Sept. 20, 1971 A. VERLINDE 3,606,029

HOISTING APPARATUS

Filed June 16, 1969 3 Sheets-Sheet 1

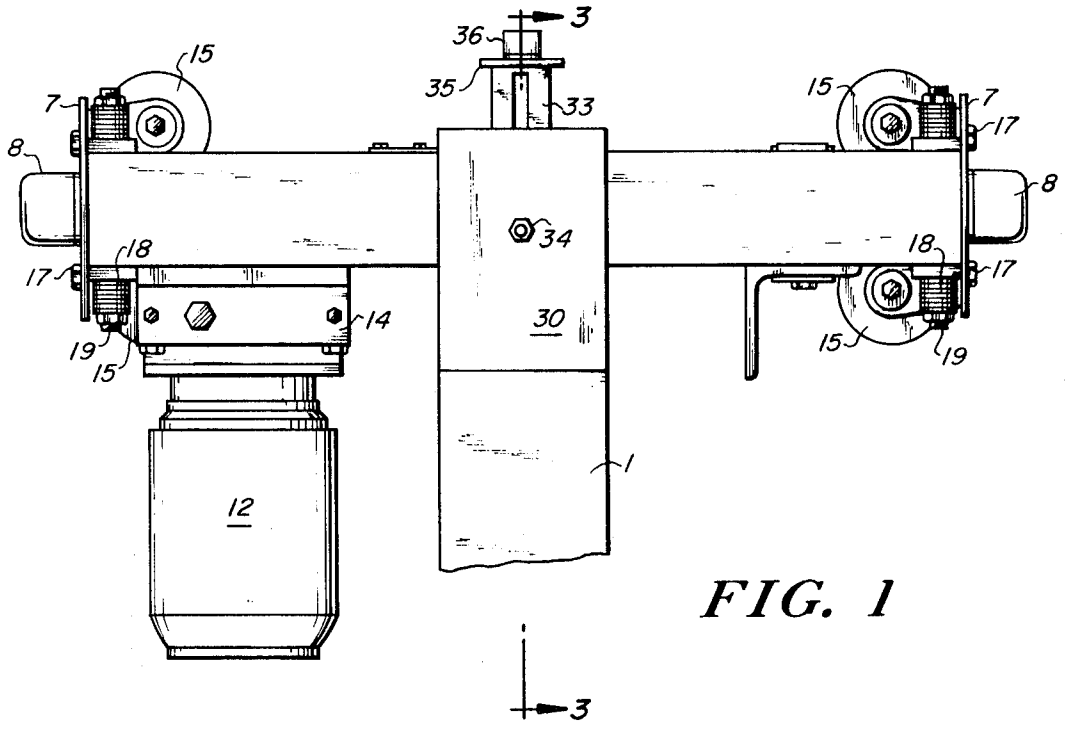

FIG. 1

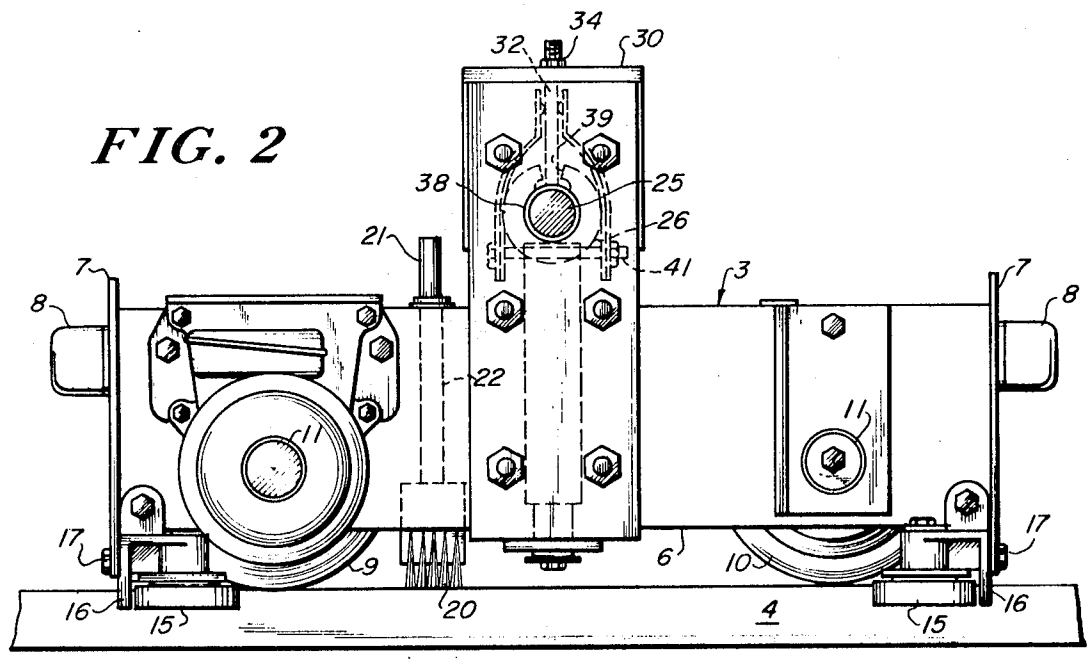

FIG. 2

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FIG. 3

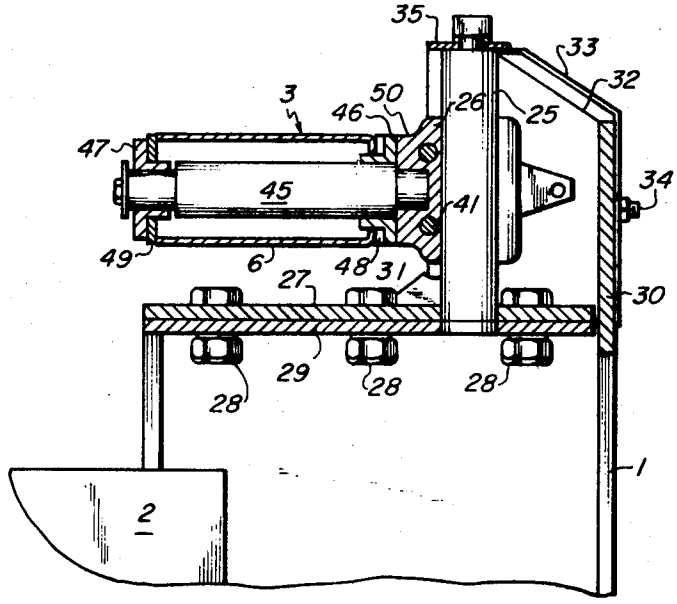
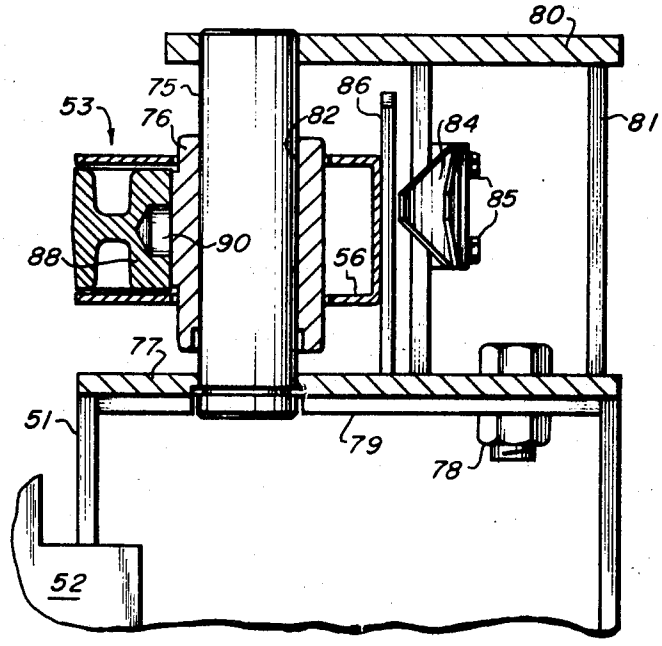


FIG. 6



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HOISTING APPARATUS

Filed June 16, 1969 3 Sheets-Sheet 3

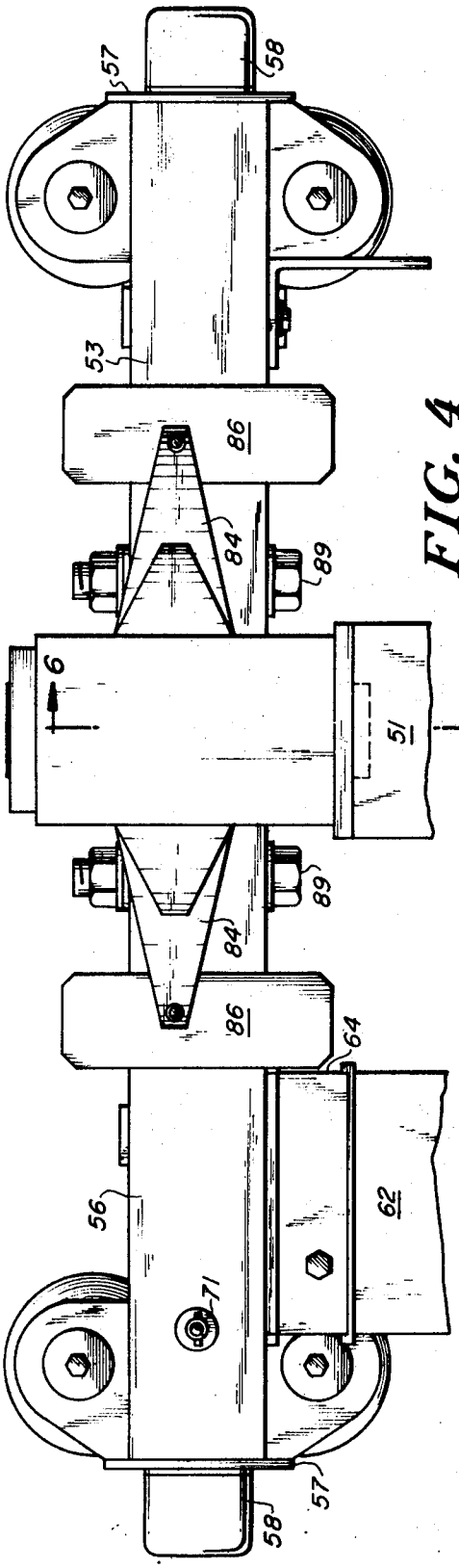

FIG. 4

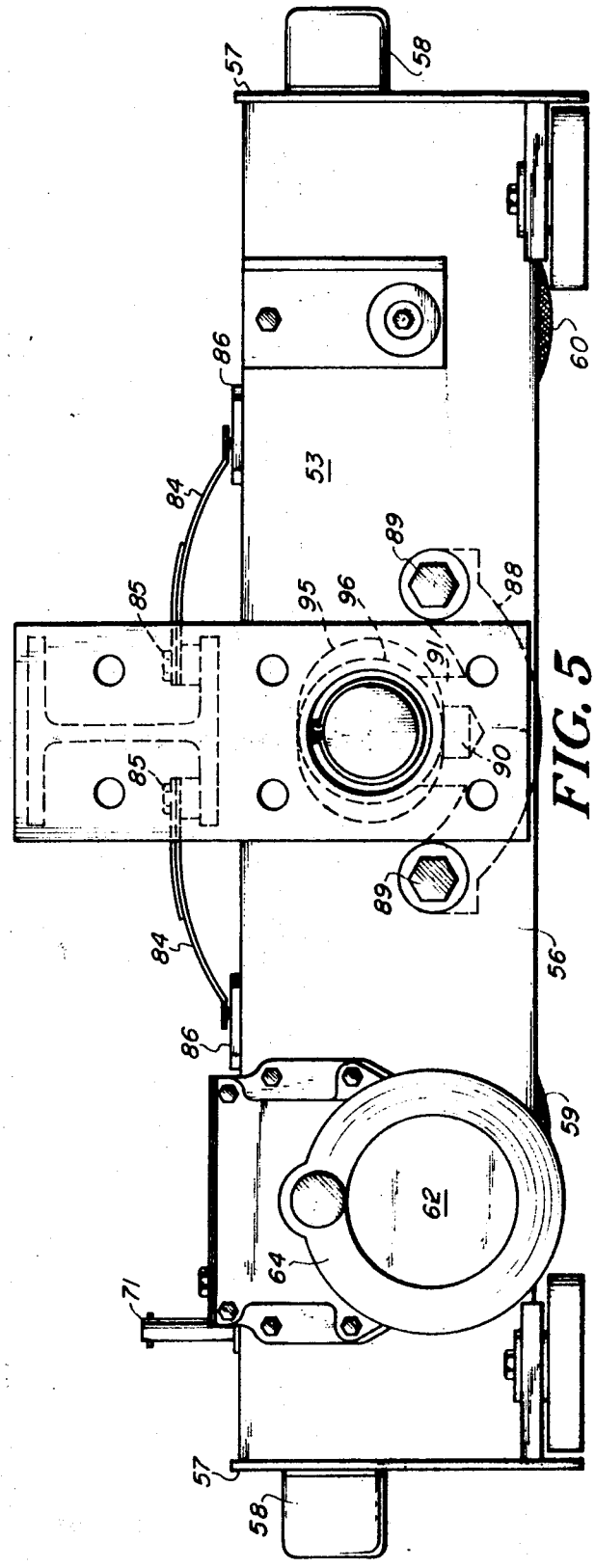

FIG. 5

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3,606,029

HOISTING APPARATUS

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Continuation-in-part of abandoned application Ser. No. 624,812, Mar. 21, 1967. This application June 16, 1969, Ser. No. 833,428
Claims priority, application France, May 12, 1966, 61,321
Int. Cl. B66c 17/00
U.S. Cl. 212—18 9 Claims

ABSTRACT OF THE DISCLOSURE

The beam of a travelling crane is supported at opposite ends by carriages running on parallel rails. The support at at least one end comprises a bearing member which is supported on the carriage to rotate about a horizontal axis and has a horizontal bearing cavity rotatively and slidably receiving a horizontal shaft projecting horizontally from the respective end of the beam.

This application is a continuation-in-part of my application Ser. No. 624,812, filed Mar. 21, 1967, and now abandoned.

In conventional hoisting installations of the kind commonly referred to as travelling cranes, a load-carrying hoist is movable along a beam the extremities of which are carried by carriages moving along parallel tracks in a direction substantially orthogonal to the beam.

In installations of this kind, the tracks are commonly supported by a metallic framework having various irregularities due for example to an accumulation of rather wide tolerances in construction or occurring later from various causes. The irregularities most frequently encountered are a lack of parallel relationship between the tracks, certain unevenness and variations of width of the tracks and variation in height of the tracks. It also sometimes happens that the tracks are slightly curved or comprise straight sections alternating with curved sections.

In travelling cranes of conventional construction, the only compensation for these irregularities is provided by the axial play of the bearings of the rollers of the carriages. This frequently results in a wedging of the carriages and an overloading of the roller bearings.

In order to avoid wedging, there have been provided beams which are secured to the carriage at at least one end by an arrangement permitting direct sliding of the beam relative to the carriage in a direction lengthwise of the beam.

The danger of wedging also occurs when one of the two carriages carrying the beam advances more rapidly than the other so that the beam tends to turn sideways. To remedy this, there have been proposed beams of the "pivoting-rolling" type which are connected at each end by a joint having a vertical axis on a cross piece rigid with each of the carriages. For example, the beam rotates on two rollers or balls placed in grooves diametrically opposite the center of rotation and substantially on a diameter parallel to the rolling track. The beam thus rests on the extremity of the two rolling members. This arrangement moreover permits absorption of the slight bending of the beam during movement of the load.

In all prior art devices however, the beam remains subject to overloads when the vector of the load is not in the principal flexural plane of the beam, for example when the load swings or when it is being dragged along the floor of other supporting surfaces.

It is an object of the present invention to avoid all of the drawbacks of the above mentioned devices and thereby

provide improved hoisting apparatus of the travelling crane type.

In accordance with the invention, the beam is connected to each of the carriages by a device permitting it to orient its main bending plane in such a way as to contain the force vector of the load while at the same time permitting pivoting of the beam relative to the carriage and avoiding wedging.

Other characteristics of the invention will appear from the following description of preferred embodiments shown by way of example in the accompanying drawings in which:

FIG. 1 is a plan showing the mounting of one end of the beam of a travelling crane on a carriage movable along a supporting rail.

FIG. 2 is a vertical elevation.

FIG. 3 is a section taken approximately on the line 3—3 of FIG. 1.

FIG. 4 is a plan of a further embodiment.

FIG. 5 is an elevation of the device of FIG. 4, and

FIG. 6 is a section taken approximately along the line 6—6 in FIG. 4.

The travelling crane illustrated by way of example in FIGS. 1 to 3 comprises a beam **1** along which a load-carrying hoist **2** is movable in a direction lengthwise of the beam. As the hoist may be of conventional construction it has been shown only schematically. At each end, the beam is mounted on a carriage **3** movable along a rail **4**, the two rails being parallel in the sense of being substantially equidistant from one another. Only one carriage and the associated rail are shown in the drawings.

The carriage **3** comprises a channel shaped frame or chassis **6**, the opposite ends of which are closed by end plates **7** carrying rubber bumpers **8**. Load carrying rollers **9** and **10** which roll on the rail **4** are disposed between opposite flange portions of the channel shaped frame **6** and are rotatable about horizontal axles **11**. One of the rollers **9** is driven by an electric motor **12** through a reducing gear drive **14** to move the carriage along the rail. The upper surface of the rail is essenitally flat while the peripheral surface of each of the rollers **9** and **10** is crowned or convex, With this arrangement the rollers at all times bear properly on the rail even if one rail at any particular location is slightly lower than the other. The carriage is guided on the rail by four guide rollers **15** mounted on brackets **16** which are secured to the channel and to the end plates **7**. The guide rollers **15** are rotatable about vertical axes and engage opposite sides of the rail **4**. The brackets **16** are mounted in an adjustable manner so as to vary the distance between opposite rollers **15** to accommodate rails of different widths. For example, bolts **17** are received in horizontally elongated holes in the end plate **7** and removable washers **18** are provided on bolts **19** which extend through the channel shaped frame member **6**.

A brush **20** which is spring mounted in the frame member **6** by means of a shaft **21** and spring **22** engages the upper surface of the rail to keep it clean.

The beam **1** is mounted on the carriage **3** by means of a shaft **25** which projects from the end of the beam in a horizontal direction and is received in a bearing cavity of a bearing member **26** which is rotatably mounted on top of the frame member **6** so as to turn about a vertical axis.

The mounting of the horizontal shaft **25** comprises a vertical plate **27** secured by bolts **28** to a vertical flange **29** at the end of the beam **1**. A horizontal top plate **30** located above the shaft **25** is braced by triangular side plates **31**. A vertical vane **32** fixed to the underside of the top plate **30** and to the upper side of the shaft **25** strengthens and supports the shaft throughout its length.

A cover 33 is removably held in place by a screw 34. At the end of the shaft 25, a washer 35 of greater diameter than the shaft is secured to the end of the shaft by a stud bolt 36.

The bearing member 26 has a cylindrical bearing cavity 38 which receives the horizontal shaft 25 and is open at the top so as to provide space for the vertical vane 32. The edges of the top opening 39 of the bearing member 26 are spaced sufficiently apart to permit the shaft 25 with its vane 32 to rotate through a selected angle, for example an angle of about three to five degrees. However, rotation from a neutral position in which the central plane of the beam 1 is vertical is resiliently resisted by leaf springs 40 secured to opposite sides of the bearing member 26 by screws 41 and engaging opposite sides of the vane 32 at a distance from the shaft.

As seen in FIG. 3, the shaft 25 is longer than the bearing member 6 and is hence longitudinally slidable in the bearing member. Sliding movement of the shaft 25 relative to the bearing member 26 is limited in one direction by the vertical plate 27 and in the other direction by the washer 35 at the end of the shaft.

The bearing member 26 is rotatably mounted on the frame 6 by means of a vertical pivot shaft 45 which is fixed with respect to the bearing member with its axis perpendicular to that of the bearing cavity 38. The pivot shaft 45 extends down through the channel shaped frame member 6 and is rotatably supported by a bushing 46 on top of the frame and a bushing 47 at the bottom. The bushings extend through holes in plates 48 and 49 welded respectively to the top and the bottom of the frame member 6. A bearing shoulder 50 on the bearing member 26 bears on an upper face of the bushing 46 to provide a thrust bearing. The pivotal mounting provided by the shaft 45 permits angular movement of the beam 1 relative to the carriage 3 in order to avoid binding in the event the carriage at one end of the beam get ahead of the carriage at the other end or on a curved section of track.

The carriage at the other end of the beam and the mounting of the beam on the carriage may be the same as just described. However, it is generally not necessary to provide horizontal sliding movement of the beam relative to the carriage at both ends of the beam. Moreover, in some instances it is not necessary to drive the carriages at both ends of the beam.

In another embodiment of the invention as illustrated in FIGS. 4 to 6, a beam 51 carrying a hoist 52 is mounted at each end on a carriage 53 running on a rail 54.

The carriage 53 has a frame 56 of inverted channel shaped cross section with opposite side walls and a connecting top wall. Opposite ends of the channel are closed by welded end plates 57 carrying bumpers 58. Load carrying rollers 59 and 60 are rotatably mounted in the frame by axles 61 to rotate about horizontal axes transverse to the frame. One of the rollers 59 is driven by means of an electric motor 62 through reducing gears 64.

Guide rollers 65 are rotatably mounted on brackets 66 to rotate about vertical axes and engage the sides of the rail 54 to keep the carriage on the rail. The guide rollers 65 are adjustable by means of eccentric hubs and pins 66 mounted in selected ones of holes 68 in the brackets 66 to vary the spacing between opposite rollers in order to accommodate rails of different widths. The guide rollers are secured in adjusted position by means of bolts 69 and washers 70.

A brush (not shown) carried on a spring loaded vertical shaft 71 engages the rail as in the embodiment of FIGS. 1 to 3 to keep it clean.

The beam 51 is mounted on the carriage 53 by a horizontal shaft 75 which projects in a lengthwise direction from the end of the beam and is rotatable and longitudinally slidable in a bearing member 76 which is rotatably mounted on the carriage 53 so as to turn about a vertical axis.

The horizontal shaft 75 is supported at its inboard end

by a plate 77 secured by bolts 78 to a flange 79 at the end of the beam 51 and at its outboard end by a vertical plate 80 connected to the plate 77 by a horizontal strut of I-beam section 81 welded at its opposite ends to the plates 77 and 80.

The bearing member 76 is generally cylindrical and has a cylindrical bearing cavity 82 to receive the shaft 75. The shaft 75 is longer than the bearing member 76 so as to be longitudinally slidable therein. Movement of the beam 51 in a lengthwise direction relative to the carriage 53 is limited by engagement of opposite ends of the bearing member 76 with the plates 77 and 80 respectively. Tilting movement of the beam 51 relative to the carriage is permitted by rotation of the shaft 75 in the bearing member 76 but is resiliently resisted by leaf springs 84 which are secured to opposite sides portions of the lower flange of the I-beam 81 by means of screws 85 and bear on bearing pads 86 welded on the top wall of the carriage frame 56. The springs 84 bias the beam 51 to a position in which the central longitudinal plane of the beam is vertical. The pads 86 project laterally of the frame 56 and are of sufficient length to be engaged by the springs 84 throughout the range of movement of the beam mounting relative to the carriage.

The bearing member 76 is supported for rotation about a vertical axis by a crescent shaped supporting member 88 which fits between the side walls of the channel shaped frame 56 and is secured by bolts 89 passing through aligned holes in the supporting member and the side walls of the frame. A stub shaft 90 projecting downwardly from the bearing member 76 is received in a cylindrical bearing cavity in the supporting member 88 to provide rotation of the bearing member 76 about a vertical axis. An annular bearing shoulder 71 on the bearing member 76 engages an annular bearing surface on the supporting member 88 to provide a thrust bearing. Opposite ends of the bearing member 76 extend out through holes 92 in the opposite side walls of the frame 56. The holes 92 are sufficiently elongated to permit rotation of the bearing member 76 through a selected angle about the vertical axis of the stub shaft 90. The rotation of the bearing member 76 about its vertical axis thus provides for angular movement of the beam 51 relative to the carriage 53.

It will be understood that features of the illustrated embodiments are mutually interchangeable insofar as they are compatible and that other modifictaions may be made, the invention being in no way limited to the embodiments shown by way of example in the drawings and herein particularly described.

What I claim and desire to secure by Letters Patent is:

1. In a travelling crane comprising two carriages having rollers running on spaced parallel rails, a beam extending between said carriages, means supporting opposite ends of said beam on said carriages and a hoist movable along said beam; the improvement that at least one of said supporting means comprises a bearing member having a cylindrical bearing cavity having its longitudinal axis extending horizontally and lengthwise of said beam, bearing means rotatably supporting said bearing member on said carriage above said rail for rotation about a vertical axis, a horizontal shaft fixed on the end of said beam and projecting in lengthwise continuation of said beam, said shaft being rotatably and slidably received in said bearing cavity of said bearing member and being longer than said bearing member so as to be longitudinally slidable in said bearing cavity, means for limiting the longitudinal sliding movement of said shaft in said bearing cavity and spring means acting between said beam and said carriage resiliently opposing rotation of said shaft in either direction from a neutral position in which the center plane of said beam is vertical, and thereby biasing said beam toward said neutral position.

2. A travelling crane according to claim 1, comprising means for limiting the rotative movement of said shaft in said bearing cavity.

3. A travelling crane according to claim 1, comprising means for supporting said shaft at its outboard end.

4. A travelling crane according to claim 3, in which the inboard end of said shaft is fixed to a vertical plate secured to said beam and said supporting means comprises a vertical vane fixed to said plate and shaft and extending out along the upper side of said shaft.

5. A travelling crane according to claim 4, in which said bearing cavity of said bearing member is open at the top to receive said vane with sufficient clearance to permit rotary movement of said shaft in said cavity.

6. A travelling crane according to claim 1, in which said bearing means rotatably supporting said bearing member comprises a vertical shaft fixed on said bearing member and projecting vertically downwardly therefrom and a bearing portion of said carriage rotatively receiving said vertical shaft and vertically supporting said bearing member.

7. A travelling crane according to claim 1, in which said rollers of said carriages comprise load-carrying rollers rotatable about horizontal axes and having peripheral rail-engaging surfaces which are convex in cross section.

8. A travelling cranes according to claim 7, in which said rollers further comprise guide rollers which are rotatable about vertical axes and engage opposite sides of said rails.

9. A travelling crane according to claim 4, in which the inboard end of said shaft is fixed to the end of said beam and in which said means for supporting said shaft at its outboard end comprises a vertical plate perpendicular to the axis of said shaft and fixed to the outboard end thereof and a strut extending from the end of said beam in a direction parallel to said shaft and carrying said vertical plate, said strut being disposed above and spaced from said shaft and said vertical plate being spaced from the end of the beam a sufficient distance to permit longitudinal movement of said shaft in said bearing cavity of said bearing member.

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