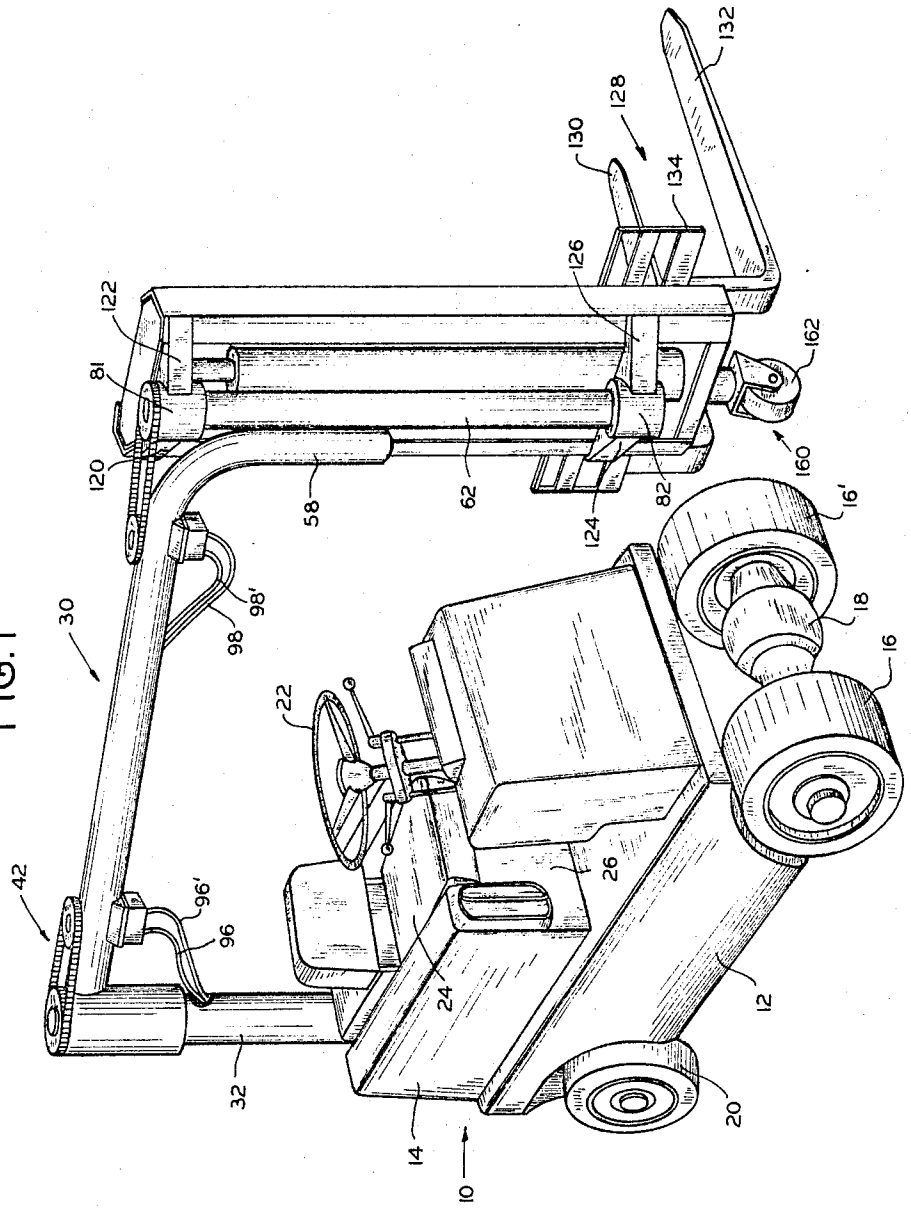
Sept. 13, 1966 D. W. STEVENS 3,272,365

INDUSTRIAL LIFT TRUCK

Filed Dec. 3, 1963 5 Sheets-Sheet 1

FIG. 1



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INDUSTRIAL LIFT TRUCK

Filed Dec. 3, 1963 5 Sheets-Sheet 2

FIG. 3

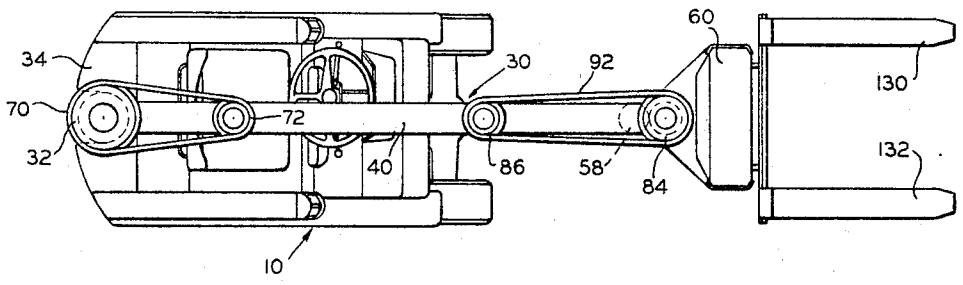
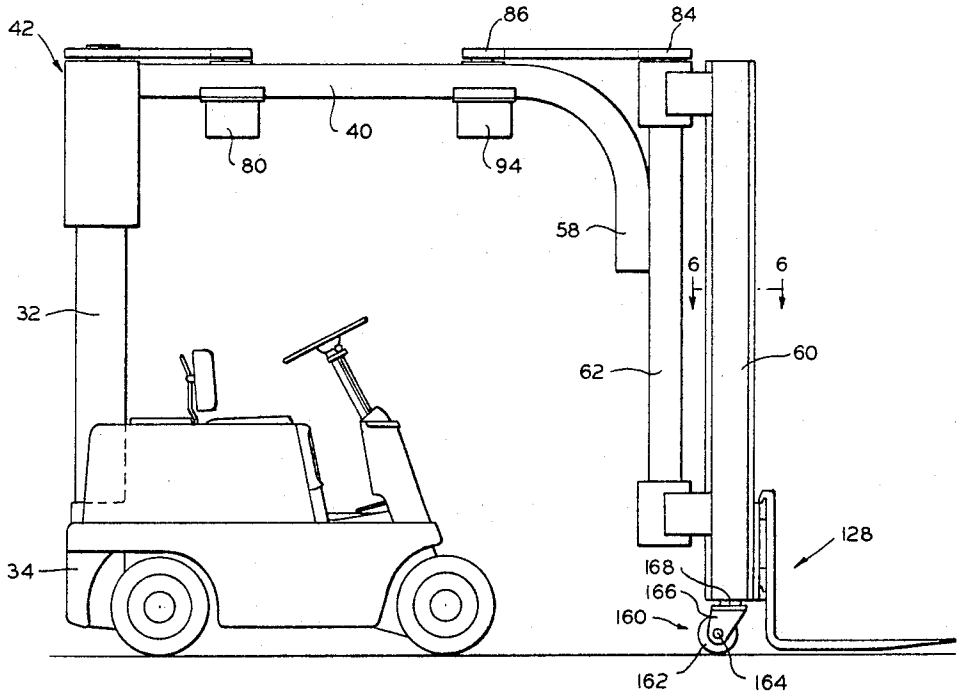


FIG. 2



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INDUSTRIAL LIFT TRUCK

Filed Dec. 3, 1963 5 Sheets-Sheet 3

FIG. 4

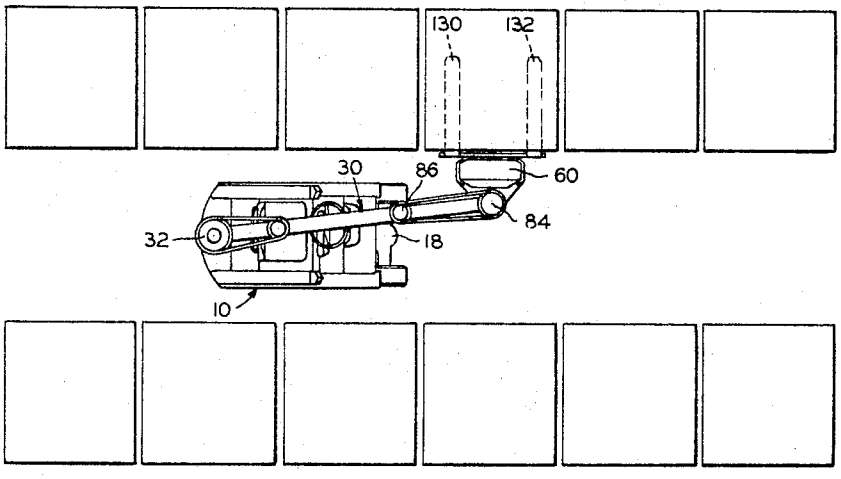
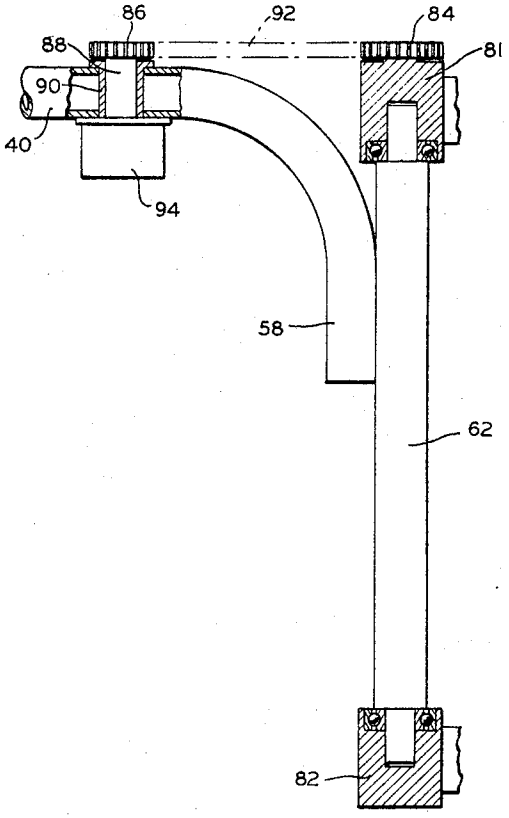


FIG. 8



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Sept. 13, 1966 D. W. STEVENS 3,272,365

INDUSTRIAL LIFT TRUCK

Filed Dec. 3, 1963 5 Sheets-Sheet 4

FIG. 6

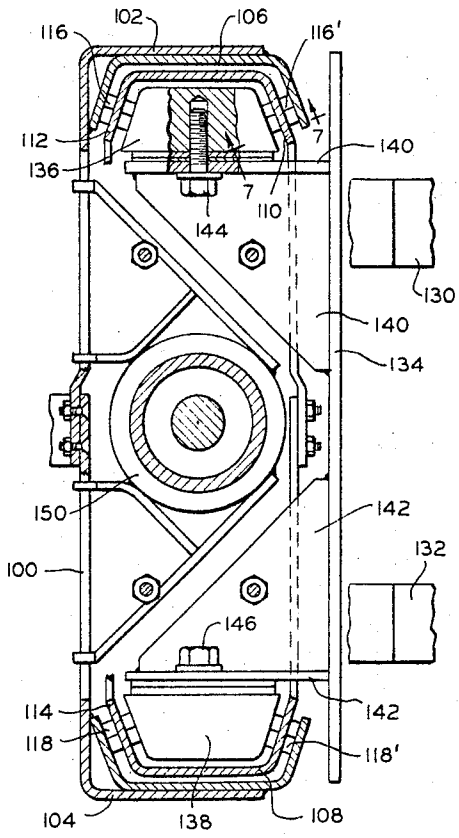


FIG. 7

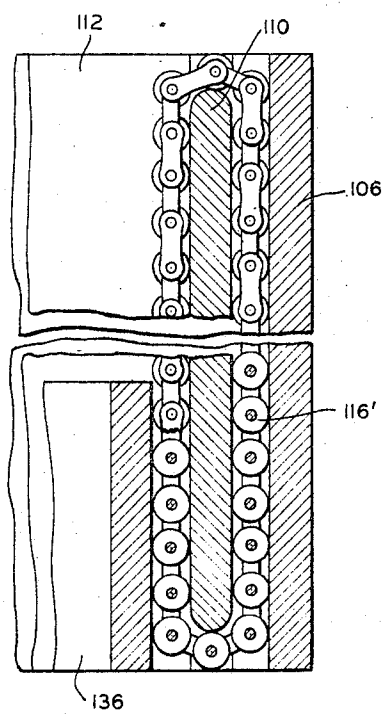
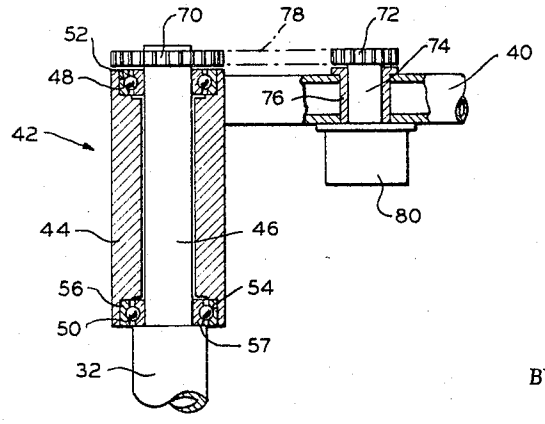


FIG. 5



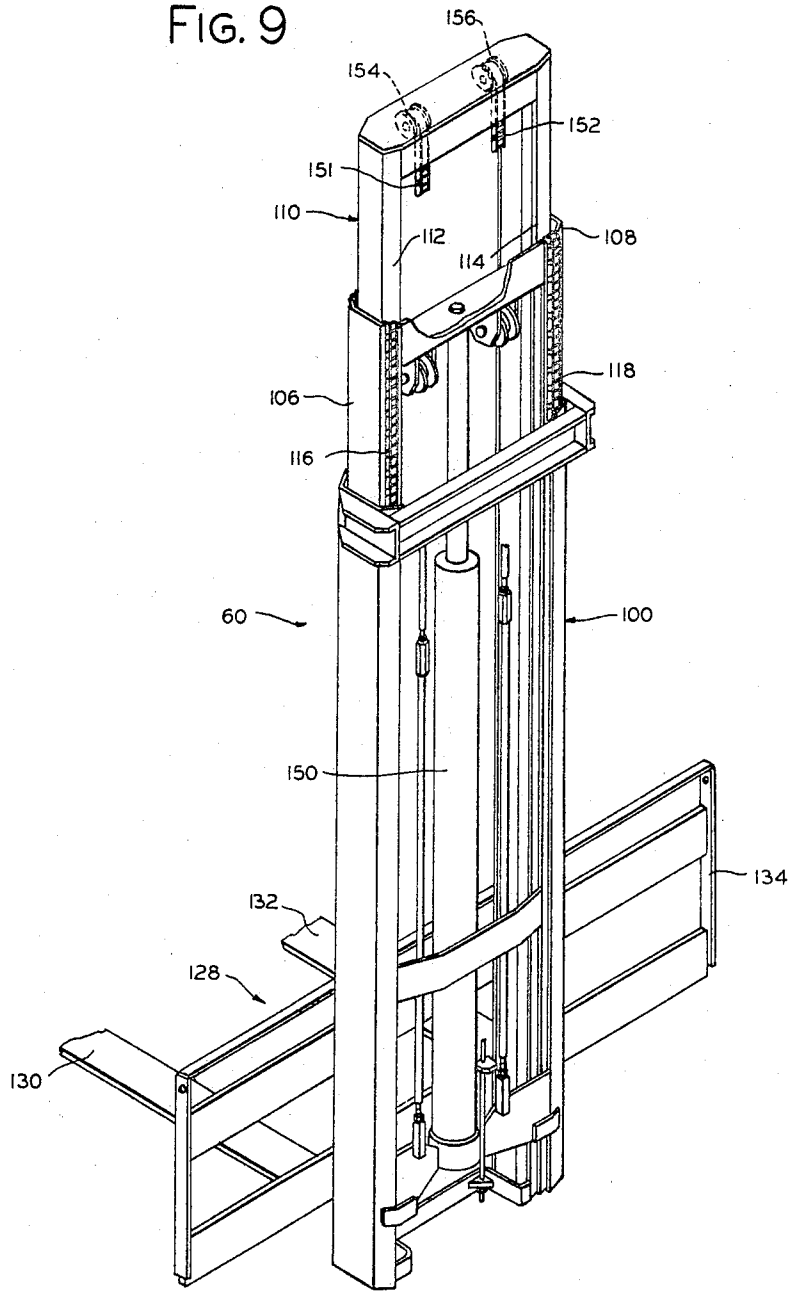
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INDUSTRIAL LIFT TRUCK

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FIG. 9



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3,272,365

INDUSTRIAL LIFT TRUCK

Daryl W. Stevens, Battle Creek, Mich., assignor to Clark Equipment Company, a corporation of Michigan

Filed Dec. 3, 1963, Ser. No. 327,588
9 Claims. (Cl. 214—671)

The present invention relates to industrial lift trucks and more particularly to front and side loading fork lift trucks.

Industrial trucks are often used in stacking boxes, crates and similar containers on either side of aisles which are often long and narrow and the stacks are often high and the containers heavy. The conventional industrial trucks for lifting the containers onto the stacks and removing them therefrom are usually provided with a pair of horizontally positioned, vertically movable forks projecting forwardly from the body of the truck. While industrial trucks of this type are normally highly maneuverable in close places and in restricted areas, the combined length of the truck body and forwardly projecting forks is substantially greater than the width of many of the aisles in which the trucks must operate, and consequently the trucks frequently can not directly approach the stacks for discharging and removing the containers. It thus becomes necessary to stop the truck in the aisle at the place where the container is to be discharged or loaded and to manually remove it from or load it on the truck forks from the side. This manual handling operation is not only difficult and time consuming but may even be hazardous to the workman, particularly in transferring the containers from the forks to and from relatively high stacks. The only satisfactory alternative in the past has been to provide excessively wide aisles between the rows of containers so that the lift trucks can be maneuvered to a position where the forks can be moved inwardly and outwardly transversely to the aisle and stack after the load has been elevated to the top tier of the stack. This alternative, however, has the inherent disadvantage of sacrificing much needed and usable floor space of the storage area. While efforts have been made in the past to design front and side loading fork lift trucks, the results have been unsatisfactory since those trucks generally were otherwise substantially wider and/or longer than the conventional truck and required complicated and hard to control mechanisms for manipulating the forks between the forward and side positions. It is therefore one of the principal objects of the present invention to provide a front and side loading lift truck which can move forwardly and rearwardly in narrow aisles and move its forks from a forwardly extending position to a laterally extending position within the limits of the narrow aisle, and thence move the forks both upwardly and downwardly and advance and retract the forks laterally into and from the stacks on either side of the aisle.

Another object of the invention is to provide a front and side loading lift truck which is relatively simple in construction and operation, and which is highly versatile in handling various sized containers and other loads, and readily maneuverable into any desired position in narrow aisles or other confined loading and unloading areas.

Still another object of the invention is to provide a front and side loading lift truck which can handle heavy loads on either side of the truck without causing any substantial tilting or swaying from side-to-side or producing any other serious instability in the body portion of the truck while the load is being moved on the forks and the truck maneuvered from place to place with a load.

A further object is to provide a lift truck of the aforesaid type which can be effectively used as a standard or

conventional fork lift truck when the side loading feature is not required and in which the attachment for performing the side loading operation can be mounted on a conventional industrial truck chassis.

Further objects and advantages of the present invention will become apparent from the following description and accompanying drawings, wherein:

FIGURE 1 is a perspective view of the present front and side loading fork lift truck showing the upright and fork turned to one side preparatory to lifting a load;

FIGURE 2 is a side elevational view of the lift truck shown in FIGURE 1;

FIGURE 3 is a top plan view of the lift truck shown in the preceding figures;

FIGURE 4 is a top plan view of the present lift truck showing it in an aisle with stacks of containers on either side thereof and illustrating the manner in which the attachment on the present truck operates to stack and remove containers along either side of the aisle;

FIGURE 5 is a fragmentary partial cross sectional view of the boom and support for the front and side loading fork attachment;

FIGURE 6 is a horizontal cross sectional view through the upright of the present lift truck shown in the preceding figures, the section being taken on line 6—6 of FIGURE 2;

FIGURE 7 is a fragmentary partial cross sectional view of the upright shown in FIGURE 6, the section being taken on line 7—7 of the latter figure;

FIGURE 8 is a fragmentary partial cross sectional view of a portion of the boom of the upright support; and

FIGURE 9 is a perspective view of the fully assembled upright, shown removed from the vehicle.

Referring more specifically to the drawings, and to FIGURES 1 through 4 in particular, numeral **10** designates a conventional industrial lift truck having a chassis **12**, body **14**, right and left front wheels **16** and **16'** mounted on drive axle **18**, and rear wheels **20** and **20'** adapted to be steered by the operator through steering wheel **22**. The truck may be driven by either an electric motor or gasoline engine and is controlled by the operator from seat **24** mounted on or above the motor or engine compartment **26**. The truck thus far described may be considered standard or conventional for the purpose of the present description, and hence will not be described in detail herein.

The attachment, which is designated generally by numeral **30**, is mounted on truck **10** and consists of a hollow tubular column **32** rigidly secured at its base to frame member **34** of chassis **12** and extends upwardly to a point substantially above the normal height of the operator sitting in seat **24**. The column extends downwardly through frame member **34** and is joined thereto by welding, bolting or any other suitable securing means for rigidly retaining the column in its upright position. A boom **40** is pivotally mounted on the upper end of column **32** by a bearing assembly **42** consisting of a sleeve **44** mounted on reduced diameter portion **46** of column **32** and rotatably retained thereon by upper and lower bearings **48** and **50**, the two bearings being seated in upper and lower internal annular grooves **52** and **54**, respectively. The bearings may be of any suitable type, such as ball or roller bearings, having outer races **56** and inner races **57** seated against the internal portion of sleeve **44** and the external surface of reduced diameter portion **46** of the column. The boom **40** is rigidly secured to sleeve **44** by welding or any other suitable securing means and projects forwardly over the top of truck **10** and is provided with a downwardly extending portion **58** spaced forwardly from the front of the truck and supporting upright **60**. In the embodiment of the

invention shown in the drawings, the downwardly extending portion is formed integrally with tubular boom **40** and is joined to column **62** of the upright by welding or by a plurality of bolts (not shown), column **62** being rigidly held by portion **58** in a vertical position and adapted to move from side to side with the boom.

The slewing of the boom is accomplished by a drive, such as the one shown in FIGURE 5, consisting of a sprocket **70** rigidly mounted on the upper end of reduced diameter portion **46** of column **32** above sleeve **44**, a sprocket **72** mounted on a rotatable shaft **74** extending downwardly through boom **40** in bearing **76** and a chain **78** extending around the two sprockets **70** and **72**. Shaft **74** and sprocket **72** are driven by a hydraulic motor **80** secured to the underside of boom **40** and operatively connected to the lower end of shaft **74**. Since sprocket **70** is rigidly secured to the upper end of reduced diameter portion **46** of column **32**, rotation of motor **80**, shaft **74** and sprocket **72** in either direction, pivots the boom on bearing assembly **42** to either the right or left. As the motor rotates shaft **74** and sprocket **72** in the clockwise direction, as seen in FIGURE 3, boom **40** moves to the left and, as the shaft and sprocket are rotated in the counter-clockwise direction, the boom moves to the right, carrying with it upright **60**.

The upright **60** is supported by bearings **81** and **82** on the upper and lower ends of the column and is rotated between the forward position, shown in FIGURES 2 and 3, and one or the other lateral positions, as illustrated in FIGURE 1, by a drive consisting of a sprocket **84** rigidly secured to the upper end of bearing **81**, sprocket **86** mounted on rotatable shaft **88** and extending downwardly through boom **40** in bearing **90**, and a chain **92** disposed around the two sprockets **84** and **86**. The shaft **88** and sprocket **86** are driven by a hydraulic motor **94** secured to the underside of boom **40** and operatively connected to shaft **88**. As the motor rotates shaft **88** and sprocket **86** in the clockwise direction, as viewed in FIGURE 3, the chain **92** rotates bearing **81** in the clockwise direction, thereby turning upright **60** to the right and, as the motor rotates shaft **88** and sprocket **86** in the counter-clockwise direction, bearing **81** and the upright are rotated to the left. The hydraulic motors **80** and **94** are supplied with hydraulic fluid from a pump driven by the main motor of the truck, through flexible tubes or hose **96** and **96'**, extending upwardly through column **32** and to hydraulic motor **80**, and flexible tubes or hose **98** and **98'** extending upwardly through column **32** and outwardly through boom **40**, to motor **94**, the two motors being controlled by the operator from controls (not shown) in the driver's compartment. The motor and controls therefor are standard or conventional in design and construction and hence will not be described in detail herein.

Upright **60** may be any one of a number of suitable and well known upright types extensively used in the industrial truck field, and hence will not be described in detail herein, the one shown, however, consisting generally of a rigid, rectangular outer frame **100** having two inwardly facing channel-shaped, vertical side members **102** and **104** rigidly supporting channel-shaped members **106** and **108**, respectively, and an inner frame **110** of rigid construction having two channel-shaped members **112** and **114** telescopically slidable in channel members **106** and **108** of outer frame **100**. Bearing chains **116** and **116'** are disposed between channel members **106** and **112**, and bearing chains **118** and **118'** are disposed between channel members **108** and **114** in order to facilitate the telescoping of frame **110** into the channel members of outer frame **100**. Frame **100** is rigidly secured to bearing **81** by upper support members **120** and **122** and to bearing **82** by lower support members **124** and **126**, rigidly connected at one end to the respective bearing, and at their other ends to members **102** and **104** of frame **100**. Thus, it is seen that frame **100** and column **62** are pivotally joined to one another, permitting upright **60** to pivot from side to side on column **62**.

The fork assembly **128** which consists of fork members **130** and **132** mounted on and carried by a carriage **134**, is slidably mounted on inner frame **110** by slide members **136** and **138** connected to carriage **134** by support members **140** and **142**, respectively, the two support members **140** and **142** being joined to slide members **136** and **138** by a plurality of bolts **144** and **146** extending through the two support members into the respective slide members. The inner frame is moved telescopically in tracks **106** and **108** relative to the outer frame by a hydraulic cylinder **150** disposed in the center of upright **60** and supplied with hydraulic fluid from a pump mounted on the main motor of the truck. Carriage **134** and fork members **130** and **132** are moved vertically along frames **100** and **110** by hydraulic cylinder **150** through chains **151** and **152** attached at one end to the fork assembly and extending over pulleys **154** and **156**, respectively, and anchored at the other end to outer frame **100** near the lower end thereof. It is thus seen that by the telescopic relation of the inner and outer frames, the upright **60** provides an effective high level extension for the fork assembly which in turn is movable relative to the inner and outer frames.

The upright **60** is provided with a caster **160** consisting a roller **162** journalled on a pin **164** in fixture **166**, the fixture being pivotally mounted on the bottom of outer frame **100** by a bearing **168** secured to the bottom plate of the frame. The caster is preferably resiliently mounted on the outer frame to permit it to retract and extend as the upright traverses uneven floors or pavement. In some installations, it may be desirable to actuate the caster hydraulically to adjust its level with respect to the bottom of the frame so that a positive support on the floor or ground will be given upright **60**, regardless of variations in or conditions of the supporting surface. The caster permits the load to be moved substantially further to either side of the truck without causing the truck to tilt, sway or otherwise become unstable, as well as to remove some of the weight from boom **40** and column **32**. In some installations where exceptionally heavy loads are to be moved by the truck, it may be desirable to further stabilize the truck by providing one or more outriggers on either side of the truck. Outriggers of a type suitable for the present truck are well known, and hence will not be described in detail here.

In the operation of the present front and side loading fork lift truck, the operator moves the truck loaded with a container or the like along an aisle, such as illustrated in FIGURE 4, to the location where the container is to be stacked. At this point, the upright is operated to lift the fork assembly **128** on which the container is mounted to the level at which the container is to be placed on the stack. Motors **80** and **94** are then operated to swing boom **40** to the right, as illustrated in FIGURE 4, and to rotate upright **60** in the counter-clockwise direction. This places the fork in the position transverse to the boom and with the load held directly in front of but above the truck. Motor **80** is then driven in the opposite direction to move the boom in the counter-clockwise direction, and motor **94** is operated to maintain the path traversed by the load perpendicular to the aisle, thus causing the container to move inwardly over the upper tier of the stack with the sides of the container parallel with the sides of the containers in the stack. The container is then placed on the upper tier of the stack, and fork members **130** and **132** withdrawn from beneath the container by swinging the boom again in the clockwise direction. Motor **94** is then operated to return upright **60** to its original position with fork members **130** and **132** projecting forwardly from the truck. In this operation, the caster **160** supports the upright and permits it to be swung laterally to a much greater extent than would be possible without it or some lateral support for the truck. In removing a

container from the upper tier of the stack, the foregoing operation is repeated in reverse. It is thus seen that little or no additional width of aisle is required for performing the stacking operation than required for moving the container in the aisle to and from the desired location in the stack.

While only one embodiment of the present lift truck has been described in detail herein, various changes and modifications may be made to satisfy requirements.

I claim:

1. A front and side loading fork lift truck, comprising a vehicle having a chassis, a body, two front driving wheels, two rear steerable wheels, a motor on said chassis for driving said front wheels, a vertically positioned column secured rigidly at its lower end to the rear end of said chassis and projecting upwardly to a point substantially above said body, a horizontally positioned boom pivotally connected to the upper end of said column for slewing from side to side above said vehicle body, a means for pivotally connecting said boom to the upper end of said column including a sleeve extending downwardly over the upper end of the column and bearings at the upper and lower ends of said sleeve between the sleeve and the column, a power means for slewing said boom on said pivot means including a sprocket rigidly connected to the upper end of said column, a sprocket and shaft rotatably mounted on said boom, a chain connecting said sprockets, a hydraulic motor mounted on said boom for driving said shaft and second sprocket, a vertically positioned column rigidly secured to the forward end of said boom and extending downwardly therefrom, an upright mounted on said second column, bearing means at the upper and lower ends of said second column, means connecting said bearing means to said upright, a power means for oscillating said upright from side to side on said bearing means including a sprocket rigidly connected to said upper bearing means, a sprocket and shaft rotatably mounted on said boom, a chain connecting said last mentioned sprockets, a hydraulic motor mounted on said boom for driving said last mentioned shaft and sprocket, said upright having vertically extensible members, and a fork assembly connected to said vertically extensible members and movable vertically thereon.

2. A front and side loading truck, comprising a vehicle having a chassis, a body, two front driving wheels, two rear steerable wheels, a motor on said chassis for driving said front wheels, a column secured rigidly at its lower end to the rear end of said chassis and projecting upwardly to a point substantially above said body, a horizontally positioned boom pivotally connected to the upper end of said column for slewing from side to side above said vehicle body, a means for pivotally connecting said boom to the upper end of said column including a sleeve extending downwardly over the upper end of the column and bearings at the upper and lower ends of said sleeve between the sleeve and the column, a power means for slewing said boom on said pivot means including a sprocket rigidly connected to the upper end of said column, a sprocket and shaft rotatably mounted on said boom, a chain connecting said sprockets, a hydraulic motor mounted on said boom for driving said shaft and second sprocket, a vertically positioned column rigidly secured to the forward end of said boom and extending downwardly therefrom, an upright mounted on said second column, bearing means at the upper and lower ends of said second column, means connecting said bearing means to said upright, a power means for oscillating said upright from side to side on said bearing means including a sprocket rigidly connected to said upper bearing means, a sprocket and shaft rotatably mounted on said boom, a chain connecting said last mentioned sprockets, and a hydraulic motor mounted on said boom for driving said last mentioned shaft and sprocket.

3. A front and side loading truck, comprising a vehicle having a frame, a body, a vertically positioned column secured at its lower end to the rear end of said frame and projecting upwardly to a point substantially above said body, a horizontally positioned boom pivotally connected to the upper end of said column for slewing from side to side above said vehicle body, a means for pivotally connecting said boom to the upper end of said column including a sleeve extending downwardly over the upper end of the column and bearings at the upper and lower ends of said sleeve between the sleeve and the column, a power means for slewing said boom on said pivot means, including a sprocket rigidly connected to the upper end of said column, a sprocket and shaft rotatably mounted on said boom, a chain connecting said sprockets, a motor mounted on said boom for driving said shaft and second sprocket, a vertically positioned column rigidly secured to the forward end of said boom and extending downwardly therefrom, an upright mounted on said second column, bearing means at the upper and lower ends of said second column, means connecting said bearing means to said upright, a power means for oscillating said upright from side to side on said bearing means, including a sprocket rigidly connected to said upper bearing means, a sprocket and shaft rotatably mounted on said boom, a chain connecting said last mentioned sprockets, and a motor mounted on said boom for driving said last mentioned shaft and sprocket.

4. A front and side loading truck, comprising a vehicle, a vertically positioned column secured at its lower end to the rear end of said vehicle and projecting upwardly to a point substantially above said vehicle, a horizontally positioned boom pivotally connected to the upper end of said column for slewing from side to side above said vehicle, a means for pivotally connecting said boom to the upper end of said column including a sleeve extending downwardly over the upper end of the column and bearings at the upper and lower ends of said sleeve between the sleeve and the column, a power means for slewing said boom on said pivot means, a vertically positioned column rigidly secured to the forward end of said boom and extending downwardly therefrom, an upright mounted on said second column, bearing means at the upper and lower ends of said second column, means connecting said bearing means to said upright, a power means for oscillating said upright from side to side on said last mentioned bearing means, a wheel positioned below said upright and turnable on a vertical axis for alignment with the direction of movement of said upright, said upright having vertically extensible members, and a fork assembly connected to said vertically extensible members movable vertically thereon.

5. A front and side loading truck, comprising a vehicle, a vertically positioned column secured at its lower end to the rear end of said vehicle and projecting upwardly to a point substantially above said vehicle, a horizontally positioned boom pivotally connected to the upper end of said column for slewing from side to side above said vehicle, a means for pivotally connecting said boom to the upper end of said column including a sleeve extending downwardly over the upper end of the column, a power means for slewing said boom on said pivot means, a vertically positioned column rigidly secured to the forward end of said boom and extending downwardly therefrom, an upright mounted on said second column, bearing means at the upper and lower ends of said second column, means connecting said bearing means to said upright, a power means for oscillating said upright from side to side on said last mentioned bearing means, a wheel positioned below said upright and turnable on a vertical axis for alignment with the direction of movement of said upright, said upright having vertically extensible members, and a fork assembly connected to said vertically extensible members and movable vertically thereon.

6. A front and side loading truck, comprising a vehicle, a column secured at its lower end to the rear end

of said vehicle and projecting upwardly to a point substantially above said vehicle, a horizontally positioned boom pivotally connected to the upper end of said column for slewing from side to side above said vehicle, a power means for slewing said boom on said pivot means, a vertically positioned column secured to the forward end of said boom and extending downwardly therefrom, an upright pivotally mounted on said second column, a power means for oscillating said upright from side to side on a vertical axis, a wheel positioned below said upright and turnable on a vertical axis for alignment with the direction of movement of said upright, said upright having vertically extensible members, and a fork assembly connected to said vertically extensible members.

7. A front and side loading truck, comprising a vehicle, a column secured at its lower end to the rear end of said vehicle and projecting upwardly to a point above said vehicle, a horizontally positioned boom pivotally connected to the upper end of said column for slewing from side to side above said vehicle, a power means for slewing said boom, a vertically positioned column secured to the forward end of said boom and extending downwardly therefrom, an upright pivotally mounted on said second column on a vertical axis, a power means for oscillating said upright from side to side, and a supporting means below said upright and turnable on a vertical axis for alignment with the direction of movement of said upright.

8. A front and side loading truck, comprising a vehicle, a column secured at its lower end to said vehicle and projecting upwardly to a point above said vehicle, a horizontally positioned boom connected to the upper end of said column for slewing from side to side above said vehicle, a power means for slewing said boom, an upright mounted on said boom, a means for pivotally

connecting said upright to the forward end of said boom, a power means for oscillating said upright from side to side on a vertical axis, and a supporting means below said upright and turnable on a vertical axis for alignment with the direction of movement of said upright.

9. A front and side loading truck, comprising a vehicle, a column secured at its lower end to said vehicle and projecting upwardly to a point above said vehicle, a horizontally positioned boom connected to the upper end of said column for slewing from side to side above said vehicle, an upright mounted on said boom, a means for pivotally connecting said upright on a vertical axis to the forward end of said boom, and a supporting means below said upright and turnable on a vertical axis for alignment with the direction of movement of said upright.

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