United States Patent [19]

Wagner et al.

[11] **3,851,732**

[45] **Dec. 3, 1974**

[54] **MAST AND CARRIAGE FOR A LIFT TRUCK**

[75] Inventors: **Richard A. Wagner,** Euclid; **Paul A. Reid,** Mentor; **Edward G. Teutsch,** Willoughby; **Milford D. McVeen,** Highland, all of Ohio

[73] Assignee: **Towmotor Corporation,** Mentor, Ohio

[22] Filed: **Feb. 8, 1973**

[21] Appl. No.: **330,890**

[52] **U.S. Cl.** **187/9**

[51] **Int. Cl.** **B66b 9/20**

[58] **Field of Search** ..... 187/9; 212/46 B

[56] **References Cited**

UNITED STATES PATENTS

2,456,320	12/1948	Repke	187/9
2,643,162	6/1953	Barr	187/9
2,936,047	5/1960	Quayle	187/9
3,506,092	4/1970	Shinoda et al.	187/9
3,556,247	1/1971	Shinoda et al.	187/9

Primary Examiner—Robert B. Reeves
Assistant Examiner—Hadd Lane
Attorney, Agent, or Firm—Phillips, Moore, Weissenberger, Lempio & Strabala

[57] **ABSTRACT**

A lift truck incorporates a pair of fixed, laterally spaced apart upright channel members the edge flanges of which are directed inwardly. A pair of interconnected elongated members are associated with these fixed channel members by means of a pair of top rollers mounted to the fixed channel members and positioned adjacent single edge flanges of the elongated members, and a pair of bottom rollers mounted to the elongated members and disposed within the channel members, the edge flanges defining proper cutout portions to allow such positioning of the rollers. The rolling portions of the top rollers are actually in rolling contact with angled portions of the elongated members, and the rolling portions of the bottom rollers are actually in rolling contact with angled portions of the fixed channel members. The cutout portions are so sized, in relation to the rollers associated therewith, that the elongated members cannot be applied to or removed from the fixed channel members with all rollers in place. The movable elongated members further comprise laterally spaced apart movable uprights with which a fork carriage is associated. A first pair of rollers is mounted to the frame of the fork carriage. Such rollers are rollingly associated with one movable upright. A second pair of rollers is mounted to the frame of the fork carriage. These rollers are rollingly associated with the other movable upright. Another roller is mounted to the fork carriage frame with its axis between the axes of the first pair of rollers, and positioned to contact the rear portion of the one movable upright. Yet another roller is mounted to the frame of the fork carriage, with its axis between the axes of the second pair of rollers, and is positioned to contact the rear portion of the other movable upright. Such means allow for raising and lowering the fork carriage relative to the movable upright, meanwhile providing positive forward, rearward, and lateral location of the fork carriage relative thereto.

19 Claims, 10 Drawing Figures

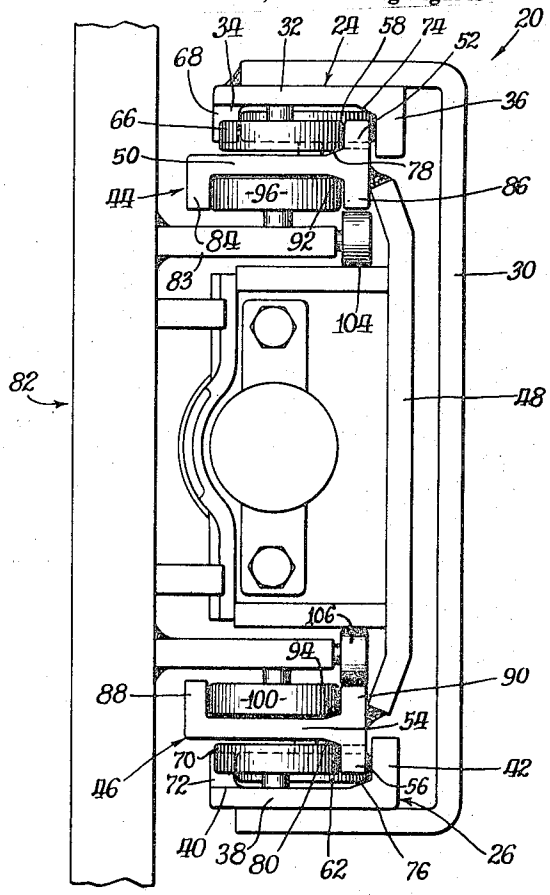


Fig. 1

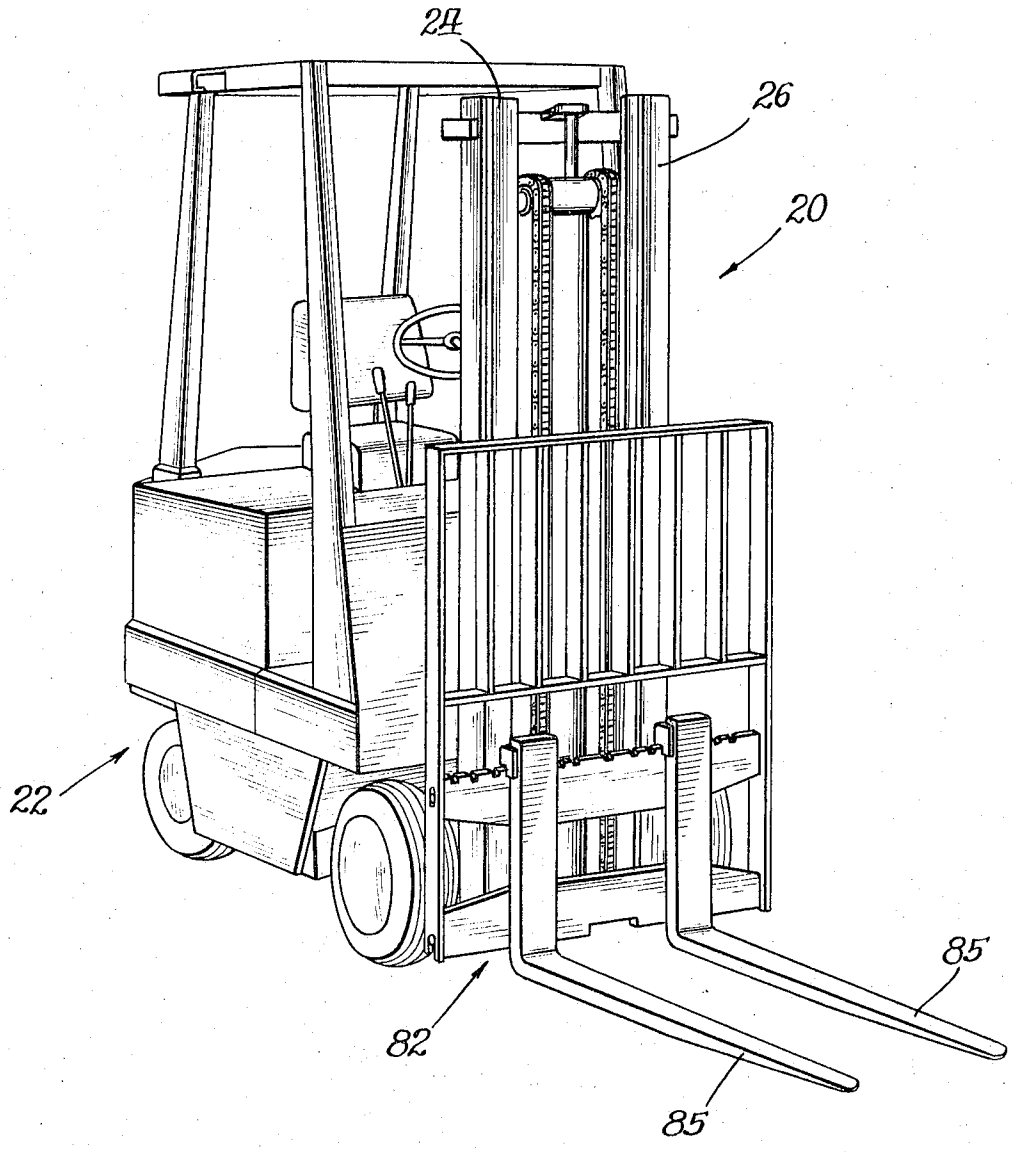


Fig. 2.

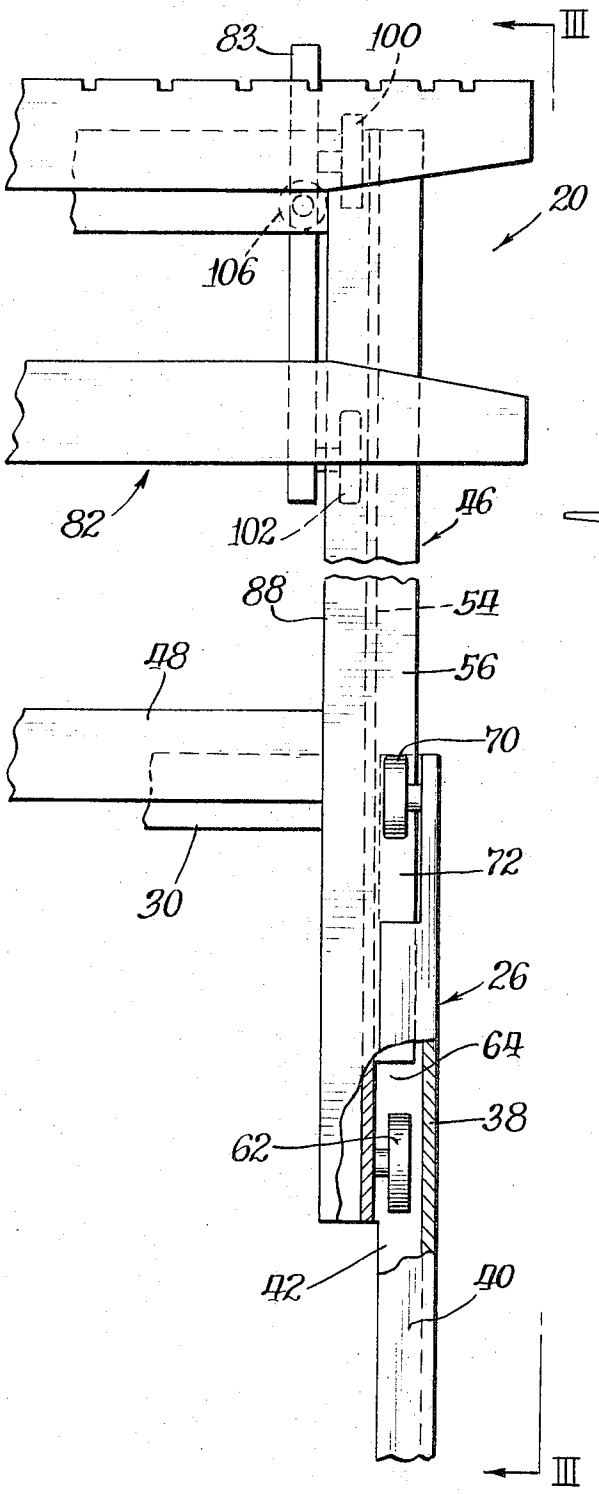
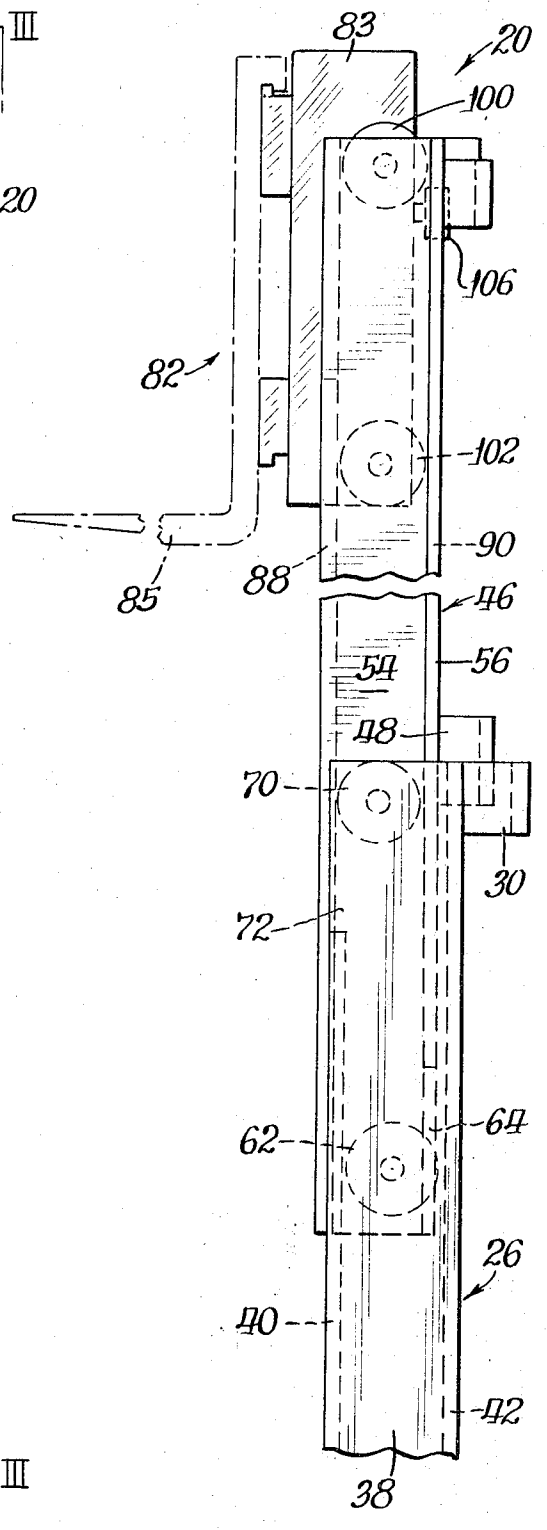

83
100
III
20
106
82
102
46
88
54
48
56
70
72
30
26
64
38
62
42
40
III

Fig. 3.


83
20
100
106
82
102
85
88
90
46
54
56
48
70
30
72
62
64
26
40
42
38

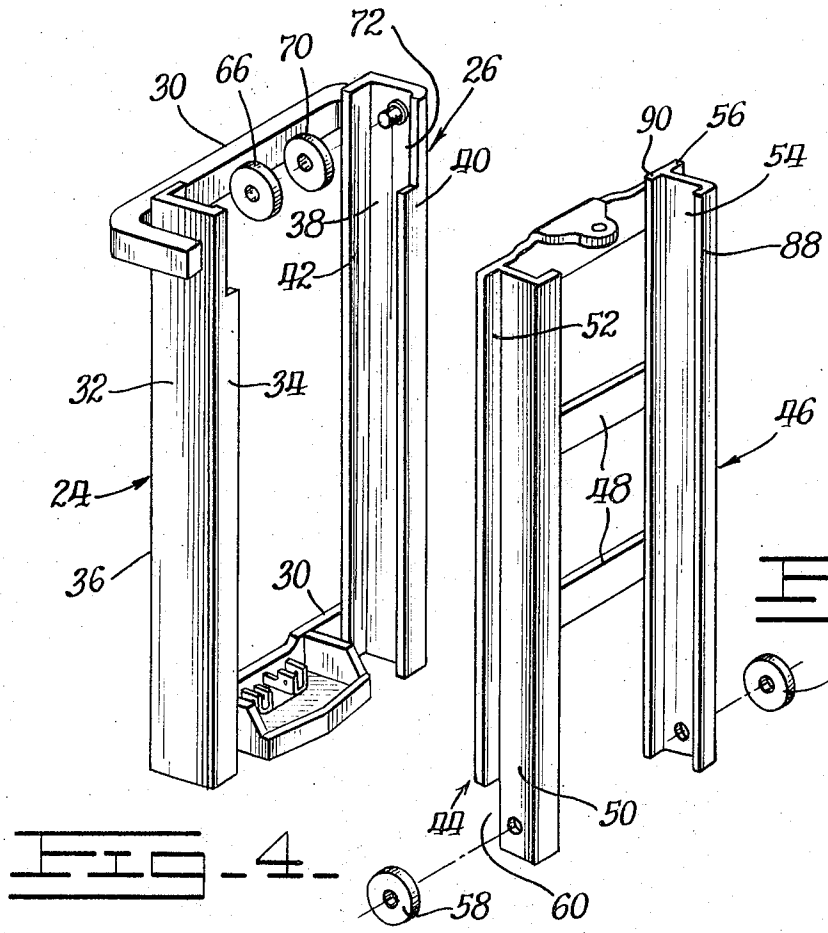


FIG-4-

FIG-5-

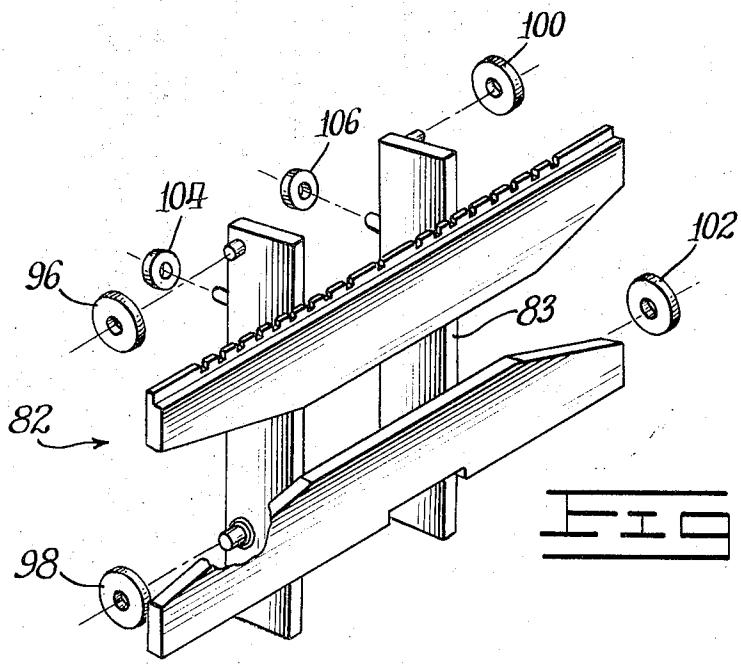


FIG-6-

Fig. 7

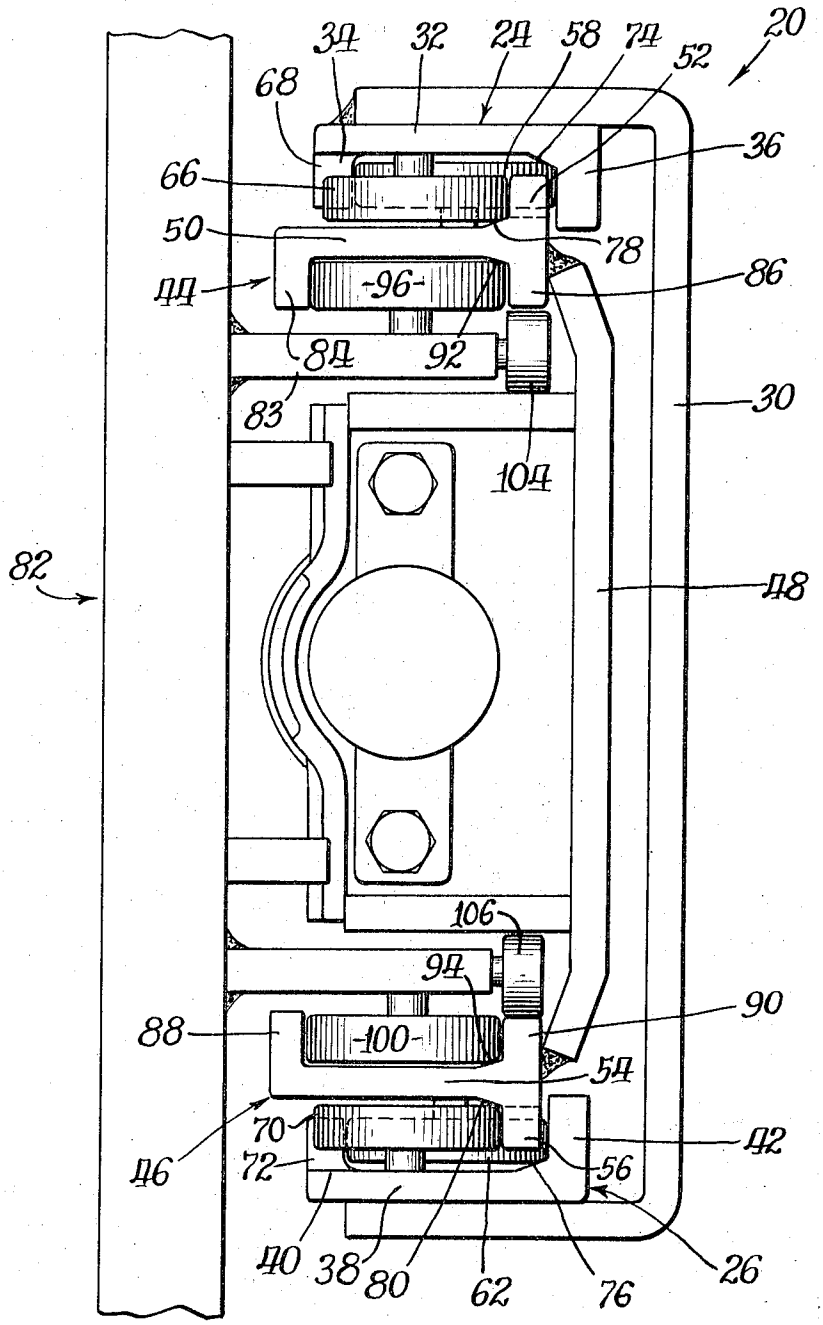
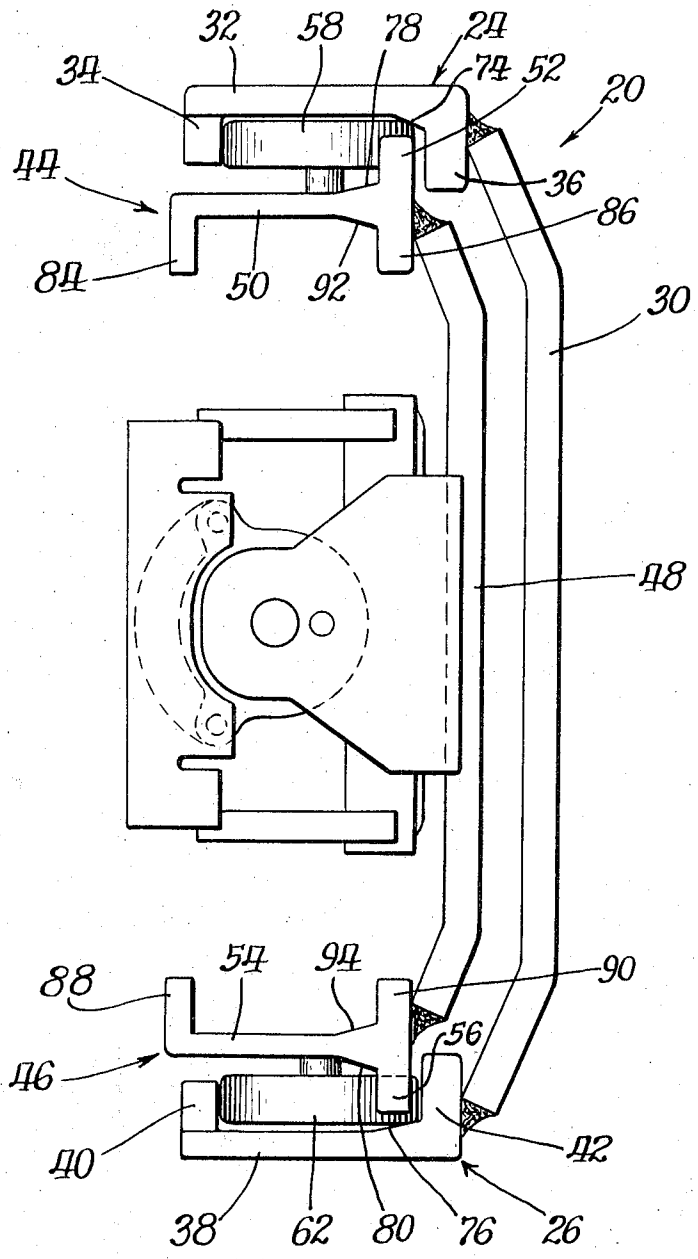

20
34
32
24
58
74
52
68
36
66
50
78
44
-96-
86
84
92
83
30
104
82
48
106
94
90
88
-100-
54
70
42
46
72
56
40
38
80
62
76
26

FIG. 8


32
58
78
24
74
52
20
34
44
36
86
84
50
92
30
48
88
54
94
90
56
46
40
42
38
62
80
76
26

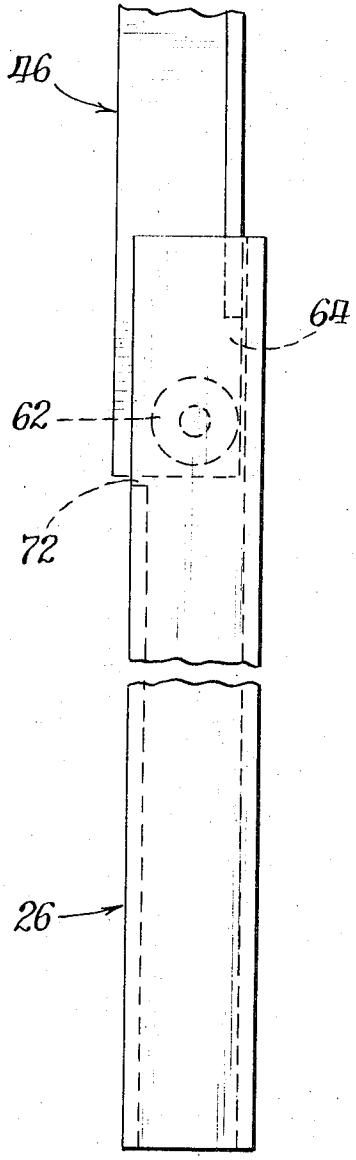


Fig. 9

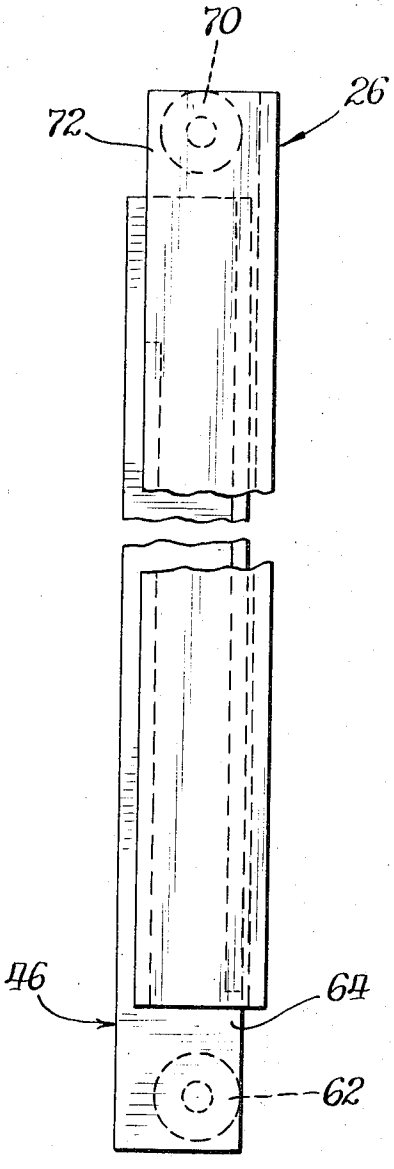


Fig. 10

MAST AND CARRIAGE FOR A LIFT TRUCK

BACKGROUND OF THE INVENTION

This invention relates to mast and carriage assemblies for a lift truck, and more particularly, to such an assembly which provides a pair of elongated members extensible relative to a pair of fixed channel members, and a fork carriage movably associated with the pair of elongated members.

In the normal fork-type lift truck, the fork thereof is carried by a vertically extensible mast assembly located at the forward end of the truck. Such fork engages a load in a lower position and is thereafter raised to a desired elevation, in which position such load is transported to a desired location, lowered, and unloaded. Such a mast assembly for supporting a fork carriage preferably includes means for its vertical extension so as to maintain minimum vertical retracted height, while also providing maximum elevation of the fork carriage.

In general, such extensible mast assemblies of known construction have included a stationary assembly fixed to the truck and a movable section including a pair of slidingly extensible rail members movable relative to the stationary assembly, and a fork carriage movably associated with a pair of slidingly extensible rail members. Examples of such structures are U.S. Pat. No. 2,428,223 to Johnson, U.S. Pat. No. 2,791,292 to Quayle, U.S. Pat. No. 2,505,009 to Schroeder, U.S. Pat. No. 2,918,143 to Shaffer, U.S. Pat. No. 3,213,967 to Hastings et al., U.S. Pat. No. 3,506,092 to Shinoda et al., U.S. Pat. No. 2,759,562 to Ulinski. (Of more general interest are U.S. Pat. No. 3,362,503 to Stoilov, U.S. Pat. No. 3,556,247 to Shinoda et al., and U.S. Pat. No. 2,298,196 to Cochran.)

Such previous structures have maintained minimum retracted height and provided means for elevating the fork carriage thereof above the normal vertical dimension of the stationary mast portion.

The present invention improves upon the general features and concepts of the extensible mast structure.

SUMMARY OF THE INVENTION

It is an object of this invention to provide a mast assembly in a lift truck which provides a compact arrangement in the fully lowered position, meanwhile extending to allow sufficient raising thereof.

It is a further object of this invention to provide a mast assembly in a lift truck which includes rollers which may be easily and properly positioned for proper bearing of eccentric loading, meanwhile insuring smooth operation under this and all other conditions.

It is a still further object of this invention to provide a mast assembly in a lift truck which, while fulfilling the above objects, is simple in design and manufacture.

Broadly stated, the invention comprises a mast assembly for a truck or the like. Such mast assembly comprises first and second upright, laterally spaced channel members each defining a base portion and forward and rearward parallel edge flange portions extending from the base portion and generally perpendicular thereto, with the flange portions of each channel member disposed toward the other channel member. First and second interconnected elongated members are positioned inwardly of the first and second channel members respectively and movable therealong, the first elongated member defining a base portion and a single edge flange portion extending from said base portion and generally perpendicular thereto, and disposed toward the first channel member and between the forward and rearward flange portions of the first channel member and adjacent the rearward flange portion thereof. The second elongated member defines a base portion and a single edge flange portion disposed toward the second channel member and between the forward and rearward flange portions of the second channel member and adjacent the rearward flange portion thereof. First and second bottom rollers are mounted to the lower ends of the first and second elongated members respectively, the single flange portions of the first and second elongated members defining cutout portions through which portions of the first and second top roller respectively extend, with the first bottom roller positioned between the forward and rearward flange portions of the first channel member, with the rolling portions of the first bottom roller adjacent the forward and rearward flange portions of the first channel member, and further with the second bottom roller positioned between the forward and rearward flange portions of the second channel member, with the rolling portions of the second bottom roller adjacent the forward and rearward flange portions of the second channel member. First and second top rollers are mounted to the upper ends of the first and second channel members respectively, with the forward flange portions of the first and second channel members defining cutout portions through which portions of the first and second top rollers respectively extend, with the rolling portion of the first top roller adjacent the single flange portion of the first elongated member, and with the rolling portion of the second top roller adjacent the single flange portion of the second elongated member. Further included is a fork carriage comprising a frame and a pair of forwardly extending arms. First and second rollers are mounted to the fork carriage frame and are rollingly associated with the first elongated member, with the axis of the second roller being below the axis of the first roller. Third and fourth rollers are mounted to the fork carriage frame and are rollingly associated with the second elongated member, with the axis of the fourth roller being below the axis of the third roller, allowing movement of the fork carriage along the elongated members upwardly and downwardly, meanwhile providing positive forward and rearward location of the fork carriage relative to the first and second elongated members. A fifth roller is mounted to the fork carriage frame and is positioned with its axis below the axis of the first roller and above the axis of the second roller. A sixth roller is mounted to the fork carriage frame and is positioned with its axis below the axis of the third roller and above the axis of the fourth roller, the fifth and sixth rollers being in contact with rear portions of the first and second elongated members respectively, to provide positive lateral location of the fork carriage relative to the first and second elongated members.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other objects of the invention will become apparent from the study of the following specification and drawings, in which:

FIG. 1 is a perspective view of a lift truck incorporating the inventive mast and carriage assembly;

FIG. 2 is a front elevation, with portions broken away, of a portion of the mast and carriage assembly;

FIG. 3 is a view taken along the line III—III of FIG. 2;

FIG. 4 is a perspective view of channel member structure of the assembly;

FIG. 5 is a perspective view of the elongated member structure of the assembly;

FIG. 6 is a perspective view of a portion of the fork carriage of the assembly;

FIG. 7 is a plan view of the mast and carriage assembly as shown in FIGS. 2 and 3;

FIG. 8 is a sectional plan view of the mast and carriage assembly as shown in FIGS. 2 and 3; and,

FIGS. 9 and 10 are side elevations of a channel member and associated elongated member, showing them being fitted together.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Shown generally in FIG. 1 is a mast assembly 20 in association with a truck 22. Such mast assembly 20 includes a pair of longitudinal, upright, laterally spaced channel members 24,26 which are fixed to the body of the truck 22. These channel members 24,26 are rigidly connected together by cross braces 30, as shown in FIG. 4. As best shown in FIGS. 4 and 8, channel member 24 defines a base portion 32 and forward and rearward parallel edge flange portions 34,36 extending from the base portion 32 and generally perpendicular to said base portion 32. Similarly, channel member 26 defines a base portion 38 and forward and rearward parallel edge flange portions 40,42 extending from the base portion 38 and generally perpendicular to said base portion 38. As will be seen, the flange portions 34,36 are disposed toward the channel member 26, and the flange portions 40,42 are disposed toward the channel member 24.

Longitudinal elongated members 44,46 are rigidly interconnected by cross braces 48 and are positioned inwardly of the channel members 24,26 respectively (FIG. 8). The elongated member 44 defines a base portion 50 and a single edge flange portion 52 which extends from the base portion 50 and is generally perpendicular to the base portion 50. Said flange portion 52 extends toward the channel member 24 and is disposed between forward and rearward flange portions 34,36 and adjacent the rearward flange portion 36. Similarly, the elongated member 46 defines a base portion 54 and a single edge flange portion 56 which extends from the base portion 54 and is generally perpendicular to the base portion 54. Said flange portion 56 extends toward the channel member 26 and is disposed between the forward and rearward flange portions 40,42, adjacent the rearward flange portion 42.

Bottom roller 58 is mounted to the lower end of the elongated member 44, with the single flange portion 52 defining a cutout portion 60 through which a portion of the bottom roller 58 extends. The bottom roller 58 is positioned between forward flange portion 34 and rearward flange portion 36, with the rolling portions of that bottom roller 58 adjacent said forward and rearward flange portions 34,36.

Bottom roller 62 is mounted to the lower end of the elongated member 46, with the single flange portion 56 defining a cutout portion 64 through which a portion of the bottom roller 62 extends. The bottom roller 62 is positioned between forward and rearward flange portions 40,42 with the rolling portions of that bottom roller 62 adjacent such forward and rearward flange portions 40,42.

A top roller 66 is removably mounted to the upper end of the channel member 24 (FIG. 8), with the forward flange portion 34 defining a cutout portion 68 through which a portion of the top roller 66 extends, with the rolling portion of the top roller 66 adjacent the single flange 42 of the elongated member 44. A top roller 70 is removably mounted to the upper end of the channel member 26, with the forward flange portion 40 defining a cutout portion 72 through which a portion of the top roller 70 extends, with the rolling portion of the top roller 70 adjacent the single flange portion 56.

These cutout portions 60,64 are sized so that, in combination with the bottom rollers 58,62, the top rollers 66,70 are respectively blocked thereby so that they cannot be moved through cutout portions 60,64. Similarly, the cutout portions 68,72 are sized so that, in combination with the top rollers 66,70, the bottom rollers 58,62 are respectively blocked thereby so that they cannot be moved through cutout portions 60,64. Consequently, with all rollers 58,62,66,70 in place, the mast assembly so far described cannot be assembled if in a disassembled state, or disassembled if in an assembled state.

The manner of assembly of the structure is shown in FIGS. 9–10 and will relate to channel member 26 and elongated member 46, it being understood that the operation is the same in relation to channel member 24 and elongated member 44, and is undertaken simultaneously with the operation on the corresponding parts associated with channel member 26 and elongated member 46.

Initially, top roller 70 is removed, and elongated member 46 is positioned as shown in FIG. 9 relative to channel member 26, and moved downwardly relative to channel member 26, removal of top roller 70 allowing such positioning and movement, which would not be possible with top roller 70 in place. Elongated member 46 is moved downwardly until top roller 70 can be fitted to channel member 26, the elongated member 46 being moved sufficiently downwardly to expose the top ends of channel member 26 (FIG. 10).

In such manner, the assembly so far described allows movement of the elongated members 44,46 together along the channel members 24,26.

The channel member 24 defines an angled portion 74 which interconnects the base portion 32 and the rearward flange portion 36. The rolling portion of roller 58 is in position to contact the angled portion 74 and the forward flange portion 34, as shown. Similarly, the channel member 26 defines an angled portion 76 which interconnects the base portion 38 and the rearward flange portion 42. The rolling portions of roller 62 are in a position to contact the angled portion 76 and the forward flange portion 40.

The elongated member 44 defines an angled portion 78 which interconnects base portion 50 and single flange portion 52 so that the rolling portion of the top roller 66 is in position to contact the angled portion 78. The elongated member 46 defines and angled portion 80 which interconnects base portion 54 and single flange portion 56, so that the rolling portion of the top

roller 70 is in position to contact said angled portion 80.

In the assembly of said structure, the bottom rollers 58,62 are shimmed and then are run over the full length of travel before top rollers 66,70 are installed, as described above. In this way, the installation of bottom rollers 58,62 can be checked for proper operation independently of the top rollers 66,70 subsequently installed in the channel members 24,26. Proper operation of the top rollers 66,70 can then be checked by extending and retracting the structure again with all four rollers 58,62, 66,70 in place.

Associated with the mast assembly 20 as a part thereof are load lifting means comprising a fork carriage 82. Said fork carriage 82 is made up of a frame 83 and forwardly extending arms 85. Elongated member 44 has a pair of parallel edge flange portions 84,86 extending from the base portion 50 thereof, and generally perpendicular to the base portion 50 thereof. Said pair of flange portions 84,86 are disposed toward the elongated member 46, as shown. Elongated member 46 has a pair of parallel edge flange portions 88,90 extending from the base portion 54 thereof, and generally perpendicular to the base portion 54. Said pair of flange portions 88,90 are disposed toward the elongated member 44. Said flange portions 84,88 are actually forward flange portions, and flange portions 86,90 are rearward flange portions.

The elongated member 44 defines an angled portion 92 which interconnects the base portion 50 and the rearward flange portion 86, and the elongated member 46 similarly defines an angled portion 94 which interconnects the base portion 54 and the rearward flange portion 90.

Mounted to the frame 83 of fork carriage 82 are rollers 96,98,100,102. Rollers 96,98 are positioned between the flange portions 84,86, with the rolling portions of the rollers 96,98 positioned adjacent flange portions 84,86. The axis of roller 98 is substantially directly below the axis of roller 96. Rollers 100,102 are positioned between the flange portions 88,90 with the rolling portions of these rollers 100,102 adjacent the flange portions 88,90. The axis of the roller 102 is substantially directly below the axis of roller 100.

A roller 104 is mounted to the frame 83 and is positioned with its axis below the axis of roller 96 and above the axis of roller 98. A roller 106 is also mounted to the frame 83 and is positioned with its axis below the axis of roller 100 and above the axis of roller 102. The rollers 104,106 are positioned to contact the rearward flange portions 86,90 of the elongated members 44,46 respectively, to provide positive lateral location of the fork carriage 82 relatively to the elongated members 44,46.

The rollers 98,102 are shimmed so as to be positioned to contact the angled portions 92,94 respectively. Said means allow movement of the fork carriage 82 along the elongated members 44,46 upwardly and downwardly, meanwhile providing positive forward rearward locations of the fork carriage 82 relative to the elongated members 44,46.

In the operation of the mast assembly 20, a cylinder, chains, and sheaves may, of course, be utilized to provide proper raising and lowering of the elements.

Side thrusts on the fork carriage 82 are taken by the rollers 104,106 which contact flange portions 86,90 respectively, and the rollers 98,102 which are properly shimmed to bear on angled portion 92,94. With an off center load, the side thrust roller on one side of fork carriage 82 and the lower roller on the other side of the fork carriage 82 handle the turning moment placed on the fork carriage 82. With side thrusts in either direction, because of the placing of the rollers 104,106 to contact the rearward flange portions 86,90 and the placing of rollers 98,102 to contact angled portions 92,94 which are themselves rearward, loads are applied to the elongated members 44,46 as closely as possible to the rear portions thereof, where the cross braces 48 are fixed, so that there is little tendency for the elongated members 44,46 to open up or spread apart upon such application of side thrust thereto. The particular placing of the rollers 104,106 relative to rollers 98,96 and rollers 102,100 respectively, aids in such stability and strength. In addition, rollers 104,106 can be used as fork carriage 82 stops if desired, eliminating the need for separate parts.

It will be seen that herein is provided a mast assembly which is of compact arrangement in the fully lowered position, meanwhile being raisable to allow sufficient extension thereof. The roller system incorporated and the particular positioning thereof insure that eccentric loading is properly carried, meanwhile also insuring smoothness of operation under this and all other conditions. Such design, as will be seen, is also simple, and lends itself to ease of manufacture.

What is claimed is:

1. A mast assembly for a truck or the like, comprising:

first and second upright laterally spaced channel members each defining a base portion and forward and rearward parallel edge flange portion extending from said base portion and generally perpendicular thereto, with the flange portions of each channel member disposed toward the other channel member;

first and second interconnected elongated members positioned inwardly of the first and second channel members respectively and movable therealong, the first elongated member defining a base portion and an edge flange portion extending from said base portion and generally perpendicular thereto, and disposed toward the first channel member and between the forward and rearward flange portions of the first channel member and adjacent the rearward flange portion thereof, the second elongated member defining a base portion and an edge flange portion disposed toward the second channel member and between the forward and rearward flange portions of the second channel member and adjacent the rearward flange portion thereof;

first and second bottom rollers mounted to the lower ends of the first and second elongated members respectively, the edge flange portions of the first and second elongated members defining cutout portions through which portions of the first and second bottom rollers respectively extend, with the first bottom roller positioned between the forward and rearward flange portions of the first channel member, with the rolling portions of the first bottom roller adjacent the forward and rearward flange portions of the first channel member, and further with the second bottom roller positioned between the forward and rearward flange portions of the second channel member, with the rolling portions of the

second bottom roller adjacent the forward and rearward flange portions of the second channel member;

first and second top rollers mounted to the upper ends of the first and second channel members respectively, with the forward flange portions of the first and second channel members defining cutout portions through which portions of the first and second top rollers respectively extend, with the rolling portion of the first top roller adjacent the edge flange portion of the first elongated member, and with the rolling portion of the second top roller adjacent the edge flange portion of the second elongated member;

a fork carriage comprising a frame and a pair of forwardly extending arms;

first and second rollers mounted to the fork carriage frame and rollingly associated with the first elongated member, with the axis of the second roller being below the axis of the first roller;

third and fourth rollers mounted to the fork carriage frame and rollingly associated with the second elongated member, with the axis of the fourth roller being below the axis of the third roller, allowing movement of the fork carriage along the elongated members upwardly and downwardly, meanwhile providing positive forward-and-rearward location of the fork carriage relative to the first and second elongated members;

a fifth roller mounted to fork carriage frame and positioned with its axis below the axis of the first roller and above the axis of the second roller; and,

a sixth roller mounted to the fork carriage frame and positioned with its axis below the axis of the third roller and above the axis of the fourth roller, the fifth and sixth rollers being in contact with the rear portions of the first and second elongated member respectively inwardly of the first and second elongated members respectively, and a reinforcing member interconnecting the first and second elongated members rearwardly thereof, the fifth and sixth rollers passing closely adjacent thereto to minimize misalignment of said elongated members, to provide positive lateral location of the fork carriage relative to the first and second elongated members.

2. Load lifting apparatus comprising:

first and second laterally spaced apart elongated members;

a fork carriage comprising a frame and a pair of forwardly extending arms;

first and second rollers mounted to the fork carriage frame and rollingly associated with the first elongated member, with the axis of the second roller being below the axis of the first roller;

thrid and fourth rollers mounted to the fork carriage frame and rollingly associated with the second elongated member, with the axis of the fourth roller being below the axis of the thrid roller, allowing movement of the fork carriage along the elongated members upwardly and downwardly, meanwhile providing positive forward-and-rearward location of the fork carriage relative to the first and second elongated members;

a fifth roller mounted to the fork carriage frame and positioned with its axis below the axis of the first roller and above the axis of the second roller, and,

a sixth roller mounted to the fork carriage frame and positioned with its axis below the axis of the third roller and above the axis of the fourth roller, the fifth and sixth rollers being in contact with the rear portions of the first and second elongated members respectively inwardly of the first and second elongated members respectively, and a reinforcing member interconnecting the first and second elongated members rearwardly thereof, the fifth and sixth rollers passing closely adjacent thereto to minimize misalignment of said elongated members, to provide positive lateral location of the fork carriage relative to the first and second elongated members.

3. The load lifting apparatus of claim **2** wherein the axis of the second roller is substantially directly below the axis of the first roller, and wherein the axis of the fourth roller is substantially directly below the axis of the third roller.

4. The load lifting apparatus of claim **3** wherein the first elongated member comprises a base portion and a pair of parallel edge flange portions extending from the base portion, with the first and second rollers positioned between the pair of parallel flange portions of the first elongated member and having the rolling portions thereof adjacent said pair of flange portions of the first elongated member, and wherein the second elongated member comprises a base portion and a pair of parallel edge flange portions extending from the base portion, with the third and fourth rollers positioned between the parallel flange portions of the second elongated member and having the rolling portions thereof adjacent said pair of flange portions of the second elongated member.

5. The load lifting apparatus of claim **4** wherein the pair of flange portions of the first elongated member comprise forward and rearward flange portions disposed toward the second elongated member, and wherein the pair of flange portions of the second elongated member comprise forward and rearward flange portions disposed toward the first elongated member.

6. The load lifting apparatus of claim **5** wherein the fifth roller is in contact with the rearward flange portion of the first elongated member, and the sixth roller is in contact with the rearward flange portion of the second elongated member.

7. The load lifting apparatus of claim **6** wherein the pair of flange portions of the first elongated member are generally perpendicular to the base portion thereof, and the pair of flange portions of the second elongated member are generally perpendicular to the base portion thereof.

8. The load lifting apparatus of claim **7** wherein the first elongated member defines a first angled portion interconnecting the base portion and one of the pair of flange portions thereof, so that the rolling portions of the second roller are in position to contact said first angled portion and the other of the pair of flange portions of the first elongated member, and wherein the second elongated member defines a second angled portion interconnecting the base portion and one of the pair of flange portions thereof, so that the rolling portions of the fourth roller are in position to contact the second

angled portion and the other of the pair of flange portions of the second elongated member.

9. A load lifting apparatus of claim **8** wherein the first angled portion interconnects the base portion and the rearward flange portion of the first elongated member, and wherein the second angled portion interconnects the base portion and the rearward flange portion of the second elongated member.

10. A mast assembly for a truck or the like, comprising:

first and second upright, laterally spaced channel members, each defining a base portion and forward and rearward parallel edge flange portions extending from said base portion and generally perpendicular thereto, with the flange portions of each channel member disposed toward the other channel member;

first and second interconnected elongated members positioned inwardly of the first and second channel members respectively and movable therealong, the first elongated member defining a base portion and an edge flange portion extending from said base portion and generally perpendicular thereto, and disposed toward the first channel member and between the forward and rearward flange portions of the first channel member and adjacent the rearward flange portion thereof, the second elongated member defining a base portions and an edge flange portion disposed toward the second channel member and between the forward and rearward flange portions of the second channel member and adjacent the rearward flange portion thereof;

first and second bottom rollers mounted to the lower ends of the first and second elongated members respectively, the edge flange portions of the first and second elongated members defining cutout portions through which portions of the first and second bottom rollers respectively extend, with the first bottom roller positioned between the forward and rearward flange portions of the first channel member, with the rolling portions of the first bottom roller adjacent the forward and rearward flange portions of the first channel member, and further with the second bottom roller positioned between the forward and rearward flange portions of the second channel member, with the rolling portions of the second bottom roller adjacent the forward and rearward flange portions of the second channel member;

first and second top rollers mounted to the upper ends of the first and second channel members respectively, with the forward flange portions of the first and second channel member defining cutout portions through which portions of the first and second top rollers respectively extend, with the rolling portion of the first top roller adjacent the edge flange portion of the first elongated member, and with the rolling portion of the second top roller adjacent the edge flange portion of the second elongated member, wherein the first and second top rollers are removably mounted to the upper ends of the first and second channel members respectively, wherein, with the first and second top rollers and first and second bottom rollers so mounted, the cutout portions of the edge flange portions of the first and second elongated members are sized, in combination with the first and second bottom rollers, to block passage of the first and second top rollers respectively therethrough, and the cutout portions of the forward flange portions of the first and second channel members are sized, in combination with the first and second top rollers, to block passage of the first and second bottom rollers respectively therethrough.

11. The mast assembly of claim **10** wherein the first channel member defines an angled portion interconnecting the base portion and the rearward flange portion thereof, so that the rolling portions of the first bottom roller are in a position to contact said first channel member angled portion and the forward flange portion thereof, and wherein the second channel member defines an angled portion interconnecting the base portion and the rearward flange portion thereof, so that the rolling portions of the second bottom roller are in a position to contact said second channel member angled portion and the forward flange portion thereof, and wherein the first elongated member defines an angled portion interconnecting the base portion thereof and the edge flange portion thereof, so that the rolling portion of the first top roller is in position to contact said first elongated member angled portion, and wherein the second elongated member defines an angled portion interconnecting the base portion thereof and the edge flange portion thereof, so that the rolling portion of the second top roller is in position to contact the second elongated member angled portion.

12. The mast assembly of claim **11** and further comprising:

a fork carriage comprising a frame and a pair of forwardly extending arms;

first and second rollers mounted to the fork carriage frame and rollingly associated with the first elongated member, with the axis of the second roller being below the axis of the first roller;

third and fourth rollers mounted to the fork carriage frame and rollingly associated with the second elongated member, with the axis of the fourth roller being below the axis of the third roller, allowing movement of the fork carriage along the elongated members upwardly and downwardly, meanswhile providing positive forward-and-rearward location of the fork carriage relative to the first and second elongated members;

a fifth roller mounted to the fork carriage frame and positioned with its axis below the axis of the first roller and above the axis of the second roller; and,

a sixth roller mounted to the fork carriage frame and positioned with its axis below the axis of the third roller and above the axis of the fourth roller, the fifth and sixth rollers being in contact with the rear portions of the first and second elongated members inwardly of the first and second elongated members respectively to provide positive lateral location of the fork carriage relative to the first and second elongated members.

13. The load lifting apparatus of claim **12** wherein the axis of the second roller is substantially directly below the axis of the first roller, and wherein the axis of the fourth roller is substantially directly below the axis of the third roller.

14. The load lifting apparatus of claim **13** wherein the first elongated member comprises a base portion and a pair of parallel edge flange portions extending from the

base portion, with the first and second rollers positioned between the pair of parallel flange portions of the first elongated member and having the rolling portions thereof adjacent said pair of flange portions of the first elongated member, and wherein the second elongated member comprises a base portion and a pair of parallel edge flange portions extending from the base portion, with the third and fourth rollers positioned between the parallel flange portions of the second elongated member and having the rolling portions thereof adjacent said pair of flange portions of the second elongated member.

15. The load lifting apparatus of claim 14 wherein the pair of flange portions of the first elongated member comprise forward and rearward flange portions disposed toward the second elongated member, and wherein the pair of flange portions of the second elongated member comprise forward and rearward flange portions disposed toward a first elongated member.

16. The load lifting apparatus of claim 15 wherein the fifth roller is in contact with the rearward flange portion of the first elongated member, and the sixth roller is in contact with the rearward flange portion of the second elongated member.

17. The load lifting apparatus of claim 16 wherein the pair of flange portions of the first elongated member are generally perpendicular to the base portion thereof, and the pair of flange portions of the second elongated member are generally perpendicular to the base portion thereof.

18. The load lifting apparatus of claim 17 wherein the first elongated member defines a first angled portion interconnecting the base portion and one of the pair of flange portions thereof, so that the rolling portions of the second roller are in position to contact said first angled portion and the other of the pair of flange portions of the first elongated member, and wherein the second elongated member defines a second angled portion interconnecting the base portion and one of the pair of flange portions thereof, so that the rolling portions of the fourth roller are in position to contact the second angled portion and the other of the pair of flange portions of the second elongated member.

19. A load lifting apparatus of claim 18 wherein the first angled portion interconnects the base portion and the rearward flange portion of the first elongated member, and wherein the second angled portion interconnects the base portion and the rearward flange portion of the second elongated member.

* * * * *