United States Patent

[11] **3,550,788**

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[45] Patented **Dec. 29, 1970**

[73] Assignee **United Industrial Syndicate, Inc.**
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[54] **OVERHEAD TRAVELING CRANE AND HOIST MECHANISM THEREFOR**
2 Claims, 7 Drawing Figs.

[52] **U.S. Cl.** **212/128,** 212/11, 212/18, 212/125
[51] **Int. Cl.** **B66c 19/00**
[50] **Field of Search** ..... 212/10-—15, 124—128, 18, 66, 69

[56] **References Cited**

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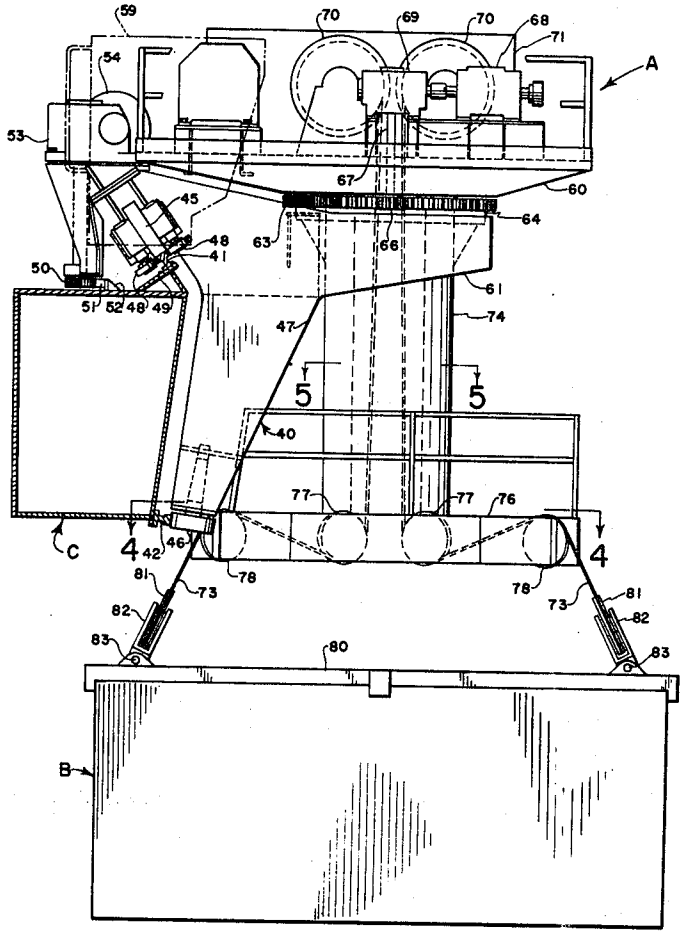
ABSTRACT: An overhead traveling crane with a trolley that runs along the side of a girder or other supporting structure in cantilever fashion. The trolley has a turntable mounted thereon which supports a hoist mechanism for lifting and lowering a suspended load.



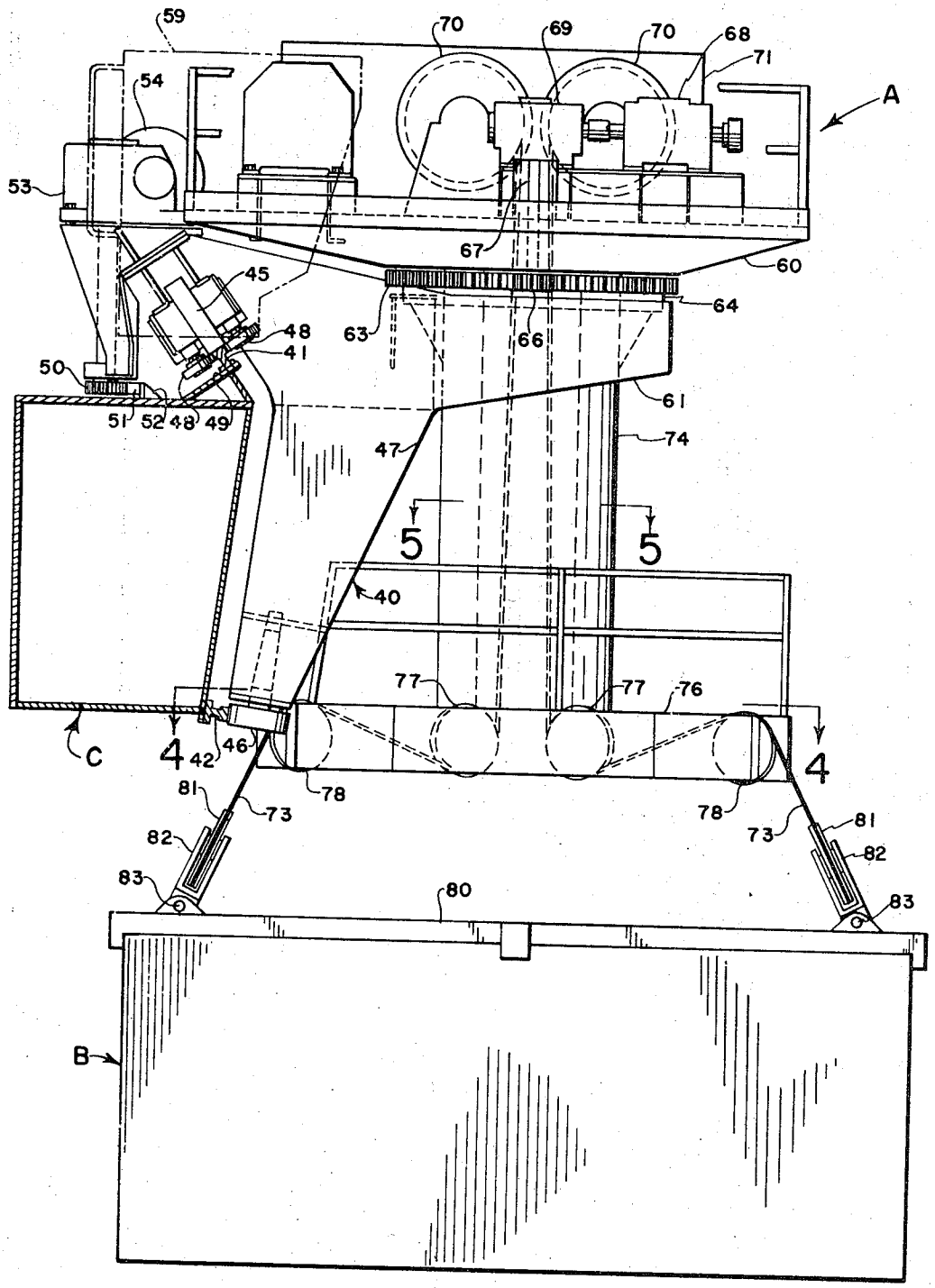


FIG.-1

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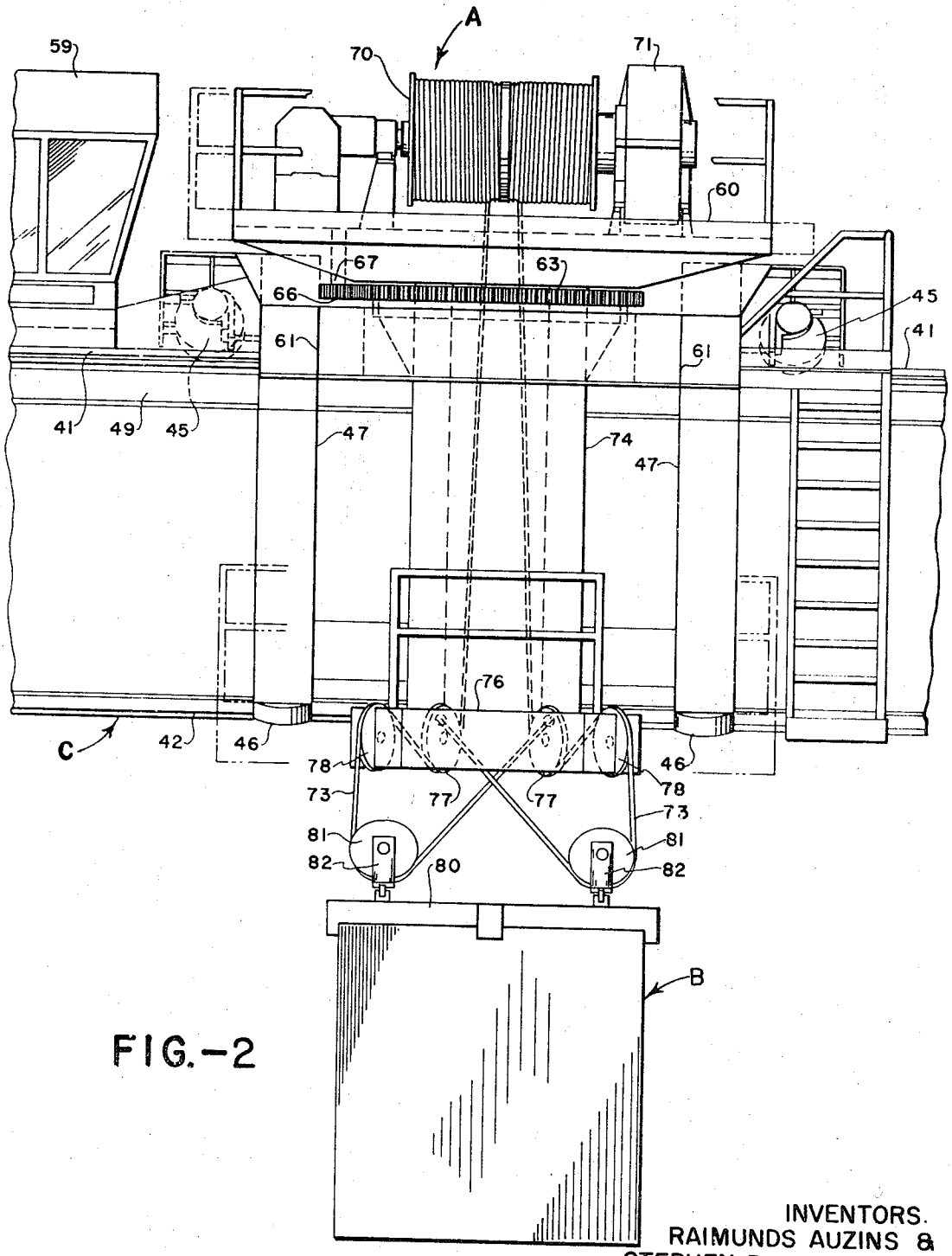

FIG.-2

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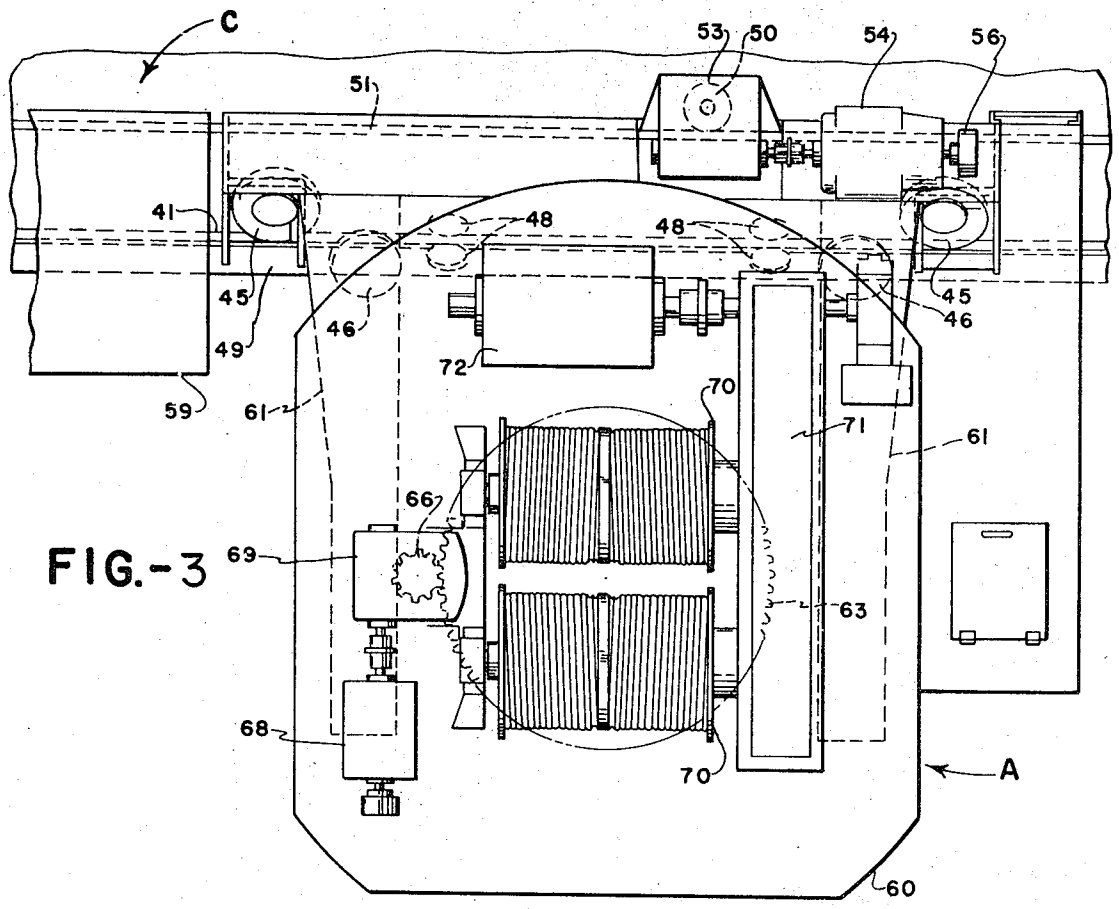

FIG.-3

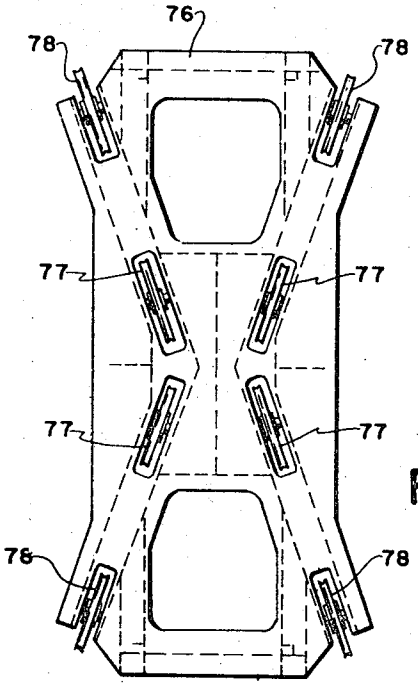

FIG.-4

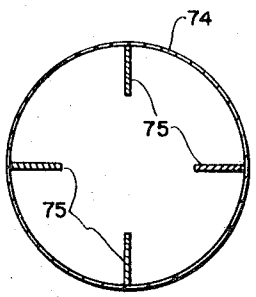

FIG.-5

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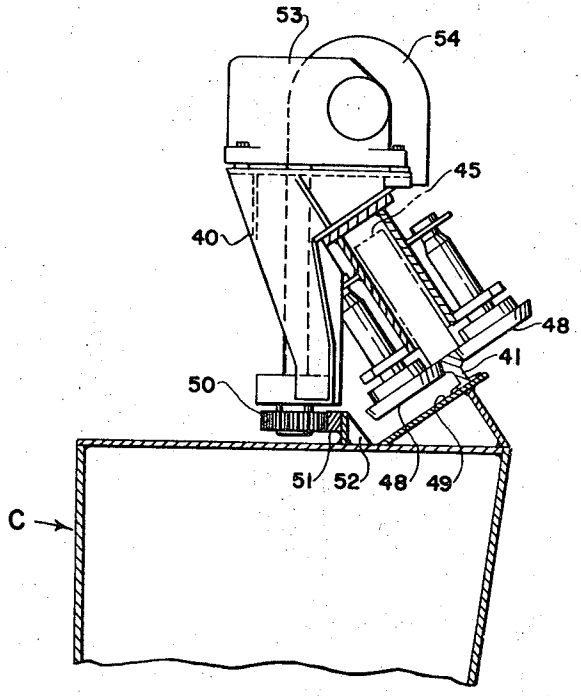

FIG.-6

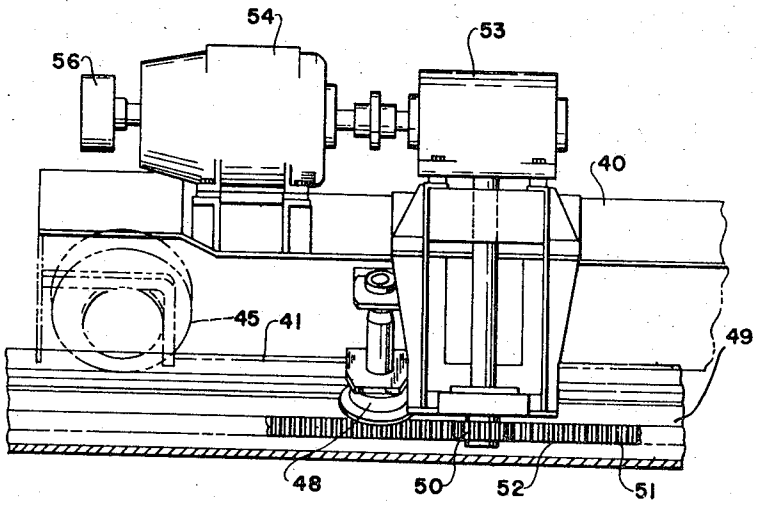

FIG.-7

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OVERHEAD TRAVELING CRANE AND HOIST MECHANISM THEREFOR

CROSS REFERENCE TO RELATED APPLICATION

This application is a division of our copending application Ser. No. 688,815 filed Dec. 7, 1967, now Pat. No. 3,467,263.

BACKGROUND OF THE INVENTION

This invention relates to overhead traveling cranes and hoist mechanism therefor and especially to bridge type cranes adapted to handle portable loads such as shipping containers or equipment used in industrial process—steel making for example. More particularly the invention relates to an overhead crane having a traveling trolley that carries a turntable and hoist equipment for lifting and lowering a suspended load.

Most traveling cars or trolleys used in connection with bridge-type overhead cranes are mounted either above or below the supporting girder or girders. When mounted above the girder, a sufficient clearance must be provided between the top of the bridge girder and the ceiling of the building in which the crane is used. When the trolley is carried below the bridge girder, however, the vertical distance for load lifting is limited by the hoist mechanism and trolley. This imposes substantial operating limitations on the crane if it must operate within an enclosure.

Another problem encountered in some crane applications is that of handling asymmetrically loaded containers or in other words containers loaded so that the center of gravity is longitudinally displaced from the geometrical center. If the center of gravity is spaced outwardly relative to the point of suspension of the nearest hoist ropes, the container will tip in the ropes until the center of gravity is vertically aligned with the nearest suspension point. Where such tipping tilts the container very much from its horizontal position, the handling operation cannot be properly performed. For design purposes, loaded containers having a center of gravity spaced longitudinally from the geometrical center as much as 20 percent of the length of the container (e.g. 8' for a 40' container) must be accommodated.

The gantry crane and hoist mechanism of the present invention however substantially resolve the problems indicated above and provide other features and advantages not obtainable from the prior art.

SUMMARY OF THE INVENTION

It is among the objects of the invention to provide a means for turning cargo containers through at least 90° of arc while being carried by hoist ropes suspended from a traveling trolley car on a girder and to restrict the twisting of a load carried thereby when the load is turned.

A further object is to prevent tipping of an asymmetrically loaded cargo container suspended by hoist ropes from a traveling trolley car.

These and other objects and advantages of the invention are accomplished by an overhead crane construction including a bridge-type transverse overhead girder which may have means for propelling it laterally along rails at its ends, and a trolley mounted thereon to run along the side thereof in cantilever fashion. Rails or ways for the trolley car rollers are provided on the girder and the trolley car supports a turntable that carries hoist equipment including rope falls connectable to a load such as a shipping container.

As another aspect of the invention, the rope falls are so connected between the latch frame and the turntable structure that the twisting of the latch frame relative to the turntable is greatly restricted, and asymmetrical loading of the containers can be accommodated. This is accomplished by an arrangement wherein the turntable serves to spread the hoist ropes outwardly from their point of connection to the rope drums and wherein the hoist ropes connected at each suspension point on the latch frame are reeved so as to have nonparallel passes between the turntable and latch frame, thus providing a triangulation type suspension wherein tension forces are non-

parallel to one another in the lengths of rope terminating at the same point of load application.

Other objects, uses and advantages of the invention will be apparent from the following detailed description and drawings wherein like parts are indicated by like numerals.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an end elevational view showing a traveling car and hoist mechanism embodying the invention located on a girder of an overhead crane;

FIG. 2 is a fragmentary front elevational view of the traveling car on the girder;

FIG. 3 is a fragmentary plan view showing the traveling car as in FIGS. 1 and 2;

FIG. 4 is a cross-sectional view taken on the line 4–4 of FIG. 1;

FIG. 5 is a cross-sectional view taken on the line 5–5 of FIG. 1;

FIG. 6 is a fragmentary cross-sectional view on an enlarged scale showing the traveling gear and drive mechanism for the side running trolley car; and

FIG. 7 is a fragmentary rear elevational view of the traveling gear and drive mechanism of the trolley car drawn to the same scale as FIG. 6.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring more particularly to the drawings there is shown a side running trolley A that travels along an overhead crane girder C and is adapted to handle a load such as a shipping container B. The side-running trolley A consists of a rigid frame 40 which supports the trolley drive mechanism and which travels on an inclined rail 41 located on top of the overhead girder C and a secondary rail 42 located at the bottom edge of the overhead girder C. The angle of the inclined rail 41 is such that forces due to the weight of the trolley and the load carried thereby are transferred normal to the bearing face of the rail to minimize any tendency of the trolley to slip off of the rail.

The trolley moves along the inclined rail 41 on two inclined rollers 45 and along the secondary rail 42 on two side-running rollers 46, each of the rollers 46 being located on one of two downwardly extending legs 47 of the rigid frame 40. The inclined rail 41 is mounted on a sloping platform 49 welded to the edge of the girder C.

As a secondary precaution the trolley is provided with lateral guide rollers 48 which engage the side edges of the inclined rail 41 best shown in FIGS. 6 and 7. These rollers 48 serve to keep the inclined rollers 45 properly positioned on the rail 41 and also take up an any axial loads that may occur.

The trolley A is driven along the girder C by means of a pinion 50 which engages a fixed gear rack 51 secured to a vertical mounting strip 52 welded to the top of the girder C. The sprocket 50 is driven through a gear reduction unit 53 mounted on the rigid frame 40, and the drive is supplied by an electric motor 54 as best seen in FIG. 7. An electromagnetic hydraulic brake unit 56 is interposed between the motor 54 and gear reduction unit 53 to provide braking for the drive when desired and to provide a positive lock which holds the trolley at a desired position.

An operator's cab 59 is mounted on the fixed frame 40 on the left hand side of the trolley H as viewed in FIG. 2, the cab being so designed and located as to give the operator optimum visibility throughout the operation of the crane.

A turntable 60 is supported by outwardly extending arms 61 of the rigid frame 40 on ball bearing units. The ball bearing units include a fixed slewing ring 63 bolted to the arms 61 and a rotating bearing ring 64 bolted to the bottom of the turntable 60. The slewing ring 63 has external gear teeth formed therein which are engaged by a pinion 66 mounted on a vertical shaft 67. The shaft 67 is driven by the turntable motor 68 through a gear reduction unit 69 (FIG. 3).

In the illustrated embodiment the turntable **60** can be rotated at least a total of 220°, or 110° in either direction from the center line of the frame **40** of the trolley A. The mid position of the turntable **60** is illustrated in FIGS. **1**, **2** and **3**. Overtravel is prevented by mechanical stops.

The turntable **60** carries the hoist mechanism that includes two rope drums **70** driven simultaneously through a transmission unit **71** by an electric motor **72**. Each drum **70** winds two hoist ropes **73** wound in opposite directions so that each pair of ropes **73** moves simultaneously during turning of the drums. The ropes **73** extend downwardly through a hollow cylinder **74** having vertical reinforcing ribs **75** welded therein, to a lower frame **76** that serves as a support for eight pulleys, two pulleys **77** and **78**, for each rope **84**.

The ropes **73** are reeved through the pulleys **77** and **78** as shown in FIGS. **1** and **2** so as to spread them radially outward from alignment with their point of vertical suspension from the rope drums **70**.

A latch frame or spreader **80** is suspended by the ropes **73** in such a manner that the swinging of the latch frame **80** and the container B being carried is reduced to a practical minimum.

The ropes **73** are connected to the latch frame or spreader **80** by means of pulleys **81** mounted in forks **82** which are pivotally connected to the frame **80** by pivot pins **83**. With this arrangement the pulleys **81** are aligned with their axes perpendicular to their corresponding rope fall during the entire vertical range of travel of the latch frame **80**. The latch frame or spreader **80** is of conventional design and construction, and forms no part of the invention. Various types of standard latch frames may be used depending, of course, on the size and type of container. The frames may be quickly changed by removing the pins **83**.

The ropes **73** pass through the pulleys **81** and then extend diagonally back up to the lower frame **76** as best shown in FIG. **2**. With this arrangement the container B can be turned by the turntable with a minimum of twisting of the container and latch frame about the vertical axis and relative to each other even though the container B is supported well below the lower frame **76**.

OPERATION

To operate the crane, the trolley A is first unlocked from its secured position and the latch frame **80** released from storage. The crane operator then operates the drive motor **54** to move the trolley A along the girder C to a position over a shipping container B to be loaded. While the trolley A is moving, the turntable **60** will have been rotated if necessary a sufficient amount to position the latch frame **80** in proper alignment with the container B.

When the trolley stops, the hoist motor **72** is operated to turn the rope drums **70** in a direction to lower the latch frame **80** onto the container B. After latching is complete the motor **72** is operated in the reverse direction to raise the latch frame **80** and container B up to the container carrying position shown in FIG. **1**.

When the latch frame **80** is raised to a position where the container B is free of obstructions but still below its upper limit or traversing position, the turntable motor **68** may be operated if necessary to position the container B with its longitudinal axis aligned parallel with the girder C if desired. The trolley A is then moved along the girder B while carrying the container B at a sufficient height to clear obstructions below. When the trolley completes its travel across the girder C, the girder C may be propelled laterally if necessary to position the container B over its destination. At the same time the turntable motor **68** may be operated to turn the container if desired. Finally, the hoist drum motor **72** is operated to lower the container B into position after which the latch frame is released and the frame **80** raised again to its highest carrying position.

While the invention has been shown and described with reference to a specific embodiment thereof, this is intended for the purpose of illustration rather than limitation and variations and modifications will become apparent to those skilled in the art within the intended spirit and scope of the invention as herein specifically illustrated and described. Therefore the patent is not to be limited in scope and effect to the preferred form shown herein nor in any other way that is inconsistent with the extent to which progress in the art has been advanced by the invention.

We claim:

1. In an overhead crane having an overhead supporting member, a trolley car adapted for travel along said member, said trolley car being supported at the side of said member to bear against said member so as to apply a torsional load thereto, a powered turntable including a platform mounted for rotary movement on said trolley car, a frame spaced below said platform and said trolley car and a central support connecting said frame to said platform, hoist mechanism carried on said platform and including a plurality of hoist ropes extending through the central portion of said platform to said frame, inner pulleys centrally located on said frame and adapted to receive said hoist ropes of said hoist mechanism from said platform, outer pulleys mounted at the perimeter of said frame and adapted to receive said hoist ropes from said inner pulleys to spread said hoist ropes outwardly in radial directions from the axis of said turntable to suspension points at the perimeter of said frame and symmetrically spaced relative to said axis, a latch frame suspended by said hoist ropes, perimetrically spaced pulleys on said latch frame, each of which receives on of said hoist ropes, said pulleys having supporting forks pivotally connected to said latch frame for movement about an axis perpendicular to the axis of their respective pulley, each hoist rope being reeved through one of said latch frame pulleys and extending back upward to a connection point on said first named frame to define a triangle formed by its outer pulley on said first named frame, its pivotally mounted pulley on said latch frame and said connection point.

2. Apparatus as defined in claim **1**, wherein said forks of said latch frame pulleys are connected to said latch frame by removable pivot pins.

PO-1050
(5/69)

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,550,788 Dated December 29, 1970

Inventor(s) Raimunds Auzins and Stephen P. Yendrich, Jr.

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Correct claim 1: Change "on" to --one-- in line 44.

Signed and sealed this 6th day of April 1971.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

WILLIAM E. SCHUYLER, J
Commissioner of Patent