles located at a spacing of about $3\frac{1}{2}$ to $5\frac{1}{2}$ meters viewed in the lengthwise direction of the rails. At the present time, there are more readily employed cast tubular piles having a spacing up to 6 meters. Nowadays, ship cranes are employed which have a support width in the lengthwise direction of the rails amounting to 9 to 14 meters. These modern cranes are oftentimes very heavy, so that as regards their support locations, viewed in the lengthwise direction of the rails, they produce great contact or bearing pressures.

SUMMARY OF THE INVENTION

Hence it is a primary object of the present invention to provide an improved framework for travelling cranes which is not associated with the aforementioned drawbacks and limitations of the prior art constructions.

Another and more specific object of the present invention relates to a new and improved construction of crane framework by means of which the aforementioned difficulties can be overcome so that also modern heavy cranes can be employed for quay installations and in particular for old quay installations.

Now in order to implement these and still further objects of the invention, which will become more readily apparent as the description proceeds, the inventive crane framework of this development is manifested by the features that a number of frame struts are assembled together to form articulated supports intended to travel upon rails.

Larger travelling cranes are generally not designed as solid wall or compact constructions, rather consist of a grid assembly. Now if a number of frame struts are in-

tended to be assembled together in such manner, then this means that such frame struts must be interconnected with one another such that they at least form an almost rigid unit, like a solid wall support. According to the invention, a plurality of rigid strut structures are constructed as articulated supports and bear through the agency of travelling wheels upon the rails. Each articulated support can be then equipped with two support locations for the travelling rails viewed in the lengthwise direction of the rails. The weight of the crane and also the additional loads, for instance caused by wind, are now taken-up by a number of support locations. Each support location must therefore bear less load. Owing to this plurality of support locations there is thus also realized load pairs spaced at a lesser distance from one another for the quay surface supported by the piles. By virtue of the inventive measures it is possible to select both of the support or bearing locations of an articulated support so as to be approximately equal to the spacing of the piles carrying the quay surface. This is extremely advantageous since it is known that in such case the bearing pressure and the bending moment as well as the throughbending of the quay surface are lowest and this loading technique is the most advantageous.

BRIEF DESCRIPTION OF THE DRAWING

The invention will be better understood and objects other than those set forth above, will become apparent when consideration is given to the following detailed description thereof. Such description makes reference to the annexed drawing which schematically illustrates an exemplary embodiment of inventive framework for a travelling crane.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Describing now the drawing, a crane framework 1 is constructed as a trussing or skeleton structure and can travel upon rails 2. The illustrated crane framework 1 is depicted as if viewed from the side of the water, so that only one rail 2 is visible in the drawing. Framework 1 is placed upon the rails 2 through the agency of the wheel supports or carriages 3, 4, 5 and 6. These wheel supports 3-6 carry travelling wheels 25. The rails 2 are mounted upon a quay surface or cover 7 which is supported by piles 8. In the case of existing quay installations, the spacing 9 of the piles 8 from one another amounts to about 3.5 - 6 meters. Moreover, there are provided a number of piles 8 situated behind one another so that here only the forward situated row of piles is visible in the drawing. The mutual spacing of the wheel carriage supports 3 and 6 with the presently employed cranes can amount to between 9 and 12 meters, sometimes also as much as 14 meters.

The frame struts or trusses 10, 11 and 12 form a hinged or articulated support arrangement 13 and the frame struts 14, 15 and 16 form a hinged or articulated support arrangement 17. The lower struts 12 and 16 situated at the base at the region of the wheel carriages 3-6, in the illustrated exemplary embodiment, are arranged at least approximately horizontally extend longitudinally and serially along the rail 2, and in conjunction with two respective upwardly directed struts 10 and 11 and 14 and 15 are assembled together into the aforementioned articulated support arrangement 13 and 17. These articulated supports or support arrange-

ments 13 and 17 are pivotably mounted at hinge joints 18 and 19 essentially in the same horizontal plane.

In the exemplary embodiment under consideration, the wheel carriages 4 and 5 are disposed directly adjacent to one another, as is also the case for both of the travelling wheels 25 of each of the wheel carriages 3 and 6 respectively. The adjacent base corners of the articulated supports 13 and 17 are spaced from each other by less than 1 meter. The adjacent corners of the articulated supports 13 and 17 are interconnected with one another by means of a sliding joint or hinge 21. Sliding joint 21 provides an articulated connection of both units 13 and 17 with one another and permits displacement of both of these units 13 and 17 towards and away from one another.

The hinge or articulation joints 18 and 19 are arranged over the associated bases defined by the struts 12 and 16 in such a manner that they are located at a spacing 20 from the respective wheel carriages 3 and 6, as shown. This distance or spacing 20 amounts to about one-third of the length of the associated base struts 12 and 16 forming the respective base of the articulated supports 13 and 17. If there is then considered the wheel carriages 4 and 5 as a common support location, then each of the now available three support locations 3, 4 and 5, 6 takes-up a respective one-third of the vertical load. Hence, if for instance 102 tons act upon the rails 2, then there are supported 34 tons at the wheel support 3, likewise 34 tons at the wheel support 6, and the wheel support 4 takes-up 17 tons and the wheel support 5 likewise takes-up 17 tons.

In the illustrated exemplary embodiment, the articulated supports 13 and 17 are designed as triangular guides and the travelling wheels 25 of the wheel carriages 3 - 6 are located at the base corners of such triangular guides.

According to another exemplary embodiment of the invention, it would also be possible to place the wheel carriages 4 and 5 further from one another, for instance at a spacing in the order of 3 - 4 meters. The spacing of both wheel carriages or supports 3 and 6 from one another can therefore be subdivided into three equal sections, so that also the wheel carriages 4 and 5 have the same spacing from one another as the wheel carriages 3 and 4 from one another and the wheel carriages 5 and 6 from one another. Hence, when again using two articulated supports, the crane framework will be supported at four locations at the rails 2. However, if it is desired to advantageously have, in the previously mentioned manner, the spacing of the wheel supports 3 and 4 from one another so as to be at least approximately equal to the spacing 9 of the piles 8, then illustrated exemplary embodiment is more advantageous.

The rigidity or stiffness of the planes or the framework 1 disposed transverse to the rails 2 is not impaired by the articulation hinge joints 18 and 19. Viewed statically, everything remains the same as previously; this is also true for the entire framework. The illustrated construction of the framework, in other words the illustrated plane, can be provided at the front (at the side of the water as explained) and at the rear, or only at the front or only at the rear, depending upon the requirements imposed by the understructure of the quay installation.

If the course of the rails 2 is very uniform, then the locations 18 and 19, instead of being designed as artic-

ulation joints, could also be constructed as standard connection or joint locations which are elastically deformable within the permissible stresses such that there occurs the same effect as for the mechanical constructed articulation or hinge joint. Such type constructed connection or joint location 18 and 19 would then merely constitute a mathematical articulation or hinge. A prior art construction of a rigid crane framework can not, for the purpose of distributing the vertical load, be supported at three wheel carriages or supports arranged in a row, since such rigid framework at three supports is incapable of accommodating an uneven rail. Such known rigid framework, for instance with the corner points 18, 19, 6 and 3, can be modified by cutting at the base in accordance with the inventive construction and providing the one beam portion 13 with the wheel carriage 4 and the other beam portion 17 with the wheel carriage 5. Then the location 18 and 19 would be constructed in such a manner that both beam portions 13 and 17 could move relative to one another. There would be installed between the beam portions 13 and 14 at the locations 4, 5, the sliding joint 21.

In the event it is desired to realize an improved distribution of the loads with a known crane framework for a travelling crane, that is to say, to have the intermediately disposed piles also participate in taking-up the load, then distribution of the load to a number of intermediately disposed piles could also take place through the agency of, for instance, hydraulic support elements. For that purpose, there is however required a hydraulic energy source and a servosystem in order to distribute the total load to the different support locations and in order to continuously realize this load distribution independently of the irregular course of the rails for the crane. The distribution of the load must be therefore continuously monitored and controlled. Should a valve of such system become defective, then there is a breakdown of the compensation and a failure in the uniform distribution of the load.

With the inventive crane framework, there is continuously realized and automatically maintained a uniform distribution of the load only by mechanical means. There is not present any energy source. It is for this reason that this type of uniform load distribution is reliable and always insured for.

While there is shown and described present preferred embodiments of the invention, it is to be distinctly understood that the invention is not limited thereto but may be otherwise variously embodied and practiced within the scope of the following claims.

Accordingly, what is claimed is:

1. A framework for a travelling ship crane on a rail, comprising
 - a pair of articulated support units, each constructed of struts rigidly joined in a triangular configuration to form a horizontal base and an upward extending apex,
 - said bases extending longitudinally and serially along the rail,
 - hinge means at the apex of each articulated support unit for supporting the crane,
 - wheel means at the base corners of each of the articulated support units for supporting the support units and crane on the rail, and
 - sliding joint means interconnecting the adjacent base corners of the articulated support units,

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the apex of each articulated support unit located at a horizontal spacing between the wheel means on the corners of each base to produce substantially equal loading on each wheel-means-engaged unit length of the full length of the rail beneath the pair of support units.

2. The framework as defined in claim 1, wherein both articulated support units possess a spacing from one another at the region of the base struts which is less than one meter.

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3. The framework as defined in claim 1, wherein both articulated support units possess at the region of the base struts a spacing in the order of 3 - 4 meters.

4. The framework as defined in claim 1

wherein the spacing between wheel means is at least approximately equal to a spacing between piles supporting a quay upon which the rails are mounted.

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