

Nov. 21, 1967

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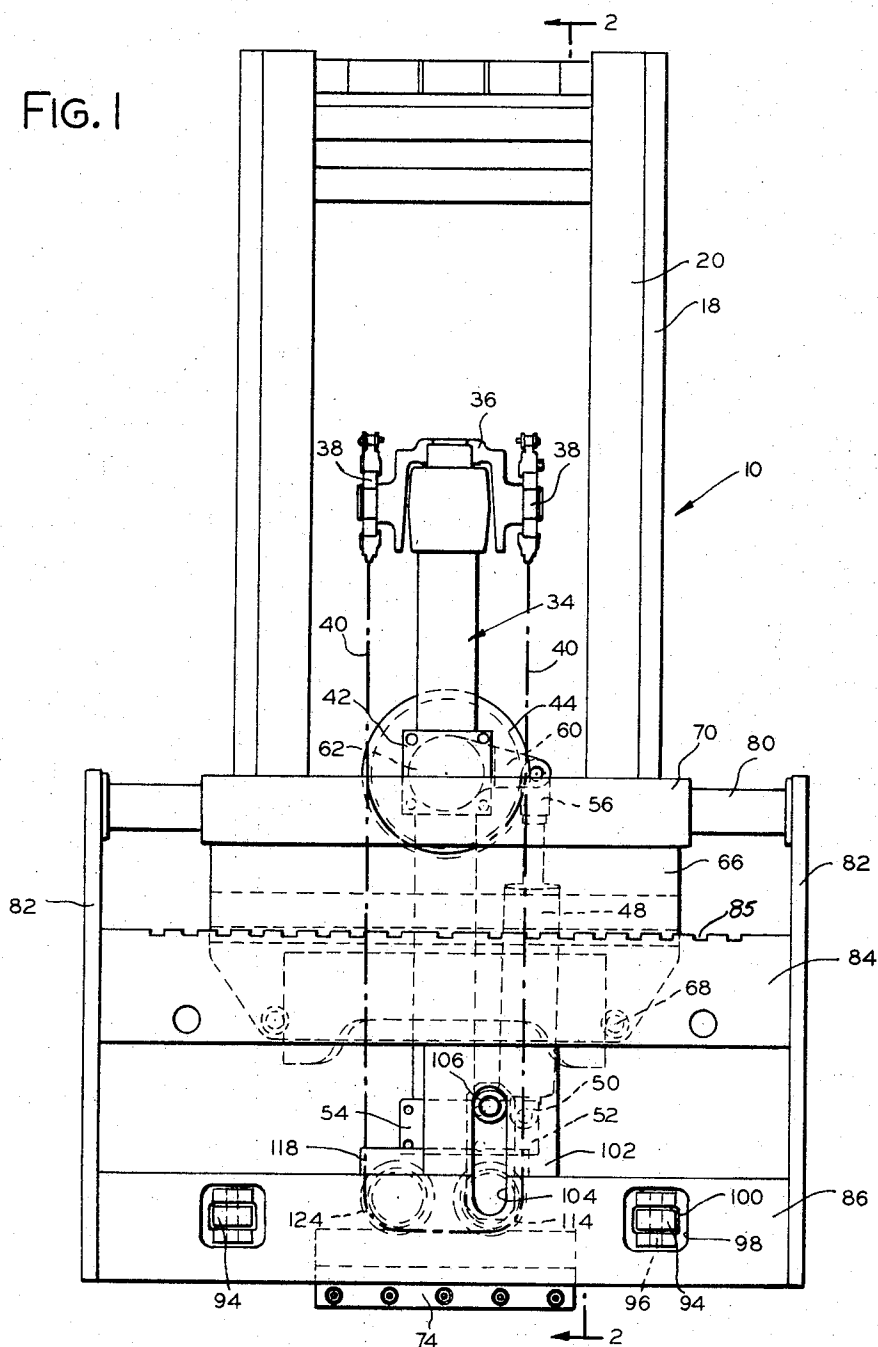
3,353,698

ATTACHMENT FOR INDUSTRIAL TRUCK

Filed Dec. 29, 1965

4 Sheets-Sheet 1

FIG. 1



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FIG. 2

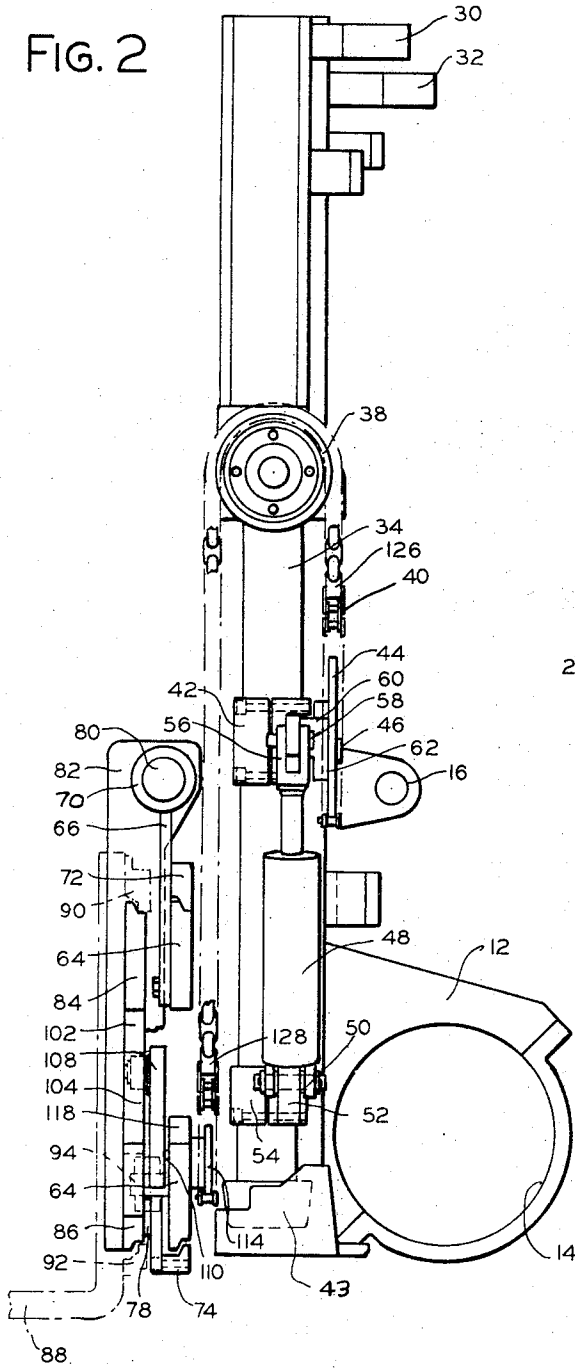
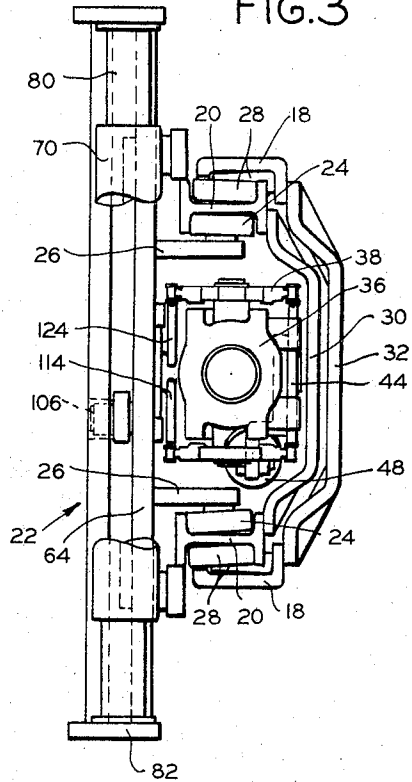


FIG. 3



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FIG. 4

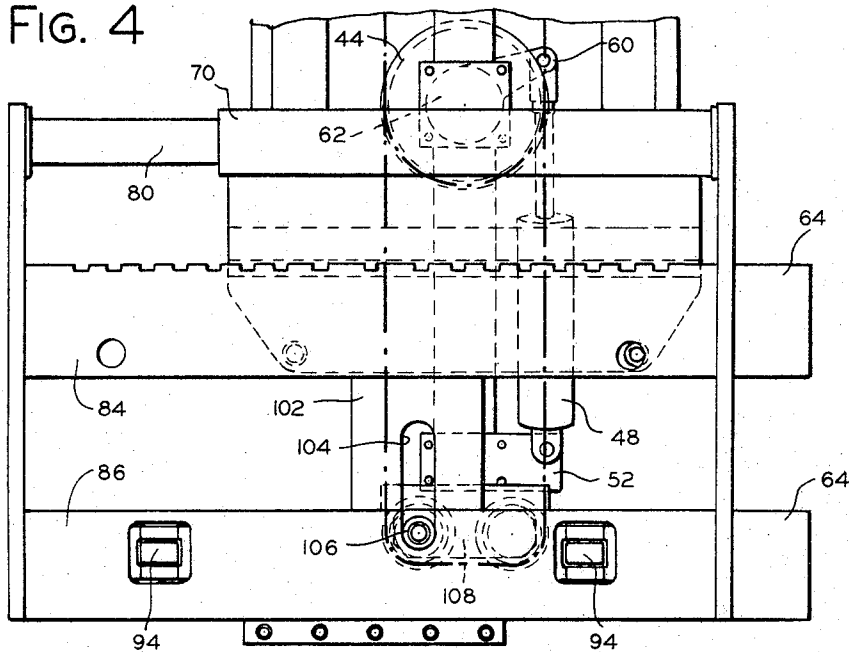
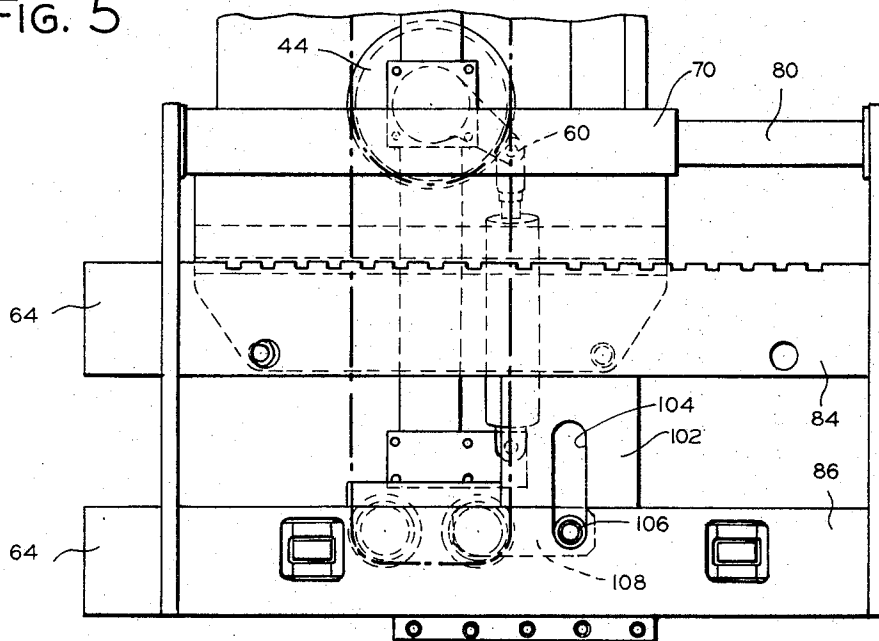


FIG. 5



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FIG. 6

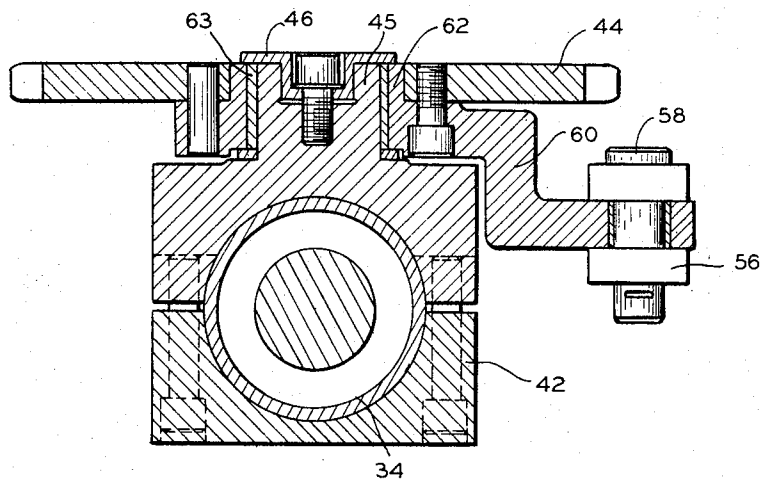
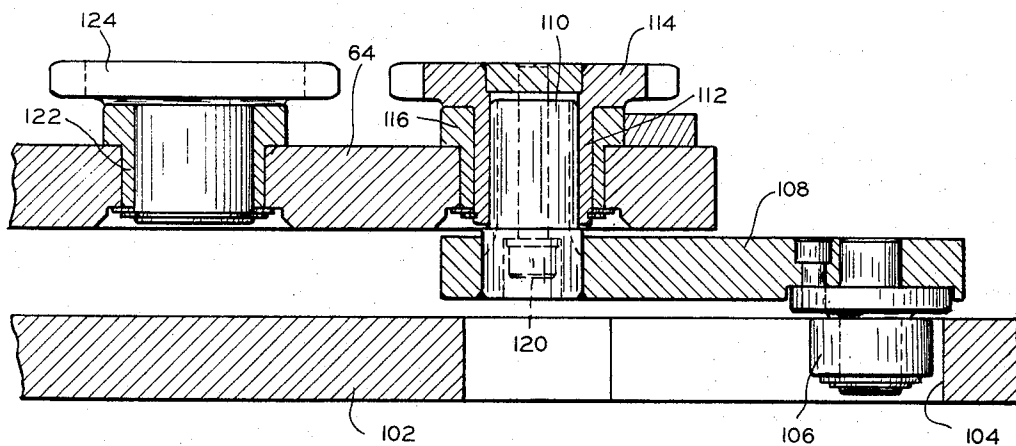


FIG. 7



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ATTACHMENT FOR INDUSTRIAL TRUCK

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Filed Dec. 29, 1965, Ser. No. 517,355
8 Claims. (Cl. 214-730)

This invention relates to attachments for lift trucks, and more particularly to actuator means for lift truck attachments in which the main lifting chain is utilized also for actuating the attachment.

It is an object of the present invention to provide improved attachment actuator means of relatively simple and low-cost construction.

Another object of the invention is to minimize the use of hydraulic actuator mechanism in lift truck attachments in order to improve operator visibility, minimize leakage problems, and eliminate the requirement of special sheave assemblies for guiding hydraulic hoses to attachments at all elevations thereof.

Another object of the invention is to provide an improved side shifter attachment for lift trucks.

In carrying out my invention in a preferred embodiment, I provide rotatable sprockets which secure the main lifting chain at its one end to the lift carriage and at its other end to a fixed portion of the truck, actuator means for rotating the latter sprocket for actuating the lifting chain, and means associated with the carriage for utilizing the resulting chain and sprocket movement to impart a linear movement to the carriage.

Other objects, advantages and features of the invention will become apparent upon consideration of the following detailed description, taken in conjunction with the accompanying drawings, wherein:

FIGURE 1 is a front elevational view of a lift truck upright which embodies my invention;

FIGURE 2 is a sectional view taken along line 2-2 of FIG. 1;

FIGURE 3 is a plan view of the upright shown in FIGS. 1 and 2;

FIGURES 4 and 5 are enlarged partial views of the upright shown in FIG. 1 wherein the device of my invention is shown in different operating positions; and

FIGURES 6 and 7 are enlarged sectional views of portions of the fork carriage side shifter mechanism.

Referring now in detail to the drawings, the numeral 10 denotes generally a lift truck upright and load carriage assembly adapted for pivotal mounting on the forward drive axle of the truck by a pair of laterally spaced trunnion members 12, one of which is shown, which are secured to rear fixed portions of the upright and provide circular bearing surfaces 14 for mounting on the drive axle. A pair of laterally spaced brackets 16 are secured also to rear fixed portions of the upright for connection with a pair of hydraulic upright tilt cylinder assemblies, not shown, which operate in well-known manner to tilt the upright assembly forwardly and rearwardly about the drive axle of the truck.

The upright assembly 10 may be of the construction disclosed in more detail in Patent No. 3,213,967. Generally, it comprises an outer guideway formed by a pair of channel members 18 and an inner slide structure formed by a pair of I-beam section members 20 which telescope in overlapping nested relation with corresponding members of outer guide structure 18. I-beam members 20 are supported in outer channel members 18 by pairs of rollers 28, as described in detail in the above-mentioned patent. Transverse support members 30 and 32 are secured to the rear flange portions of the pairs of channels and I-beams 18 and 20 for bracing these members. A load supporting carriage assembly 22 is

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arranged to move upwardly and downwardly on the inner slide structure 20 by means of pairs of rollers 24 which are connected to the carriage by brackets 26. The lifting mechanism includes a conventional lift cylinder and piston assembly 34 having a cross head 36 located at the outer end of the piston rod and carrying on opposite sides of the lift cylinder a pair of sprocket members 38 which engage lifting chain 40. The lift cylinder 34 is secured at the lower end thereof to a fixed transverse portion of the upright assembly at numeral 43. Upright assembly 10 as thus far described is conventional.

Mounted for rotation of a collar 42, which is secured to the outer fixed cylinder of assembly 34, is a sprocket 44. Connected to collar 42 in a projection 45 is a retainer 46 (FIG. 6). A relatively short actuator cylinder 48 is located at one side of lift cylinder 34 and is pivotally connected at its base end by a bracket and pin 50 to a fixed extension 52 of a collar 54 which is secured to the lower end portion of the cylinder assembly 34. The piston rod end 56 is bifurcated and is pivotally connected by a pin 58 to the outer end of a lever arm 60 which is offset rearwardly and secured to sprocket 44 by an annular bearing portion 62 which is rotatable on a bearing sleeve 63. Actuator cylinder 48 is double-acting, and fluid pressure supplied to the lower end thereof extends the piston rod to rotate sprocket 44 in a counterclockwise direction (FIG. 4), whereas retraction thereof actuates lever 60 to rotate the sprocket in a clockwise direction (FIG. 5). Sprocket 44 functions as a rotatable fixed anchor for chain 40, which is reeved on sprocket 44 and extends upwardly from opposite sides thereof for reeving on crosshead sprockets 38.

Fork carriage assembly 22 comprises a pair of vertically spaced and transversely extending fork bar members 64 secured together and supported by rollers 24 in I-beams 20 by the pair of vertically extending and transversely spaced brackets 26. A vertically extending plate 66 is mounted by bolts 68 to upper fork bar 64 and supports from the top edge thereof a transverse hollow tubular journal or guide member 70. The fork bars 64 are notched to receive overlapping bracket members 72 and 74 at the upper and lower edges thereof, bracket 72 being secured to plate 66 and bracket 74 to a forward fork carriage plate 86 by a member 78. Supported from tubular guide 70 for sliding movement transversely of the truck is an inner shaft member 80, to the opposite ends of which are secured downwardly extending plates 82 to which are secured at opposite ends vertically spaced and transversely extending fork carriage plate members 84 and 86. Plate 84 is notched at 85 along the upper edge thereof to receive a pair of fork tines, or other load supporting device. A fork tine is illustrated in phantom view at numeral 88 in FIG. 2. Fork tine brackets 90 and 92 support the fork tines from carriage plates 84 and 86, the fork tines being adapted for adjustment laterally in selected ones of the notches 85. A pair of transversely mounted support rollers 94 are mounted for rotation on vertical pins 96 which are secured in block members 98 on plate 86. Rollers 94 extend through slots 100 in the plate for rolling engagement during side shifting of the fork carriage with lower fork bar 64, and maintain the proper spacing between the fork bar and carriage plate.

A block member 102 is secured to opposed inner horizontal edges of carriage plates 84 and 86 and defines with plate 86 a vertically extending elongated slot 104. A roller 106 engages in slot 104 and is located at the upper end thereof when the fork carriage assembly is in a centered transverse position on the upright assembly, as in FIG. 1. A lever arm 108 is connected at its outer end to roller 106 and at its inner end is fixedly secured to the forward end of a rotatable shaft 110

which extends into a hollow sleeve extension 112 of a sprocket 114 which is mounted on the opposite side of fork bar 64. A bushing 116 for sprocket 114 is secured partially in the fork bar 64 and partially in a bearing block 118 which is secured to the upper edge of lower plate 64. A recessed bolt 120 secures shaft 110 to sprocket 114. Spaced laterally from sprocket 114 and mounted for rotation in a bushing 122, which is secured in an opening in lower fork bar 64, is the shaft of another sprocket 124. Chain 40 reeves both sprockets 114 and 124. It will now be seen that the lifting chain 40 is a continuous or endless chain. The chain is constructed of links mounted at right angles to each other above each side portion of sprocket 44, and sprockets 114 and 124, as shown at numerals 126 and 128 on one side of said sprockets (FIG. 2), so that the respective chain portions conform to the various sprockets 38, 44, 114 and 124, sprockets 38 being mounted for rotation on an axis transverse of the truck and the other sprockets being mounted for rotation on axes longitudinal of the truck.

In normal load lifting operations of the fork carriage assembly 22 in upright assembly 10 with the carriage assembly centered as in FIG. 1, energization of lift cylinder assembly 34 extends the cross head 36 thereof to elevate the carriage assembly in I-beams 20, and to elevate the I-beam in outer channel sections 18 in known manner. It will be appreciated that none of sprockets 44, 114 or 124 rotates during vertical movement per se of carriage assembly 22. Just as the fixed sprocket 44 functions as a truck anchor for chain 40, so the sprockets 114 and 124 function as a chain anchor on the carriage assembly 22. If it is desired to side shift the fork carriage 80, 82, 84, 86 to one side or the other of the position of FIG. 1 thereof, actuator cylinder 48 is energized in either extension or retraction which actuates lever arm 60 and rotates sprocket 44, thereby actuating chain 40 independently of any lifting action to rotate sprockets 114 and 124 either clockwise or counterclockwise. Rotation of the latter sprockets causes lever arm 108 to actuate roller 106 either to the right or to the left in slot 104, as shown in FIGS. 4 and 5. In FIG. 4 the actuator 48 is extended, which action causes chain 40 to rotate sprockets 44, 114 and 124 counterclockwise, thereby actuating lever 108 counterclockwise approximately 90°, as shown, which causes roller 106 to traverse the length of slot 104 forcing the fork carriage to the left in guide support tube 70. Thus, the fork tines or other load engaging mechanism supported by the carriage are enabled to engage loads not centered with respect to the longitudinal axis of the truck. Conversely, retraction of cylinder 48 actuates sprockets 44, 114 and 124 clockwise which rotates lever arm 108 and roller 106 to the position shown in FIG. 5, thereby actuating the fork carriage to the right of center.

By means of relatively simple and inexpensive mechanism I have provided a side shifter device for lift trucks which utilizes the main lifting chain for the additional purpose of actuating the fork carriage transversely in either direction. It will also be noted that inherent in the construction of my device is the desirable attribute of deceleration of the fork carriage during side shifting in either direction from a centered position. That is, as roller 106 is actuated downwardly relative to slot 104, the transverse or side shifting force component of the roller decreases until, in the position thereof in FIGS. 4 and 5, said force has decreased to zero. This is desirable because it eliminates the need for stop mechanism, and also eliminates any jarring of the device during or at the end of side shift travel of the fork carriage.

Although only one embodiment of my invention has been described herein, this disclosure is merely for purpose of illustration and not as a limitation of the scope of the invention. For example, it will be appreciated that the principle of my invention is readily applicable to a lift truck extension fork carriage which may be mounted on a

pantograph device operated in a direction longitudinal of the truck by a lift chain operated worm screw, for instance. It is therefore to be expressly understood that the invention is not limited to the specific embodiment shown, but may be used in various other ways, and that various modifications may be made to suit different requirements, and that other changes, substitutions, additions and omissions may be made in the construction, arrangement and manner of operation of the parts without necessarily departing from the scope of the invention as defined in the following claims.

I claim:

1. In an industrial truck having a load lifting upright assembly mounted at one end thereof, a load carriage assembly having first and second relatively movable portions mounted for elevation in the upright assembly, and extensible motor means in the upright assembly having a first pair of spaced elevatable wheel means supported from one end and rotatable on an axis generally transverse of the truck, second wheel means mounted below said first wheel means for rotation on an axis longitudinal of the truck, third wheel means mounted on the first portion of the carriage assembly for elevation therewith and rotatable on an axis longitudinal of the truck, a single endless flexible means reeving said first, second and third wheel means, the second portion of said carriage assembly being mounted for substantially horizontal movement relative to the first portion, means for actuating said flexible means to rotate said third wheel means, and means operatively connecting said third wheel means to said second carriage portion for actuating the latter in said substantially horizontal movement.

2. A device as claimed in claim 1 wherein said means which connects said third wheel means to said second carriage portion comprises actuator lever means for converting rotation of said third wheel means to substantially horizontal motion of said second carriage portion.

3. A device as claimed in claim 2 wherein said lever means comprises slot means in said second carriage portion and a lever element connecting said slot means to said third wheel means, such that upon rotation of said third wheel means said lever is rotated and the end thereof connected to said slot means is actuated along said slot means thereby actuating said second carriage portion in said substantially horizontal movement.

4. A device as claimed in claim 2 wherein said third wheel means comprises a pair of laterally spaced wheel members, said lever means being connected to one of said wheel members.

5. A device as claimed in claim 1 wherein said second wheel means comprises a single wheel member secured for rotation to a fixed element of the extensible motor means, and said actuating means for the flexible means being connected to said second wheel means for rotating the latter.

6. A device as claimed in claim 5 wherein said actuating means for the flexible means comprises a double-acting cylinder assembly secured at its one end to a fixed portion of said extensible motor means and at its other end to said second wheel means for rotating the latter in either direction, whereby to actuate said second carriage portion either to the right or to the left relative to a centered position thereof transversely of the upright assembly.

7. In an industrial truck having a load lifting upright assembly mounted at one end thereof including an extensible motor means in the upright assembly for actuating vertically sprocket and lifting chain means connected to the extensible end of the motor means, a load carriage assembly including a portion mounted for elevation in the upright assembly, sprocket means mounted for rotation on said first portion, said lifting chain reeving said latter sprocket means, a second carriage portion supported from the first carriage portion for transverse movement relative thereto, means operatively connecting said latter sprocket means to said second carriage portion such that rotation of said latter sprocket means actuates said operative con-

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nection to move said second carriage portion transversely of the first carriage portion, and means for actuating said chain independently of actuation thereof by said extensible motor means for rotating said carriage mounted sprocket means.

8. A device as claimed in claim 7 wherein additional sprocket means is mounted for rotation on a fixed portion of said extensible motor means, said chain means comprising endless chain means reeving all said sprocket means, and means connected to said motor mounted sprocket means for rotating the latter.

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