

April 12, 1966

R. C. COUSINS ETAL

3,245,355

RAIL-MOUNTED JIB CRANE APPARATUS

Filed May 11, 1964

2 Sheets-Sheet 1

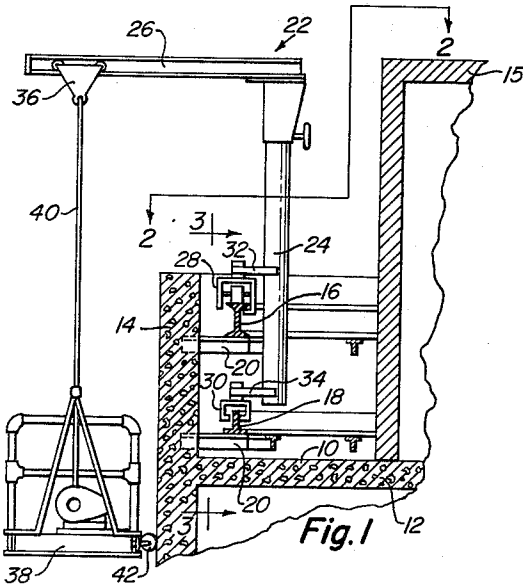


Fig. 1

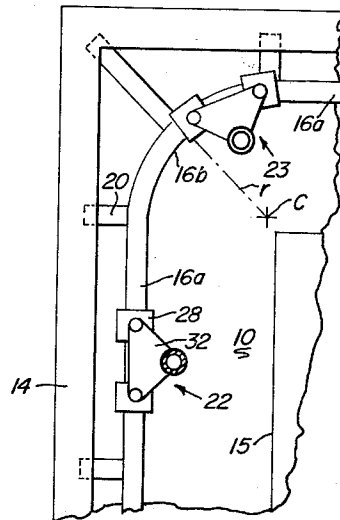


Fig. 2

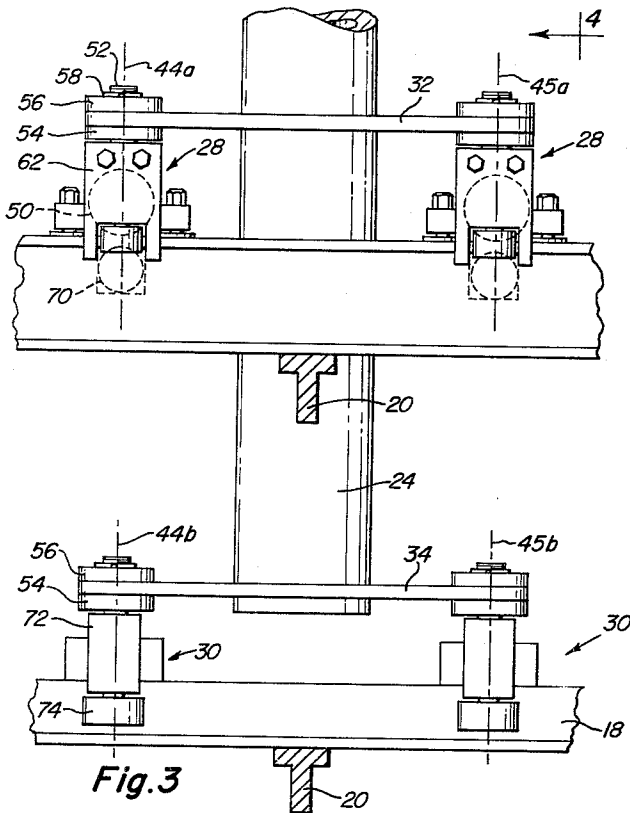
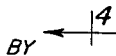


Fig. 3

BY 

BUCKHORN, BLORE, KLARQUIST & SPARKMAN
ATTORNEYS

RICHARD C. COUSINS
PERCY L. SYMONS
INVENTORS.

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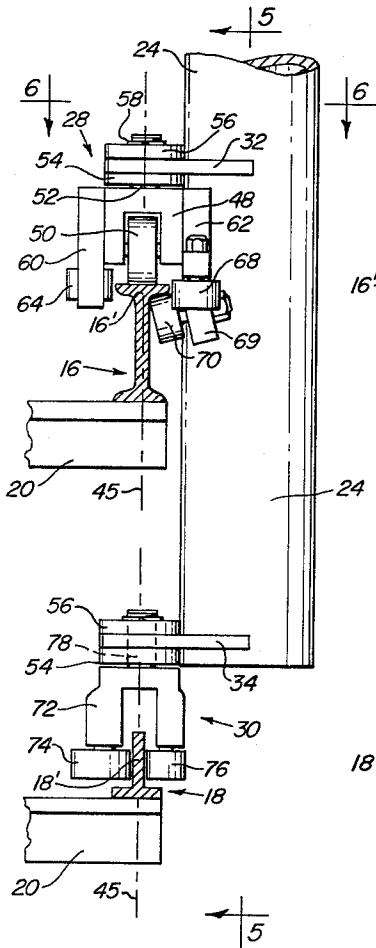


Fig. 4

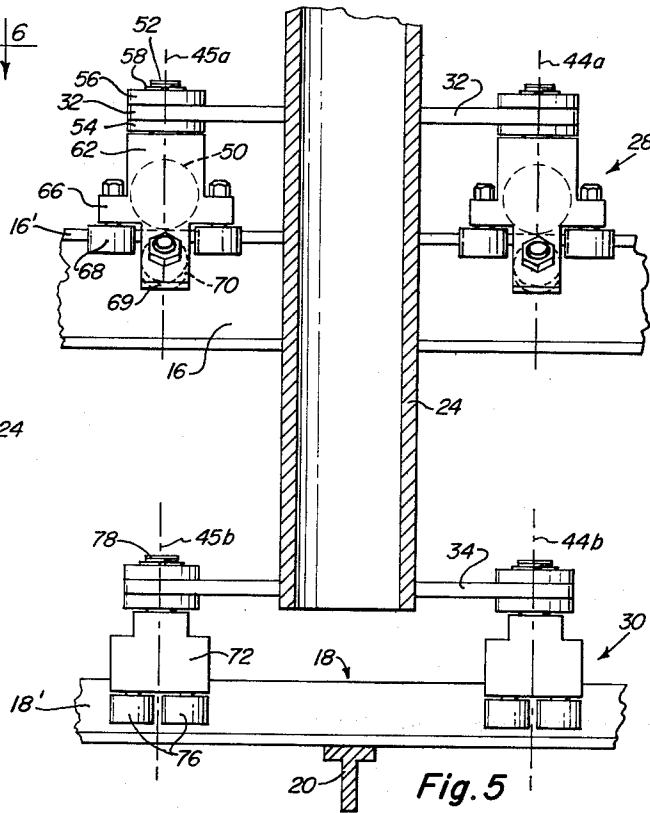


Fig. 5

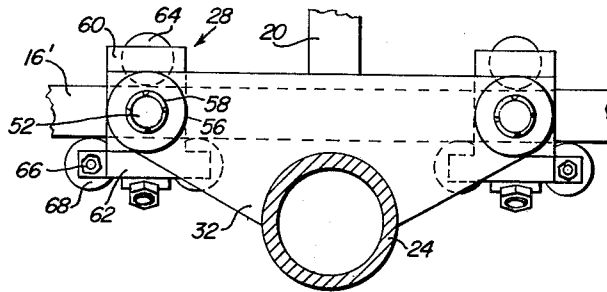


Fig. 6

RICHARD C. COUSINS
PERCY L. SYMONS
INVENTORS.

BY
BUCKHORN, BLORE, KLARQUIST & SPARKMAN
ATTORNEYS

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RAIL-MOUNTED JIB CRANE APPARATUS

Richard C. Cousins and Percy L. Symons, both of Portland, Oreg., assignors to Albina Engine and Machine Works, Inc., Portland, Oreg., a corporation of Oregon
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8 Claims. (Cl. 104—121)

The present invention relates to an improved rail-mounted mobile jib crane apparatus and particularly to an improved means for mounting such apparatus on the roof of a building.

In previously known constructions of this general type the pair of rails along which the wheels of a jib crane apparatus travel are fixed to the flat roof of a building in horizontally spaced, generally parallel relationship adjacent the peripheral edge of the roof. However, in order to prevent the wheels of the crane from binding on the curved rail sections when proceeding a corner of a building with this arrangement, the rails must be either specially curved at the corners of the building as shown, for example, Wylie Patent 3,111,094, or else the wheel units of the apparatus on one rail must be specially constructed and positioned to shift bodily relative to the wheels on the other rail as shown in our prior copending application, Serial No. 342,701, filed February 5, 1964. The latter of the foregoing two arrangements is a considerable improvement over the former in enabling the use of simple arcuately curved parallel rail sections at the building corners, but there are roofs where it cannot be conveniently accommodated.

Accordingly, a primary object of the invention is to provide a new and improved rail-mounted mobile apparatus which obviates the above problems while eliminating binding of the wheels on the rails, and which can be accommodated on roofs having insufficient space to accommodate prior apparatus.

More specifically, an object of the invention is to provide a mobile rail-mounted apparatus in which neither specially curved rails nor bodily shiftable wheels are necessary in order to eliminate binding of the wheel units on curved rail sections.

Another object of the invention is to provide a new and improved rail-mounted mobile apparatus in which the two rails have identical lengths and the same radii of curvature, thereby simplifying their manufacture, and wherein the rails are in vertical superposed relation.

A further object is to provide a rail-mounted mobile apparatus in which the rails and the wheel units may be of a simplified form and construction.

Another object is to provide a new and improved manner of mounting and supporting rail-mounted mobile apparatus on the roof of a building that prevents the wheels of the apparatus from binding on their rails.

A further object of the invention is to provide a rail-mounted mobile jib crane apparatus of a simplified, inexpensive construction.

In furtherance of the above objects and in accordance with an illustrated embodiment, we provide a jib crane apparatus in which a pair of rails are supported in vertically spaced-apart, parallel relationship by and at a lateral distance from an upstanding wall or other upstanding structure along the peripheral edge of the roof of a building. One pair of wheel units on the crane engages the upper one of the rails and a second pair of wheel units mounted vertically beneath the upper pair engages the lower rail. Each one of the four wheel units is pivoted in a fixed position on the crane for rotation about a vertical axis, with the vertically opposed wheel units being pivotal about a common vertical axis. Thus, the vertically opposed wheel units as viewed in

a horizontal plane always trace a common path as determined by the rails, while remaining at all times in their fixed, vertically opposed relationship.

Further objects and advantages of the invention will become apparent from the following detailed description taken in connection with the accompanying drawings wherein:

FIG. 1 is a schematic elevational view of a rail-mounted mobile jib crane apparatus of which the invention, shown supported by a parapet wall on the roof of a building and suspending a staging platform;

FIG. 2 is a horizontal sectional view taken along line 2—2 of FIG. 1 of the mobile apparatus of FIG. 1 at a corner of the building, in a somewhat different position than that illustrated in FIG. 1;

FIG. 3 is an enlarged elevational view of the lower portion of the apparatus, including a section of the rails on which the apparatus is mounted, taken approximately along the line 3—3 of FIG. 1;

FIG. 4 is an elevational view taken in cross section through the rails approximately along the line 4—4 of FIG. 3 showing the details of construction of the base plates, associated wheel units and rails of the apparatus;

FIG. 5 is a vertical sectional view, taken along the line 5—5 of FIG. 4 showing further details of construction of the base plates and wheel units; and

FIG. 6 is a horizontal sectional view taken along the line 6—6 of FIG. 4 showing in detail the upper base and associated wheel units of the apparatus.

Referring to the drawings, a mobile staging apparatus is shown in FIG. 1 mounted on the roof 10 of a building 12 just inwardly of a parapet wall 14 which bounds the peripheral edge of the roof. A roof building 15 commonly found on building roofs is shown to illustrate the limited space in which an apparatus can be mounted. The apparatus includes a pair of vertically spaced apart, parallel tracks, or rails, including an upper rail 16 in the form of an I-beam and a lower rail 18 in the form of an inverted T. The rails are supported at the outer ends of a pair of laterally extending, cantilevered support members 20 anchored at their inner ends in the parapet wall 14, which thus serves as an upright support structure for the entire staging apparatus. Of course, the rails could be supported by any upright support structure such as a plurality of vertical posts or columns of a guard railing.

As shown in FIG. 2, each track includes a straight track section 16a which parallels the parapet wall 14 and a horizontally curved track section 16b at each corner of the building. Because the tracks are mounted vertically one above the other on the roof, both tracks will be of exactly the same length and their curved track sections will have the same radius of curvature r and center of curvature C , at least as viewed in a horizontal plane. These features not only enable the track sections to be manufactured more simply and inexpensively as compared with horizontally spaced-apart track sections such as shown in Wylie Patent 311,094, but also enables a simplified construction of the entire mobile apparatus, as will be presently explained.

As shown in FIG. 2, a pair of jib cranes 22, 23 are mounted on and movable along the rails 16, 18. For convenience in illustration, both jib cranes are shown on a straight track section in FIG. 1 so that only the jib crane 22 is visible in such figure. Each jib crane includes a vertical frame portion, or mast, 24 and a horizontal boom 26 extending from the upper end of the mast outwardly over the parapet 14. Four wheel units, including an upper pair of wheel units 28 and a lower pair of wheel units 30 alone support and retain each crane on the rails. The upper pair of wheel units 28 engage

the upper rail 16 and are mounted beneath horizontally extending, generally triangular base plate 32 fixed to the mast 24. Similarly, the lower pair of wheel units 30 engage lower rail 18 and depend from a lower triangular base plate 34 on mast 24.

The horizontal boom 26 carries a trolley 36 from which one end of a staging platform, or scaffolding, 38 is suspended by a cable 40. The trolley 36 includes means (not shown) for releasably holding the trolley against movement along the boom. A set of wheels 42 are mounted along the inside edge of the staging platform for engaging the vertical wall of the building 12. In practice the trolley 36 would be positioned so that the cable extends upwardly and slightly inwardly toward the building to urge the platform 38 against the building, whereby in raising and lowering the platform 38 the wheel 42 remains engaged with the side of the building at all times. Of course, the boom 26 is of sufficient length so that the platform 38 can be positioned outwardly beyond the sides of the building, if desired.

FIGS. 3-6 illustrate the details of construction and mounting of the wheel units and their relationship with one another and the rails on which they are supported. The base plates 32, 34 are of substantially identical shape and size, with the upper plate 32 being welded or otherwise affixed to the mast 24 in vertical alignment above the lower plate 34.

The upper wheel units 28 are mounted in horizontally spaced-apart relationship beneath and at opposite ends of the upper base plate 32 for pivotal movement about vertical axes 44a and 45a, respectively. Similarly, the lower pair of wheel units 30 are mounted in corresponding positions beneath the lower base plate 34 for rotation about vertical axes 44b and 45b, which, it will be noted, are coincident with the extensions of vertical pivotal axes 44a, 45a of the upper wheel units 28. In other words, the two horizontally opposed pairs of wheel units are positioned so as to define two vertically opposed sets of wheel units, each set being pivotal about a common vertical axis.

It will also be apparent from FIGS. 4 and 6 that at any position of the wheel units on their respective rails the vertical pivotal axes 44 and 45 are centered with respect to the vertical axes of the rails 16 and 18. Thus, when viewed in a horizontal plane, for example, in FIG. 6, the vertically opposed upper and lower wheel units 28 and 30 coincide, as do the upper and lower rails 16 and 18, whereby each upper wheel unit 28 and its vertically opposed lower wheel unit 30 act as one in tracing a common path defined by the rails 16 and 18. With this arrangement it is unnecessary to provide specially curved rails or bodily shiftable wheel units as previously required to vary the effective distance between the wheel units on opposite rails and thus prevent binding of the wheel on the rails when negotiating curves, for in effect, the opposed wheel units on opposite tracks trace the same path at the same time.

While in most instances curved rail sections in the form of simple arcuate curves having a constant radius of curvature throughout their lengths will be most advantageously combined with straight rail sections, another advantage of our arrangement is that the wheel units will travel about any specially curved rail section without binding so long as the upper and lower rail sections remain substantially parallel to one another and vertically aligned. Of course, the upper and lower rails 16 and 18 could be offset laterally slightly with respect to one another without the wheel units binding on the rails, particularly since a small amount of lateral play is usually provided between each of the wheel units and the rail on which it rides.

Referring to FIGS. 3-6, each upper wheel unit 28 includes a yoke 48 which rotatably supports a wheel 50 which rides on the upper face of the upper flange 16' of the upper rail 16. Each yoke 48 has an upstanding

central pivot shaft 52 (FIGS. 4 and 6) that extends upwardly through a lower bearing block 54 and thence through a circular opening in the base plate 32 and an upper bearing block 56. The bearing blocks 54 and 56 are affixed as by welding to the base plate 32 and may be, for example, tapered roller bearings (not shown) as shown in FIG. 4 of our prior copending application, Serial No. 342,701, filed February 5, 1964. The pivot shaft 52 is threaded at its upper end to receive a nut 58 which secures the wheel unit to the bearing plate.

Each yoke 48 has an opposed pair of downwardly extending side members 60 and 62. The outermost one 60 of the side members, that is, the one farthest from the vertical mast 24, carries at its lower end a single guide wheel 64 mounted for rotation about a vertical axis and positioned for engaging the outside edge of the upper flange 16' of the upper rail 16. The innermost side member 62 has a laterally extending pair of ears 66 to the underside of which are mounted a pair of inner guide wheels 68 for rotation about vertical axes and positioned for engaging the inside edge of the upper flange 16'. The inner guide wheels 68 and the outer guide wheel 64 may be spaced apart a sufficient distance such that a slight clearance is provided between the guide wheels 64 and 68 and the edges of the flange 16' so as to minimize friction between the wheel units and the rail 16 and thereby increase the mobility of the jib cranes along the rails.

The lower portion 69 of the inner side member 62 is inclined outwardly slightly, and a roller 70 is rotatably mounted thereon in a position for engaging the inside lower surface of the upper flange 16'. The roller 70 helps to retain the wheel units and thus the jib crane on the rails by resisting the forces exerted by the staging platform at the outer end of the boom, which forces tend to tip the crane from the rails. Another such roller may also be provided, if desired, to engage the outside lower surface of the upper flange 16', although such a second roller may be safely eliminated in the present construction because the lower rail 18 and associated wheel units 30 resist any tipping moment applied by the boom and staging platform. In fact, all of the so-called "hook" rollers 70 may be safely eliminated with this arrangement, although it is preferred to retain at least the one illustrated hook roller 70 on each of the upper wheel units as an added safety feature.

As previously pointed out, the lower rail 18 is of a simplified, inverted T form. This simplified form of rail is possible because of the special vertical relationship of the rails, which eliminates the necessity for an upper load-supporting flange on the lower rail, such rail serving only to resist lateral tipping forces exerted by the staging platform. Of course, the form and functions of the rails can be reversed so that lower rail supports the load, or if desired, each rail could be provided with an upper flange to bear a portion of the load of the staging apparatus.

Each of the lower wheel units is of identical construction and includes a yoke 72 to the lower ends of which are mounted a single outer guide wheel 74 and a pair of slightly smaller, inner guide wheels 76. The inner and outer guide wheels 74 and 76 are mounted for rotation about vertical axes and are positioned for engaging, respectively, the inner and outer surfaces of the upstanding web portion 18' of the lower rail. However, as with the guide wheels for the upper wheel units, a slight clearance is preferably provided between the guide wheels 74, 76 and the surfaces of the web 18' so as to provide a relatively free movement of the wheel units and thus the jib crane along the rail. The upper portion of the yoke 72 has a central pivot shaft 78 which extends upwardly through lower bearing block 54, base plate 34 and upper bearing block 56. The bearing blocks 54 and 56 are of the same construction as the corresponding bearing blocks for the upper wheel units.

With wheel units and rails constructed and arranged in the foregoing manner and by spacing the vertical pivotal axes of the horizontally opposed wheel units 23 $\frac{3}{8}$ inches apart, we have found that the curved rail sections may be formed with at little as a 42-inch radius of curvature without the individual wheel units binding on the rails.

As will be apparent from the description so far, the vertical disposition of the rails and wheel units provides a mobile apparatus having considerably greater lateral stability than prior mobile apparatus having wheel units that engage horizontally disposed tracks. This greater lateral stability, moreover, is provided in the present structure with wheel units of simpler construction than heretofore possible in that fewer wheels per wheel unit are necessary to achieve the desired stability, and a much simpler rail form may be employed in association with at least one pair of wheel units. For example, in the lower pair of wheel units, only lateral guide wheels 74 and 76 need be provided, it being possible to eliminate altogether the main load-support wheels corresponding to the wheels 50 on the upper unit and hook rollers corresponding to the rollers 70 in the upper unit.

From the foregoing, it will be obvious that the present mobile apparatus eliminates binding of the wheel units on their rails without requiring the special, and costly, features of prior known rail-mounted mobile apparatus.

Having illustrated and described a preferred embodiment of our invention, it should be apparent to those skilled in the art that the invention permits of modification in arrangement and detail. It is our intention to claim as part of our invention all such modifications as come within the true spirit and scope of the appended claims.

We claim:

1. A mobile jib crane apparatus comprising:

a pair of vertically spaced apart, parallel tracks, each having a straight track section and a generally horizontally curved track section,
the upper track section being I shaped in cross section so as to have upper and lower laterally extending flanges,

the lower track section being of inverted T shape in cross section so as to have a vertical web,
a mobile frame structure for travel along said tracks,
upper wheel means on said frame structure for engaging said upper track and having at least one support wheel engaging the upper face of said upper track and other wheels engaging the free edges of the upper flanges of said upper track, and having at least one wheel engaging the under side of one of said upper flanges,

lower wheel means on said frame structure having wheels for engaging the opposite sides of the web of said lower track,
the above mentioned wheels preventing lateral displacement of said upper and lower wheel means relative to the tracks they engage,

each of said wheel means being mounted for pivotal movement about a vertical axis such that the vertical axes of said wheel means bear a fixed relation to one another as said wheel means travel from a straight track section onto a curved track section.

2. A mobile jib crane apparatus comprising:

a pair of vertically spaced apart, parallel tracks each track having a straight track section and a horizontally curved track section,

a mobile structure for travel along said tracks and including a frame,

an upper pair of wheel means on said frame for engaging the upper one of said tracks,

a lower pair of wheel means on said frame for engaging the lower one of said tracks,

each one of said lower pair of wheel means being disposed vertically beneath a different one of said

upper pair of wheel means so as to define two sets of vertically opposed wheel means,
each wheel means including a body pivotally mounted by a pivot shaft on said frame,

each wheel means having three guide rollers mounted on said body for rotation about vertical axes wherein, considered in plan, such axes are located at the corners of a triangle which defines an area through which passes the axis of the associated pivot shaft,
the vertical axes of rotation extended of the vertically opposed wheel means in each said set being substantially coincident such that said wheel means travel from said straight track sections onto said curved track sections without binding on said tracks and with the distance between vertically and horizontally opposed wheel means remaining substantially constant.

3. A mobile jib crane apparatus comprising:

a building structure, including a roof and an upstanding support structure adjacent the peripheral edge of said roof,

a pair of tracks, each track having a straight track section and a horizontally curved track section,
means extending laterally from said upstanding support structure for supporting said tracks in vertically spaced-apart parallel relationship inwardly of said peripheral edge,

a mobile frame structure, including an upper base and a lower base, for travel along said tracks,

an upper pair of wheel means on said upper base for engaging the uppermost one of said tracks,

a lower pair of wheel means on said lower base for engaging the lower one of said tracks,

each of said wheel means including means for retaining said wheel means against substantial lateral movement relative to said tracks,

means pivotally connecting each said wheel means to its respective base for rotation about a vertical axis, said wheel means being positioned such that the vertical pivotal axis extended of each said lower wheel means is substantially coincident with the vertical pivotal axis of a different one of said upper wheel means, thereby enabling said wheel means to travel from a straight track section onto a curved track section without binding on said tracks and with said vertical pivotal axes remaining substantially coincident.

4. A mobile jib crane apparatus for mounting on a pair of vertically spaced apart parallel tracks, each track having a straight track section and a horizontally curved track section, said apparatus comprising:

an upper base and a lower base,
a lower pair of horizontally spaced-apart wheel means on said lower base for engaging the lower one of said tracks,

an upper pair of horizontally spaced-apart wheel means on said upper base for engaging the upper one of said tracks,

each one of said lower wheel means being disposed vertically beneath a different one of said upper wheel means so that said wheel means include two sets of vertically opposed wheel means,

both wheel means in each said set being pivotal about a substantially common vertical axis,

each said wheel means including means for preventing substantial lateral displacement of said wheel means relative to its track.

5. A mobile jib crane apparatus for travel along a pair of vertically spaced apart parallel tracks fixedly mounted on an upstanding support structure, each track having a straight track section and a horizontally curved track section, said apparatus comprising:

a vertically disposed frame portion including an upper base and a lower base,

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a pair of horizontally spaced-apart upper wheel units on said upper base for engaging the upper one of said tracks,
 a pair of horizontally spaced-apart lower wheel units on said lower base for engaging the lower one of said tracks,
 each of said wheel units including laterally opposed guide wheel means for engaging opposite sides of its track for preventing substantial lateral displacement of the wheel unit relative to said track,
 at least two horizontally spaced-apart ones of said wheel units including load-supporting wheel means for supporting the load of said apparatus on said tracks,
 means pivotally connecting each said wheel unit to its respective base member for rotation about a vertical axis,
 the vertical pivotal axis extended of each one of said upper wheel units being substantially coincident, respectively, with a vertical pivotal axis of a different one of said lower wheel units,
 the position of each said wheel unit being fixed relative to its supporting base.

6. A mobile jib crane apparatus according to claim 5 wherein only two of said wheel units have load-supporting wheel means.

7. Mobile apparatus comprising:
 a pair of vertically spaced apart parallel tracks, each track having a straight track section and a horizontally curved track section,
 an upstanding support structure, including laterally extending means for supporting said tracks,
 a mobile structure for travel along said tracks, including a frame and an upper pair of wheel means for engaging the upper one of said tracks, and a lower pair of wheel means for engaging the lower one of said tracks,
 each wheel means including a body pivotally mounted by a pivot shaft on said frame,
 each wheel means having three guide rollers mounted on said body for rotation about vertical axes wherein,

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considered in plan, such axes are located at the corners of a triangle which defines an area through which passes the axis of the associated pivot shaft.

8. In a mobile apparatus including an upstanding support structure and a mobile frame structure,
 a pair of parallel tracks supported one vertically above the other by said upstanding wall structure in a position laterally of said support structure,
 each of said tracks having a generally horizontal curved track section and a straight track section,
 an upper base and a lower base mounted one above the other on said mobile frame structure,
 an upper pair of wheel means on said upper base for engaging said upper track,
 a lower pair of wheel means on said lower base for engaging said lower track,
 each of said wheel means including means for restraining said wheel means against substantial lateral displacement relative to the track it engages,
 at least two horizontally spaced ones of said wheel means including load-supporting means for supporting the load of said mobile frame structure on at least one of said tracks,
 means pivotally mounting each said wheel means on its respective base for pivotal movement about a vertical axis,
 the vertical pivotal axis extended of each said lower wheel means being substantially coincident with the vertical pivotal axis of a different one of said upper wheel means.

References Cited by the Examiner

UNITED STATES PATENTS

311,094	1/1885	Wilson	-----	280—136
1,408,047	2/1922	Upp.		
1,519,349	12/1924	Barthel	-----	105—147
1,526,853	2/1925	Harson	-----	105—147
3,159,110	12/1964	Wylie	-----	104—246

ARTHUR L. LA POINT, *Primary Examiner.*