

- [54] **MAST STABILIZER FOR LIFT TRUCKS**
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[22] Filed: **Dec. 14, 1972**
[21] Appl. No.: **315,218**
[52] U.S. Cl. **187/9, 187/8.59, 214/730**
[51] Int. Cl. **B66b**
[58] Field of Search **187/9, 8.59; 214/75, 214/78, 80, 730, 731; 254/189**

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[57] **ABSTRACT**

A stabilizer for reducing side-tilting moments in a lift truck mast by overcoming the moments imposed by side loads on the mast. An endless chain loop tauntly positioned on either side of the mast by a separating column with a sprocket at each end. One side of the chains is connected to the load bearing structure and the other side of the chains is anchored. One of the sprockets engaging each of the chains are connected together by a common torque shaft whereby any side loads on the carriage is transmitted to the chains and the torque shaft to compensate for the side loads.

4 Claims, 5 Drawing Figures

[56] **References Cited**

UNITED STATES PATENTS			
2,639,784	5/1953	Strock.....	187/8.59 X
2,891,636	6/1959	Krieger et al.....	187/8.59 X
3,360,078	12/1967	Hopfeld	187/9

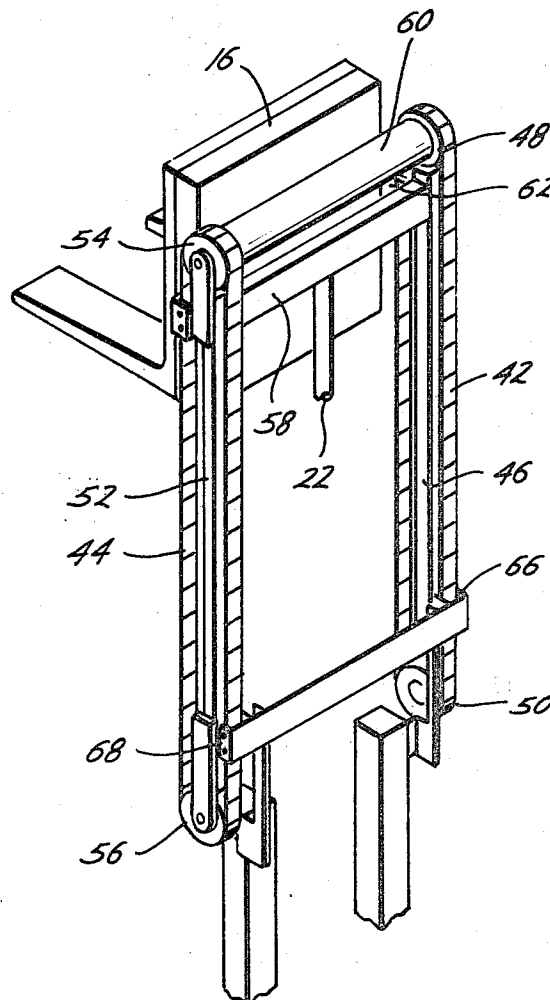


Fig. 1

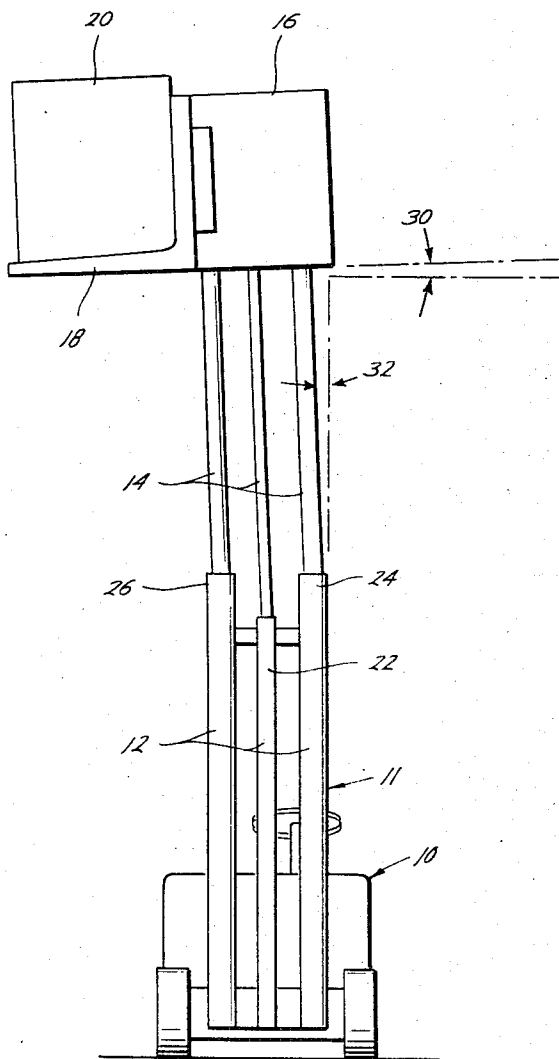
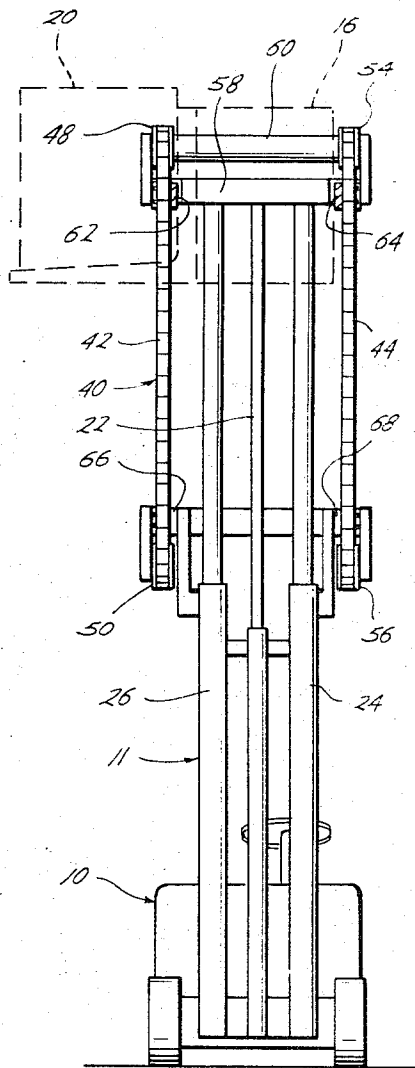


Fig. 2



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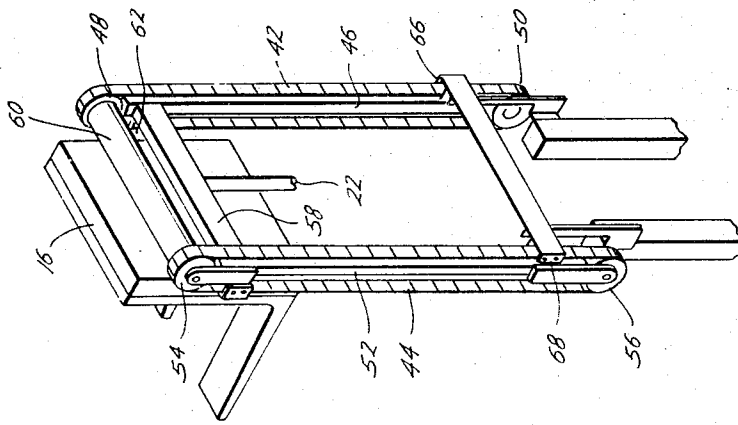


Fig. 5

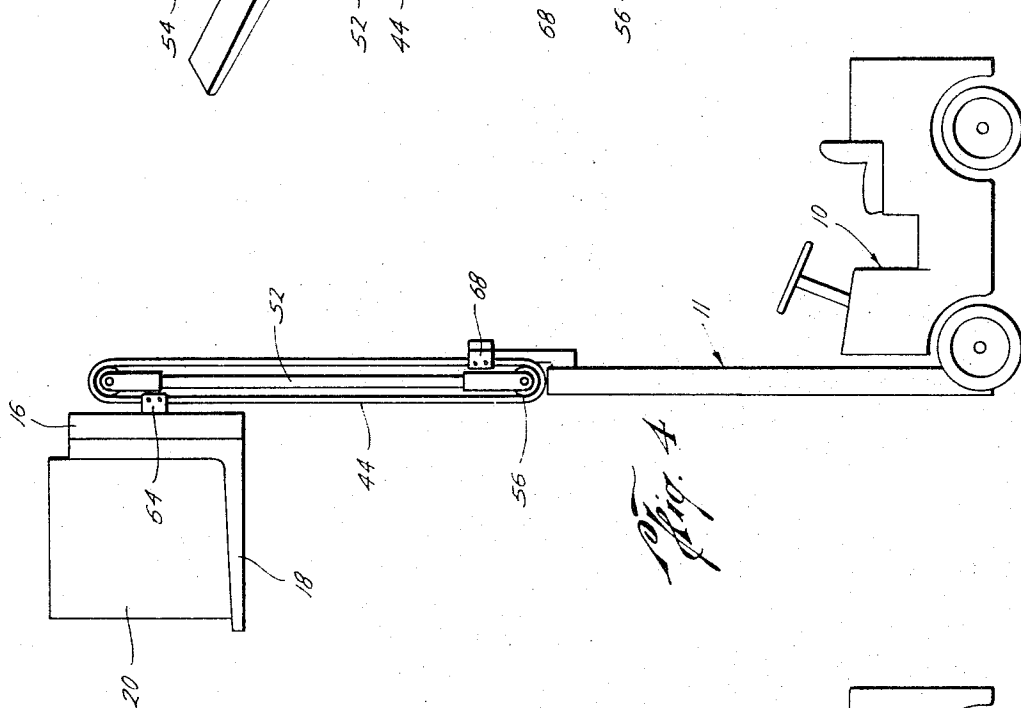


Fig. 4

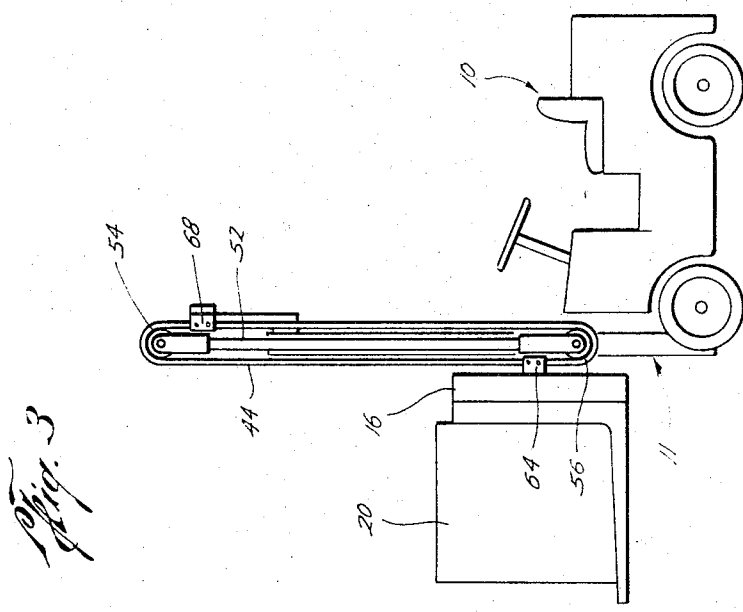


Fig. 3

MAST STABILIZER FOR LIFT TRUCKS

BACKGROUND OF THE INVENTION

The mast of lift trucks is normally designed to handle loads positioned in the front of the mast, and sufficient guides and supports are provided to overcome forward bending moments. However, the latest accessories for lift trucks include narrow aisle attachments which are capable of pivoting the load to one side of the lift truck and then placing the load on a stack at the side of the truck. The side loads can cause excessive bending moments in the structural elements of the elevating mast and cause binding in the side thrust members and may cause locking of the members, and/or galling or seizing of the side thrust bearings. The telescoping members of the mast wear, spread apart, and bend. Even if the seizing of the telescoping members does not occur, the mating parts soon have a sloppy relationship with each other. The side deflection of the mast becomes excessive, dangerous and results in a lower capacity for the lift truck.

The present invention is directed to overcoming the side moments caused by side loading on the mast of a lift truck. Instead of attempting to redesign and strengthen the mast, the present mast stabilizer may be conveniently connected to a conventional mast on a lift truck and overcome the moments transmitted to the lift truck mast through the carriage by off-center loads.

SUMMARY

In general, the present invention provides a stabilizer for use with a mast in a lift truck for overcoming side-tilting moments in the mast caused by off center or side loads. The mast stabilizer of the present invention may be combined with a conventional mast and easily attached thereto for overcoming the side load imposed moments leaving only the conventional forward loading on the mast, which the mast is designed to overcome, without requiring the mast to be redesigned and beefed up.

The mast stabilizer moves up and down as the lift truck mast is elevated and lowered, and generally includes a closed chain loop on either side of the mast, each of which is held to a minimum of slack by a separating support or column with sprockets on each end engaging the interior of the chain loop. One side of each of the chain loops may be connected to the load bearing structure and the other side of the chain loops is anchored such as to the truck. A torque shaft is provided between one pair of opposed sprockets in each of the chain loops.

The lifting elevator and mast will function in its conventional manner. When a load is moved off center to one side of the mast, the stabilizer chain connected to the load bearing structure on the off center loaded side is urged downwardly and the stabilizer chain on the other side is urged upwardly. But the tendency of one of the chains to rotate in one direction while the second chain rotates in the opposite direction will tend to compensate each other through the torque shaft connected between the two chains thereby reducing the tendency of the load and carriage to tilt.

The mast stabilizer of the present invention floats with the mast as it raises and lowers the carriage, and is compatible as an attachment to most conventional lift truck designs.

Other and further objects, features and advantages will be apparent from the following description of the presently preferred embodiment of the invention, given for the purpose of disclosure when taken into conjunction with the following drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an elevational view, partly schematic, illustrating the tilting which occurs in a conventional lift truck mast when the carriage load is applied off center such as to one side of the lift truck,

FIG. 2 is an elevational view of the present invention connected to a conventional mast of a lift truck for overcoming the bending moments applied to the mast by an off-center load,

FIG. 3 is a side elevational view of the present invention with the carriage shown in an intermediate elevated position,

FIG. 4 is a side elevational view of the present invention with the carriage elevated to the top of the mast of the lift truck, and

FIG. 5 is a fragmentary perspective view of the present invention connected to a mast.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings, and particularly to FIG. 1, a conventional lift truck is generally indicated by the reference numeral 10 having a telescoping mast including fixed mast sections 12 and telescoping movable mast sections 14 movable relative to the fixed sections 12. The movable sections 14 carry and support a load supporting structure such as a carriage 16 having any suitable load carrying accessory such as fork lifts 18 and narrow aisle attachments for carrying a load 20.

Any suitable means for raising and lowering the carriage 16 may be provided such as one of the mast sections being a lifting and lowering piston and cylinder assembly 22. The other mast and cylinder sections 24 and 26 may be telescoping guide members. As best seen in U.S. Pat. No. 3,659,733 the carriage 16 may include a narrow aisle attachment, which is capable of pivoting the load to one side of the lift truck, as best seen in FIG. 1, for placing it on a stack at the side of the truck. However, when a side load is applied to the mast 11, the telescoping members of the mast 11 can become spread apart and bend so that even if seizing of the telescoping members does not occur, the mating parts 12 and 14 would soon have a sloppy relationship with each other and produce a side deflection indicated by the numerals 30 and 32. More dangerous, however, is that in many trucks the lifting mechanism 22 is single acting. If the telescoping members seize, the load 20 can be stuck in the air unsupported, except for a frictional lock, when the lifting mechanism 22 is deactuated. Then if the load becomes centered, or the friction lock removed in any way, the support would disappear, dropping the carriage 16 and load 20. The present invention is directed to reducing the side moments created on the mast 11 of a lift truck 10 through the carriage 16 by off-center loads. Rather than redesign and rebuild a mast to handle large side loads, the present invention is directed to providing a mast stabilizer which may be combined with a conventional mast and will reduce the side load imposed moments and which will move up and down and "float" with the elevating mast.

Referring now to FIGS. 2 through 5, the floating mast stabilizer of the present invention is generally indicated by the reference numeral 40 for attachment to a conventional lift truck 10 having an elevating mast 11. The stabilizer 10 generally includes an endless chain loop 42 and 44 positioned preferably in parallel vertical planes on opposite sides of the mast 11. Each of the endless chain loops 42 and 44 are held to a minimum of slack or in maximum tension by a separating support or column having a sprocket at each end for engaging the interior of the endless chain loop. Thus, chain 42 is supported by a column 46 having sprockets 48 and 50 engaging the interior of the loop 42. Similarly, chain 44 includes a column 52 having sprocket wheels 54 and 56. Columns 46 and 52 are connected together and supported by a support 58 which may be connected to the telescopic mast member 22 which raises and lowers the support 58 as well as the columns 46 and 52 and thus the chain loops 42 and 44.

At least two of the opposing sprockets connected to each of the chains 42 and 44 are fixedly secured to a common torque shaft 60 which runs in bearings (not shown) and is supported from the support 58, or as shown from the columns 46 and 52. As shown, the shaft 60 is secured to each of the sprockets 48 and 54. If desired, the torque shaft 60 or an additional torque shaft could be connected between sprockets 50 and 56. However, generally space requirements of the truck 10 prevent the use of a lower torque shaft. Each of the chains 42 and 44 are connected on the forward side of their loops to the load handling structure such as to either side of the back side of the carriage 16 by connectors 62 and 64, respectively, for supporting and carrying the carriage 16. Each of the chains 42 and 44 on the back side of the chains is secured such as to connectors 66 and 68, respectively, which are suitably anchored. Preferably, the connectors 66 and 68 are suitably anchored at points in the same horizontal plane and to any suitable support on the truck 10 such as to the fixed sections 12 of the stationary mast members.

The elevating mast 11 of the truck 10 of FIGS. 2-5 will function in the same manner as in FIG. 1, moving the support 58 upwardly and downwardly. Raising and lowering the support 58 carries the columns 46 and 52 upwardly and downwardly. Since one end of the chains 42 and 44 are secured to connectors 66 and 68 against movement upward, upward movement of the support 58 and columns 46 and 52 will move the endless chains 42 and 44 upwardly rotating them about the sprockets and moving the connectors 62 and 64 which will support and carry the carriage 16 upwardly. As best seen in FIG. 3, with the telescopic mast 11 being partially raised the columns 46 and 52 are partially raised carrying the supports 66 and 68 and the load 20 upwardly. As best seen in FIGS. 4 and 5, with the mast 11 fully extended upwardly, the columns 42 and 44 are also fully extended upwardly raising the connectors 62 and 64 and thus the carriage 16 and the load 20 to its highest vertical position.

Referring now to FIG. 2, and assuming that the load 20 is moved to one side of the mast 11, as shown, the forward side of chain 42 connected to connector 62 is urged downwardly by the side moment of the load 20. However, the forward side of the chain 44 and the connector 62 is urged upwardly. It is to be noted that the load on connector 62 and chain 42 attempts to rotate sprocket 48 and the torsion shaft 60 in a first direction

while the side loading on chain 44 and connector 64 attempts to rotate the sprocket 54 and the torsion shaft 60 in the opposite direction. Opposite and equal rotational moments are applied to the shaft 60 which compensate for the side loading and applies the forces to the mast stabilizer 40 to prevent applying tilting forces to the telescoping mast 11, as shown in the prior art of FIG. 1. The tendency of the load 20 and carriage 16 to tilt sideways is reduced except for any minor elastic stretch in the chains 42 and 44 or torsional deflection in the shaft 60.

The truck mast stabilizer of the present invention therefore absorbs, through the mast stabilizer 40, the side stresses normally transmitted to the truck mast 11 and is easily attached to most conventional masts.

The present invention, therefore, is well adapted to carry out the objects and attain the ends and advantages mentioned as well as others inherent therein. While a presently preferred embodiment of the invention has been given for the purpose of disclosure numerous changes in the details of construction, and arrangement of parts, may be provided without departing from the spirit of the invention and the scope of the appended claims.

What is claimed is:

1. A mast stabilizer for a lift truck having an elevating mast for raising and lowering a load bearing structure comprising,

a pair of endless chains positioned adjacent the mast, each chain including a chain support having a sprocket at each end engaging the endless chain, a torsion shaft fixedly secured to one of the sprockets on each of the chains;

support means between the chain support in each chain, the first side of each of the chains being connected to the load bearing structure, and

the second side of each of the chains being anchored whereby side loads on the load bearing structure is transmitted to the chains and torsion shaft to compensate for the side loads.

2. The apparatus of claim 1 wherein the second side of the chains are anchored at points in the same horizontal plane.

3. A mast stabilizer for a lift truck having a telescoping mast including a fixed mast section and a movable mast section for raising and lowering a carriage comprising,

a pair of endless chains positioned on opposite sides of the mast,

each chain supported on a support column having a sprocket at each end engaging the endless chain, a torsion shaft fixedly secured between one of the sprockets on each of the chains,

support means between the columns in each of the chains,

the first side of each of the chains being connected to the carriage, and

the second side of each of the chains being fixedly secured to the truck whereby side loads on the carriage is transmitted to the chains and torque shaft to compensate for the side loads.

4. A stabilized mast for a lift truck comprising, a load bearing structure,

a generally vertically positioned telescoping mast including a fixed mast section and a movable mast

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section for raising and lowering the load bearing structure,
a pair of endless chains generally positioned in a vertical plane on opposite sides of the mast,
each chain carried by and held in tension on a column having a sprocket at each end engaging the interior of the endless chain,
a torsion shaft fixedly secured between one pair of opposed sprockets on each of the chains,
support means between the columns in each of the 10

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chains, said support means connected to the movable mast section,
one side of each of the chains being connected to the load bearing structure, and
the other side of each of the chains being connected to the truck at points substantially in the same horizontal plane whereby side loads on the load bearing structure is transmitted through the chains and torque shaft to compensate for the side loads.

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