

[54] LIFT TRUCK MAST-MOUNTING ARRANGEMENT

3,054,522 9/1962 Peck 214/674

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[57] ABSTRACT

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A mounting device for a tiltable lift truck mast in the form of a pair of bearing-supported pivot pins which are engaged in upwardly-opening, concave bearing surfaces of corresponding hanger brackets is provided. Each hanger bracket further includes a retainer in the form of a bolt and sleeve having a tapered end portion. Each retainer is cooperable with an annular groove in a respective pivot pin to prevent both rotational as well as axial movement of the pin with respect to its hanger bracket. Alternatively, pin movement is prevented by a bolt extending through a transverse bore in the pin.

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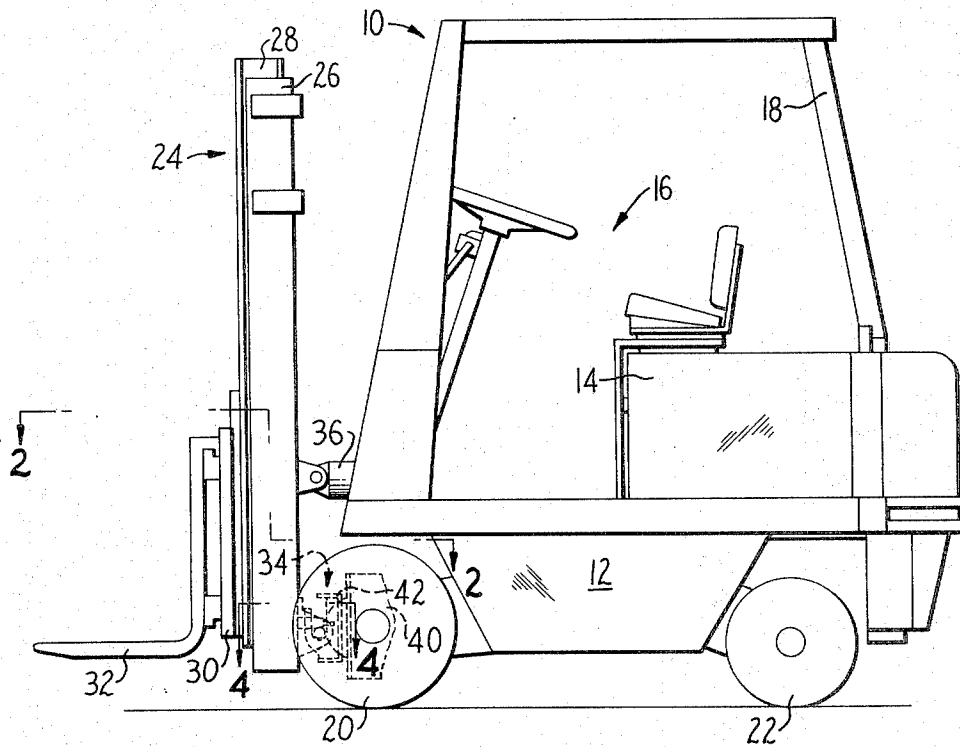
[51] Int. Cl. B66f 9/20

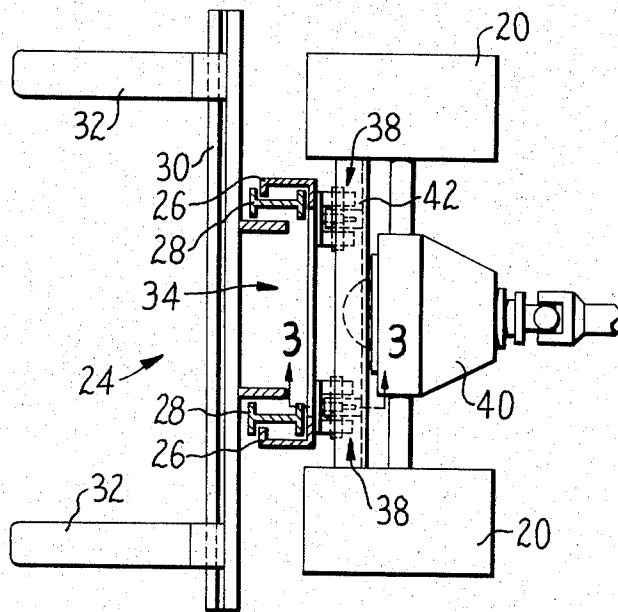
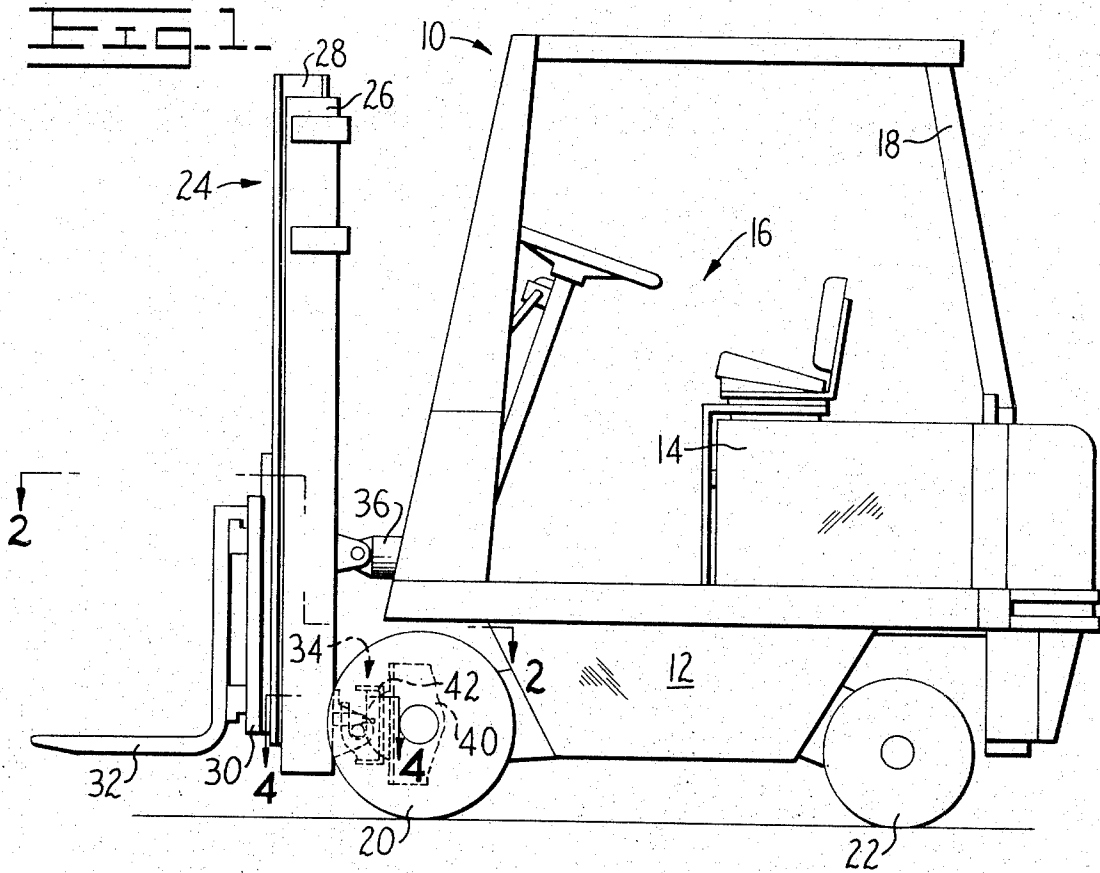
[58] Field of Search..... 214/145, 620, 670, 214/671, 672, 673, 674, 75 G

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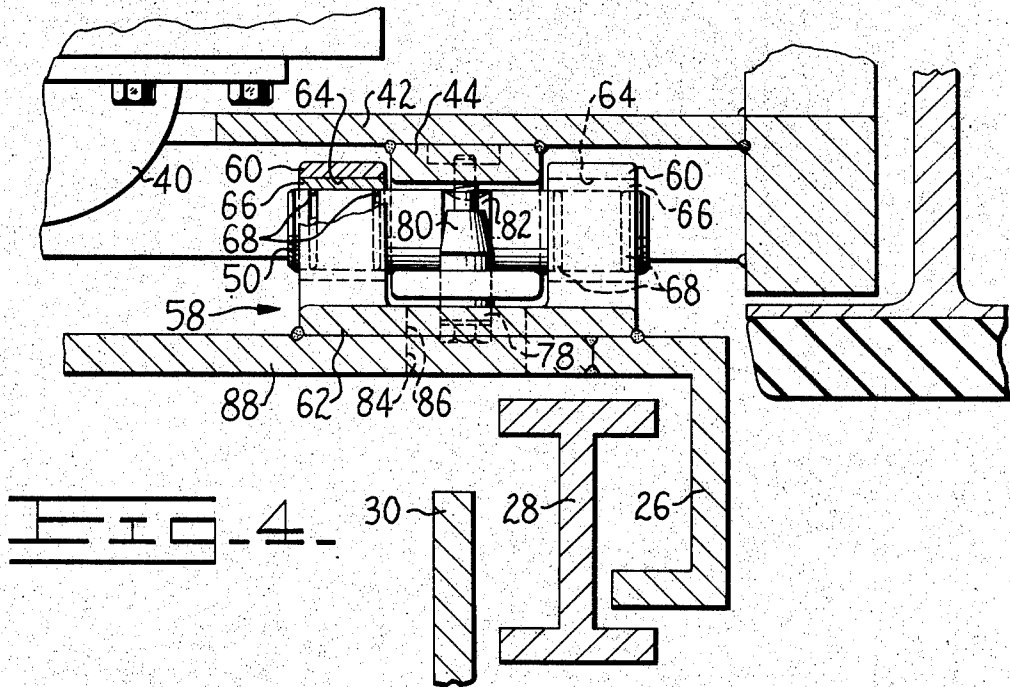
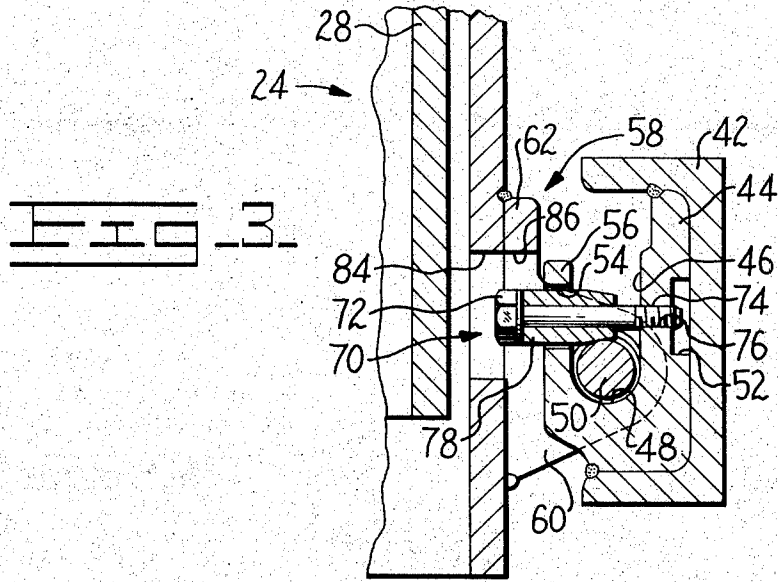
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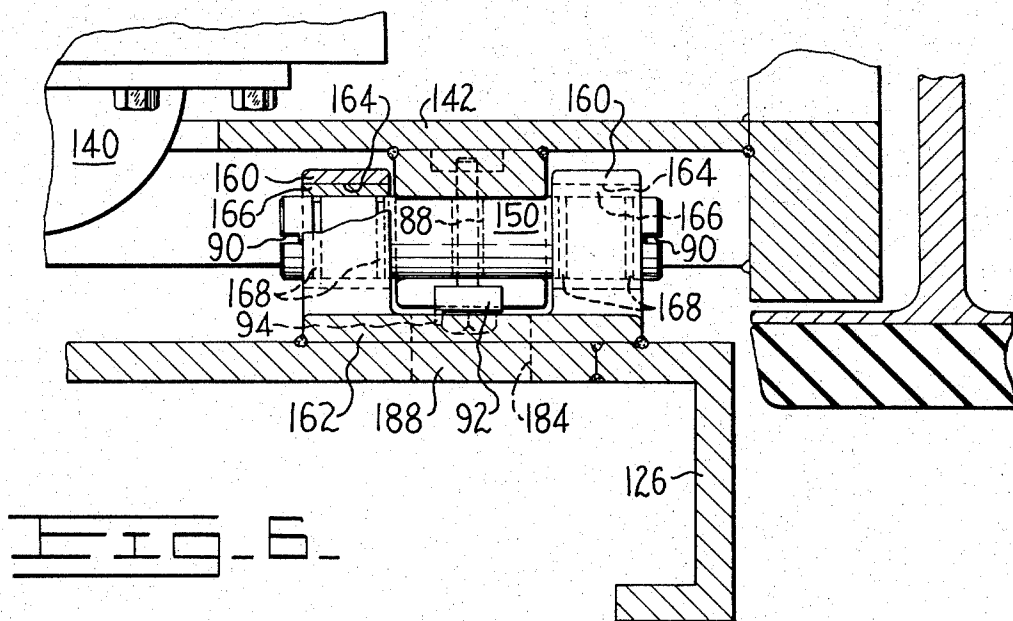
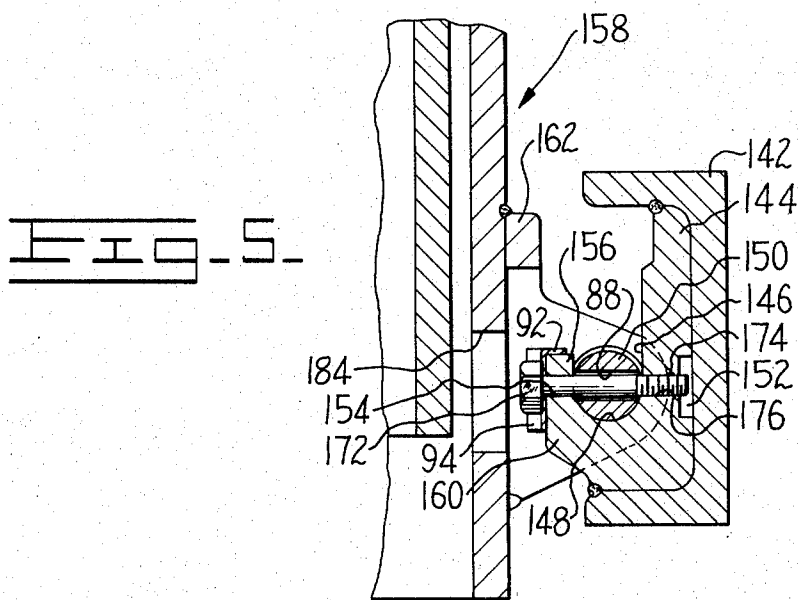
12 Claims, 6 Drawing Figures





SHEET 2 OF 3





LIFT TRUCK MAST-MOUNTING ARRANGEMENT

BACKGROUND OF THE INVENTION

The instant invention relates generally to lift trucks and, in particular, to an improved mast-mounting arrangement for pivotally supporting the mast assembly.

Lift trucks generally comprise a motor-driven chassis having a mast assembly pivotally attached to the front end thereof by a mast-mounting arrangement or means. The mast-mounting arrangement typically comprises a pivot shaft desirably located as low on the chassis as possible such that the mast assembly is as close to the chassis center of gravity as possible in order to minimize tipping of the vehicle during load handling.

Typically, the vehicle differential is located at the front end of the vehicle in order to power the front wheels. Due to the rather large size of the differential, the desired location of the mast assembly is prevented if a single pivot shaft is used. This has led to the use of a pair of pivots mounted on the vehicle chassis on opposite sides of the projecting differential. However, this type of arrangement has not been entirely satisfactory for several reasons.

These prior art mast-mounting arrangements generally contain a large number of parts which are both costly as well as difficult to assemble and remove when it becomes necessary to remove the mast assembly from the vehicle. These arrangements generally comprise a half bearing and a retainer together with a plurality of bolts for securing the pivot pin or shaft within the half bearing by means of the retainer.

Also contributing to difficulty in assembly and removal encountered with the prior art mast-mounting arrangements is the location of such arrangements in the confined space between the mast assembly and the vehicle front end. The plurality of bolts securing the retainers are normally reached either from above or below the vehicle, in either case with great difficulty.

Attempts have been made to solve these and other prior art problems. For example, the mounting arrangement shown in U.S. Pat. No. 3,321,044, to Linsay utilizes a pair of pivot shafts but still requires the plurality of bolts associated with each pivot to be installed and removed from the confined space between the mast assembly and the chassis.

OBJECTS AND SUMMARY OF THE INVENTION

It is, therefore, the primary object of this invention to provide an improved lift truck mast-mounting arrangement.

It is a further object of this invention to provide a lift truck mast-mounting arrangement which places the mast assembly close to the vehicle center of gravity.

It is a further object of this invention to provide a lift truck mast-mounting arrangement permitting easy removal and installation of the mast assembly to be accomplished.

The instant invention takes the form of a pair of upwardly-directed, generally hook-shaped hanger brackets mounted on the vehicle chassis on opposite sides of the differential housing. Each bracket defines an upwardly-directed, elongated slot portion useful for indexing a mast-mounted pivot pin during installation of the mast on the vehicle as well as a concave bearing portion cooperable with the pivot pin. Each pivot pin is rotatably supported at each end thereof by bearings which are, in turn, supported by the arms of a mast

bracket mounted on the mast assembly. A retainer in the form of a sleeve-mounted bolt is associated with each hanger bracket. A tapered end portion on the sleeve is cooperable with an annular groove intermediate the ends of the pivot pin to prevent both rotary as well as axial movement of the pivot pin as well as securing the pin in engagement with the concave bearing surface.

In an alternate embodiment, pin movement is prevented by a bolt extending through a transverse hole in the pin.

Other objects and advantages of the invention will become apparent from the following drawings and description.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view of a lift truck embodying the instant invention;

FIG. 2 is a top plan view, in partial cross section, taken along lines 2—2 in FIG. 1;

FIG. 3 is an enlarged side elevational view of a single pivot in partial cross section taken along lines 3—3 in FIG. 2;

FIG. 4 is a top plan view of the same taken along lines 4—4 in FIG. 1;

FIG. 5 is an enlarged side elevational view of a second embodiment of a single pivot in cross section similar to FIG. 3; and

FIG. 6 is a top plan view of the same similar to FIG. 4.

BRIEF DESCRIPTION

FIG. 1 shows generally at 10 a fork-lift truck comprising a chassis 12 containing motor means (not shown) in the area generally shown at 14. An operator station generally shown at 16 is protected by means of a roll-over protection structure 18.

Ground-engaging, front drive wheels 20 and rear wheels 22 support the vehicle for movement over the ground-support surface. A lift mast assembly 24 comprising a plurality of pairs of vertically telescoping lift masts 26, 28 movably support a carriage 30 having a pair of lift forks 32 mounted thereon in the conventional manner. Articulation of the lift mast assembly about the mast-mounting arrangement shown generally at 34 is accomplished by means of a pair of hydraulic jacks, one of which is shown at 36, pivotally connecting the chassis with the tiltable lift mast assembly 24.

Turning now to FIG. 2, the structure and relationship of the mast-mounting arrangement or means 34 as well as its relationship to other components can be more readily discerned. The mast-mounting arrangement is shown to comprise a pair of identical pivot assembly units 38 located on opposite sides of differential housing 40. Each pivot assembly unit is fastened to both the mast assembly 24 as well as a laterally-oriented member 42 of the front axle assembly.

Referring now to FIGS. 3 and 4, one of the pairs of pivot assembly units will be described for the sake of illustration. The unit comprises a generally hook-shaped hanger bracket 44 defined by an upwardly-opening, elongated slot 46 and a convex or arcuate bearing surface 48. Bearing surface 48 is dimensioned to conform to the generally-cylindrical pivot pin or shaft 50 over 180° of its outer periphery. The hanger bracket may be conveniently constructed of cast or formed metal such as iron or steel so as to have a rear

recess 52 therein as well as an axially aligned bore 54 in an upward projection 56 for a purpose to be more fully described below.

In like manner, a mast bracket 58 having bifurcated arms 60 extending from a base 62 may be similarly constructed. As perhaps best seen in FIG. 4, the mast bracket 58 has a pair of axially-aligned bores 64 contained within the outer ends of the arms 60. Fitted within bores 64 in a conventional manner are concentric sleeve bearings 66. Pivot pin 50 is concentrically located within the bearings and dimensioned to be rotatable relative thereto. A pair of O-ring seals 68 of resilient material such as rubber are contained within spaced, annular grooves in the periphery of pin 50 which is conveniently of metal material, e.g., steel. These O-rings act as seals to retain bearing lubricant and keep out deleterious abrasive material.

A retainer shown generally at 70 is provided in the form of a bolt 72 having a head and a threaded end portion 74 which is threadably engaged in a bore 76 in hanger bracket 44. A sleeve 78 around the bolt has a tapered end portion 80 which is cooperable within an annular groove 82 around pin 50 and intermediate the ends thereof. The described elements are dimensioned such that the tapered portion 80 contacts the groove 82 such that rotational and consequent axial movement of the bolt results in retainer 70 preventing rotational as well as axial movement of the pin. Such torquing may be accomplished from the front of the vehicle through concentric apertures 84, 86 in carriage plate 88 and base 62, respectively. As best seen in FIG. 4, arms 60 are dimensioned to closely encompass hanger bracket 44 such that lateral movement of the mast assembly with respect to the chassis is minimized. With pivot pin 50 held in engagement with bearing surface 48, the pivot pin will be stationary with respect to the chassis, and the mast assembly will pivot about the pin through the operation of the bearings 66.

In assembling mast assembly 24 onto chassis 12, the O-rings 68 are first installed on each pivot pin 50. The pivot pins are then inserted in mast brackets 58 with the ends thereof fitted within bearings 66. The mast assembly 24, upon which mast brackets 58 are mounted, is then lowered such that the pivot pins 50 are guided into engagement with bearing surfaces 48 by means of slot 46, as seen in FIG. 3. A retainer 70 is then inserted through apertures 84, 86 from the front of the vehicle. The bolt 72 having threaded portion 74 is then threadably engaged in bore 76 but not tightened. Pivot pins 50 are then laterally positioned so as to align annular grooves 82 therein with tapered portion 80 of sleeve 78. Bolts 72 are then tightened to a predetermined torque to secure the mast assembly to the chassis. Removal of the mast assembly is accomplished by reversing the steps.

Referring now to FIGS. 5 and 6, a second embodiment of the invention is shown in which structure finding its numerical analogue in the first embodiment is prefaced with the numeral one. The primary distinction over the first embodiment is in using a bolt 172 extending through a closely-fitting lateral bore 88 in pin 150 so as to be engageable therewith. Slots 90 are provided at each end of pin 150 for indexing purposes as will be hereinafter described. A bolt locking means such as bolt lock 92 serves to prevent unwanted removal of the bolt 172.

Assembly is accomplished in similar manner to that described with the first embodiment. After guiding the pivot pins 150 into bearing surfaces 148, the pins are moved axially by tapping and indexed by inserting a screwdriver or other tool (not shown) into slots 90 to achieve alignment of bores 154, 176 and 88. After bolt 172 is inserted into the aligned bores and tightened, a tab 94 on bolt lock 92 is bent over, as shown, against the bolt head to secure the bolt in place.

It is to be understood that the foregoing description is merely illustrative of the preferred embodiments of the invention and that the scope of the invention is not to be limited thereto, but is to be determined by the scope of the appended claims.

What is claimed is:

1. In a lift truck having a chassis and a mast assembly, a mast-mounting arrangement pivotally attaching the mast assembly to the chassis, said mast-mounting arrangement comprising:

a pair of hanger brackets on said chassis each defining a generally concave bearing surface,

a pair of mast bracket means on said mast assembly having means thereon rotatably supporting a pair of shafts, each of said shafts being in complementary engagement with a respective one of said concave bearing surfaces, and

retention means on each of said hanger brackets for preventing both rotational as well as axial movement of said shafts with respect to said hanger brackets.

2. The invention of claim 1 wherein each of said hanger brackets comprises a generally hook-shaped member defined by an elongated slot portion and said concave bearing portion.

3. The invention of claim 1 wherein each of said mast bracket means comprises a base and a pair of arms in spaced relation extending from said base.

4. The invention of claim 3 wherein said mast bracket means further comprises a bore through each arm and wherein said means rotatably supporting said shafts comprise bearing means in said bores.

5. The invention of claim 4 wherein said bearing means comprise generally-cylindrical sleeve bearings fitted within said bores.

6. The invention of claim 1 wherein each of said shafts comprises a generally-cylindrical member defining a pair of end portions and a center portion intermediate said end portions, and wherein said end portions are rotatably fitted within said bearings.

7. The invention of claim 6 further including seal means for retaining lubricant in said bearings and for excluding foreign matter.

8. The invention of claim 1 wherein each of said retention means comprise sleeve means defining a tapered end portion and means for tightening said sleeve means against said shaft whereby said shaft is held against said concave bearing surface.

9. The invention of claim 8 wherein each of said shafts has an annular groove therearound intermediate its ends, and wherein said retention means is located to position said sleeve means tapered end portion in said groove.

10. The invention of claim 1 wherein said retention means comprise a transverse bore through each of said shafts and bolt means extending through said transverse bore, said bolt means being secured to a respective hanger bracket.

11. The invention of claim 10 further including lock means for securing said bolt means.

12. The invention of claim 1 wherein said retention means comprise a transverse bore through each of said shafts and means in said transverse bore extending through an axially aligned bore in said hanger bracket.

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