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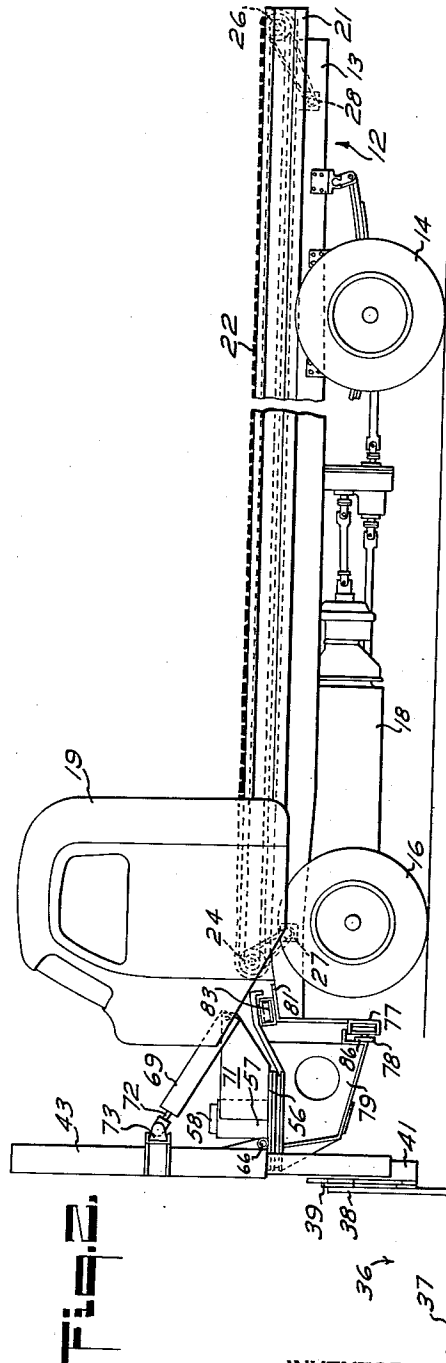
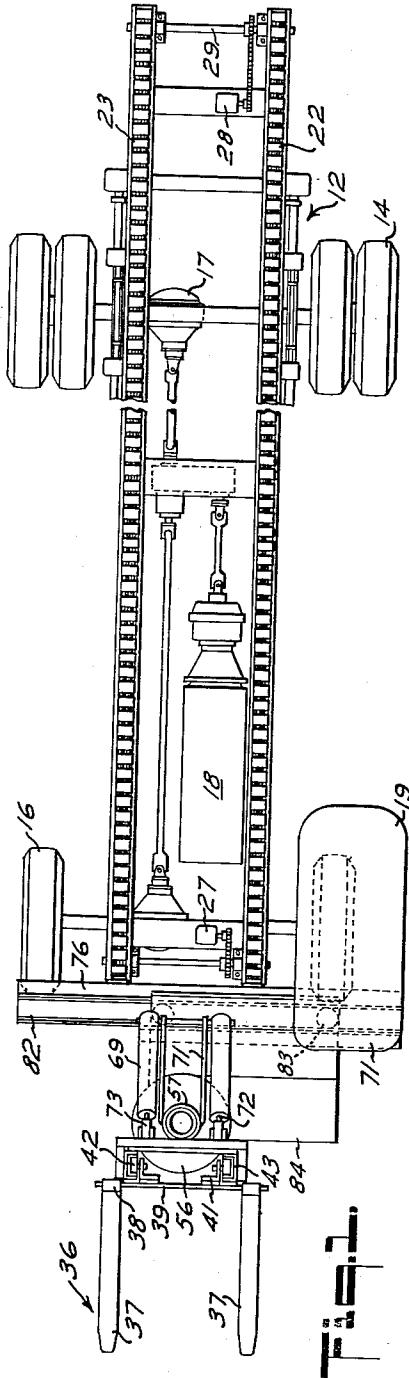
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2,980,269

ELEVATING AND HANDLING MEANS FOR SELF-LOADING VEHICLE

Filed June 10, 1957

3 Sheets-Sheet 1



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3 Sheets-Sheet 2

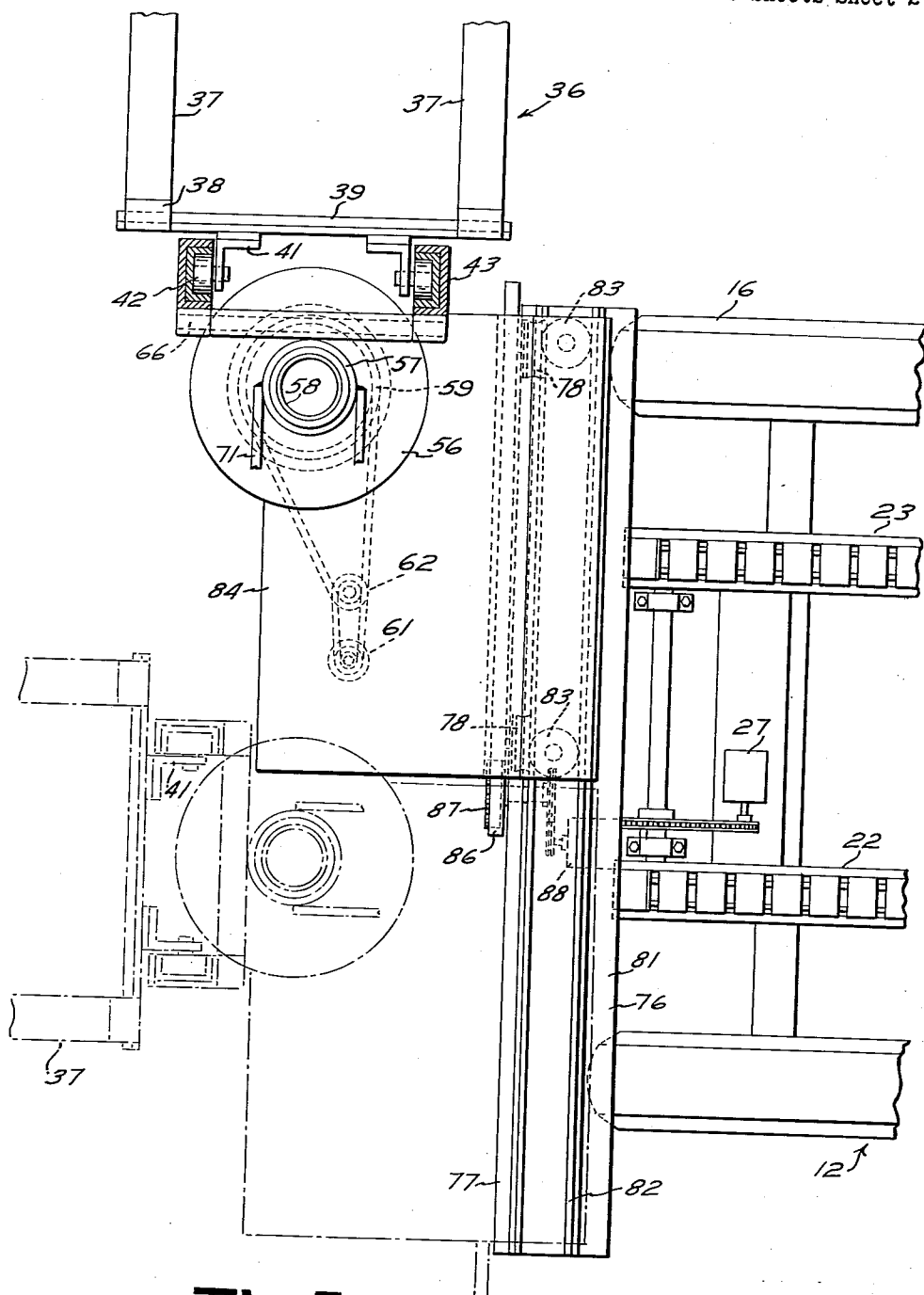


Fig. 3.

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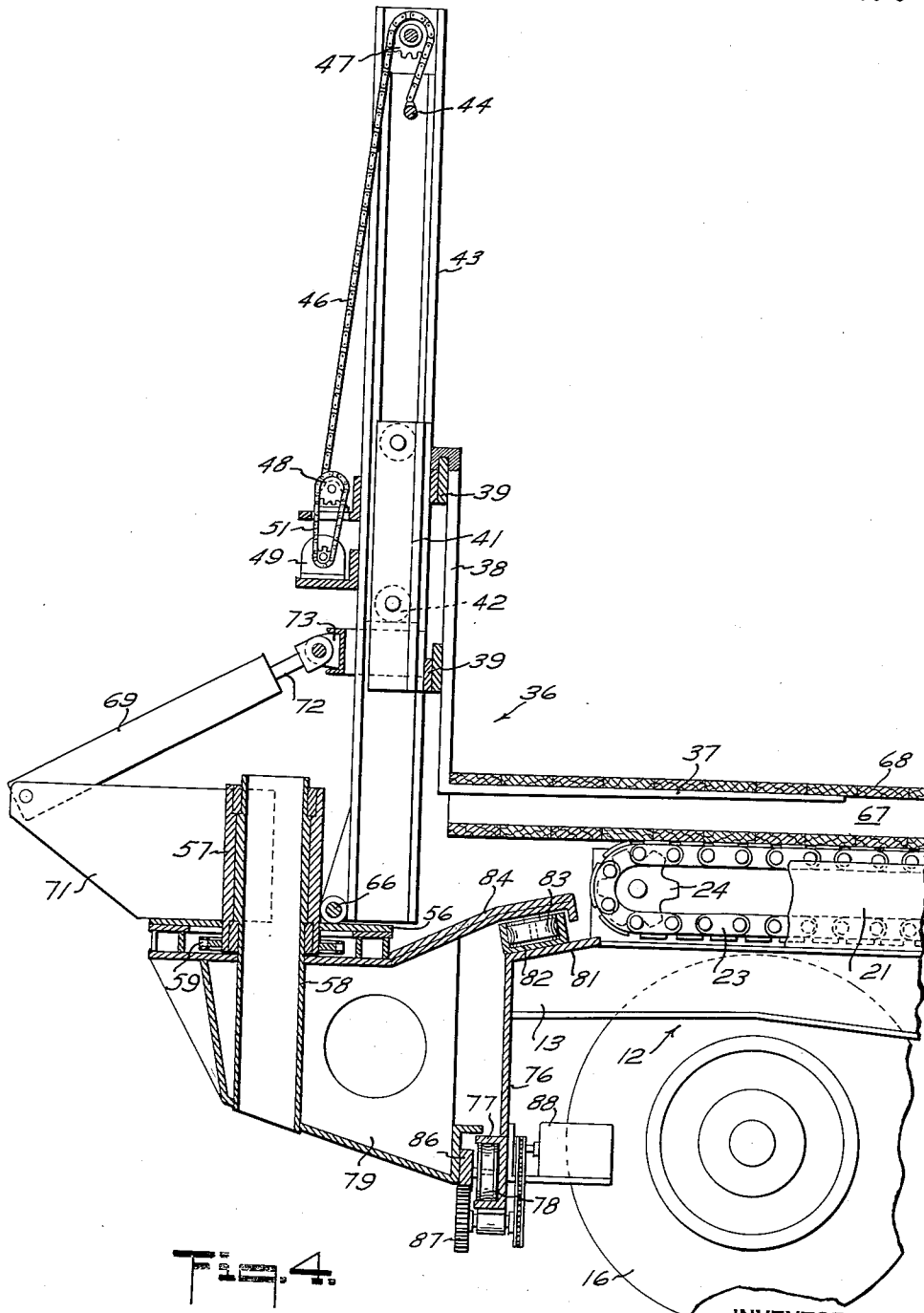


Fig. 4

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ELEVATING AND HANDLING MEANS FOR SELF-LOADING VEHICLE

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This invention generally relates to apparatus for moving material such as loaded pallets, and is more particularly directed to a fork lift apparatus in which the lifting mechanism is capable of movement in directions in addition to the conventional raising and lowering thereof.

In accordance with present practice, where movement of large quantities of relatively small articles is required, the articles are placed on skids or pallets, and then moved by fork lifts either onto a drayage truck for further transportation or merely to some adjacent area for stacking. Numerous manufacturing industries utilize such a procedure, and likewise the use of fork lifts has become widespread in connection with the movement of fruit and similar lug boxes from the fields, as well as the disposition of the food in cans or other processed form. Notwithstanding the many advantages derived by operations in which the loads are palletized and subsequently repositioned by fork lifts, there are certain undesirable limitations in presently available apparatus.

By way of example, in the conventional fork lifts, a steerable chassis is utilized with a vertically movable fork being secured to the front end thereof. Where there is ample working room, the operator may freely move the lift so as to properly orient the fork relative to the pallet and/or its desired terminal position. However, in many instances, the material handling operation occurs in relatively narrow aisles, or other obstructions, such as trees, prevent the lift from being freely moved in all directions. Consequently, a great deal of jockeying of the lift and/or repeated trips back and forth are required to load or unload a series of pallets.

Another shortcoming of presently available equipment is the manner of handling the pallets after they have been picked up by the fork. In accordance with present practice, the fork lift may only pick up a single load, consisting of one or more vertically stacked pallets, and then must deposit the same on the ground or on a separate vehicle for further transport before the next load may be engaged.

There are numerous other difficulties encountered with the use of conventional fork lifts, such as the rear wheel steering arrangement and some of these will become apparent in considering the improved apparatus of the present invention, as will be hereinafter described.

It is an object of the present invention to provide a fork truck in which the vertically adjustable fork may be rotated about a vertical axis whereby the fork may be positioned to extend forwardly of the truck, rearwardly thereof, or in selected positions therebetween.

Another object of the invention is to provide apparatus of the type referred to in which means are provided to effect a horizontal movement of the fork in a direction transverse to the longitudinal axis of the truck whereby side loading and unloading operations may be readily accomplished.

A further object of the invention is to provide apparatus of the above character in which the truck is provided

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with load-receiving means arranged in such a manner as to permit the fork to pick up a succession of loads, rotate through 180 degrees, and sequentially deposit the respective loads on said means, and in which conversely, loads may be removed from the truck by reverse action and rotation of the fork.

A still further object of the invention is to provide a fork truck chassis which is constructed along generally conventional truck lines, thereby permitting normal travel thereof along highways and the like, but which is modified to an extent to permit attachment of the fork mechanism with its above described vertical, horizontal and rotational movement thereof.

Yet another object of my invention is to provide apparatus of the character described in which the truck body is provided with a longitudinally extending conveyor platform which is power driven so as to permit a load deposited by the fork to be longitudinally removed therefrom, thereby permitting the platform to receive a successive series of loads, the sole limitation on the number of loads being the overall length of the truck body and the conveyor platform thereon.

The invention possesses other objects and features of advantage, some of which, with the foregoing, will be set forth in the following description of the preferred form of the invention which is illustrated in the drawings accompanying and forming part of the specification. It is to be understood, however, that variations in the showing made by the said drawings and description may be adopted within the scope of the invention as set forth in the claims.

Referring to said drawings:

Figure 1 is a top plan view of the fork truck of the present invention.

Figure 2 is a side elevational view thereof.

Figure 3 is an enlarged plan view of the fork assembly with the dot-dash lines indicating the normal position of the fork and the solid lines illustrating the position of the fork as for side loading and unloading.

Figure 4 is an enlarged cross sectional elevational view showing the fork in its raised position and rotated through 180 degrees so as to overlie the truck body.

In broad terms, the apparatus of the instant invention includes a longitudinally extending truck having a conveyor platform provided on the upper surface thereof and provided with a fork lift assembly adjacent its front end. This assembly includes a fork or similar load engaging member which is capable of being raised and lowered, rotated about a vertical axis, and likewise moved horizontally in a path transverse to the longitudinal axis of the truck. By rotating the fork through 180 degrees from the position illustrated in Figure 1 of the drawings to that illustrated in Figure 4, it will be appreciated that the fork may be caused to overlie the conveyor platform whereby the pallet or other load carried on the fork may be deposited on the platform for rearward movement thereof out of the path of the fork. The fork may then be returned to its normal position illustrated in Figure 1 and a new load picked up.

Referring now to the drawings in more detail, the apparatus will be seen to include a truck chassis, indicated by the numeral 12, and having generally conventional truck characteristics. By way of example, the chassis will be seen to include suitable framing 13, rear drive wheels 14, steerable front wheels 16, differential 17, and the like. However, in distinction to conventional trucks, the engine or power plant 18 is disposed subjacent the frame 13 and rearwardly of the front end thereof. Likewise, a cab 19 in which the driver or operator sits, is here shown as overlying the left front wheel and is spaced laterally outwardly from the side frame member 13

which constitutes the left hand side of the truck chassis. The reason for relocating the cab and drive unit is to permit the installation and free movement of the fork assembly which will be hereinafter discussed in detail, and likewise to permit an unobstructed longitudinally extending conveyor platform in alignment with the fork and on which pallets are adapted to be positioned. The upper surface of the chassis is defined by a pair of beams 21 which serve as supports for a pair of continuous conveyor belts 22 and 23, respectively. These belts are adapted for movement on suitable sprockets 24 and 26, and preferably each of such sprockets are driven by small motors 27 and 28 at the front and rear ends thereof, and are interconnected by a common shaft 29 whereby the two belts are moved in synchronism. Preferably the motors are of the reversible type whereby the belts may be caused to move in either direction longitudinally of the truck chassis 12.

A fork lift assembly is adapted to be carried adjacent the front end of the chassis, and as best shown in Figures 3 and 4 of the drawings, such assembly includes a conventional fork 36 having a pair of relatively flat horizontally disposed tines 37. Each of the tines 37 is provided with an angular vertical extension 38, which is secured through means of cross members 39 to angle bars 41. These bars are provided with rollers 42 engageable in tracks defined by one or more channels 43, which are disposed along each side of the fork in generally vertical relation. By means of the roller connection, the fork is capable of vertical movement on the channel rails 43 and any suitable mechanism may be utilized for effecting the conventional raising and lowering of the fork on the relatively stationary rails 43. As here illustrated, the upper end of the respective bars 41 are connected by a rod 44, which is in turn connected to one end of a chain 46. As will be most clear from observing Figure 4 of the drawing, the chain extends upwardly to engage a sprocket 47 on the channel rail adjacent the upper end thereof, and then continues downwardly to engage a drum 48 mounted on a bracket secured to a medial portion of the rail. A motor 49 of the reversible type is connected to the drum through a chain 51 for effecting rotation thereof and consequent winding or unwinding of the main lifting chain 46. As will be clear, by causing the drum 48 to move in a counterclockwise direction as viewed in Figure 4, the chain will be wound about the drum causing the fork to be raised. Reverse action will result in a lengthening of the chain 46 and a consequent lowering of the fork and fork tines 37. Thus, with respect to raising and lowering of the fork, the mechanism above described corresponds to that found on conventional fork truck mechanisms.

However, as previously explained, the fork of the instant invention, which, although normally positioned as illustrated in Figures 1 and 2 of the drawings, is capable of rotational movement so that the fork tines may be caused to overlie the conveyor platform 22 and 23 for deposit of a pallet thereon or conversely the removal of a pallet therefrom. Such rotation is preferably effected by supporting the fork rails 43 on a horizontal deck 56, which is secured to a sleeve 57 rotatably journaled on a tubular post 58, the latter being carried on the truck chassis in a manner to be hereinafter explained. The post 58 is stationary relative to the fork rails, and the lower end of the sleeve 57 is provided with a sprocket 59, such sprocket being driven by a motor 61 through a suitable chain and sprocket assembly 62. Preferably, the attachment of the fork rails 43 to the plate 56 is by means of a pivot pin 66. This pivotal mounting is to permit a slight rocking of the rails and consequently of the fork as in initially guiding the fork tines into the space 67 subjacent a pallet platform 68. In order to provide for such rocking or tilting movement, a cylinder 69 is utilized, one end of the cylinder being pivotally attached to a bracket 71 on plate 56, with the piston rod

72 of the cylinder being pivotally attached to a bracket 73 carried on the fork rails.

Since the entire fork member is capable of rotation through 180 degrees, it will be appreciated that by stopping the motor 61, the fork tines may be directed transversely of the truck or 90 degrees from their normal forwardly directing position. However, mere rotation of the fork through 90 degrees about the post 58 would not permit the fork to be utilized to load or unload pallets disposed along a side of the apparatus. This of course is due to the fact that the post is normally positioned substantially centrally of the apparatus, and in order to properly engage a pallet or disengage the same, it is necessary to have the tines move along the length thereof, so that such tines may enter the space 67 between the surfaces of the pallet or conversely be removed therefrom. Accordingly, as an important feature of the present invention, the fork assembly as disclosed herein is capable of transverse movement relative to the truck so that side loading and unloading may be readily accomplished. Such side movement may be accomplished in a variety of ways, and a manner in which such movement may be preferably accomplished is best illustrated in Figures 3 and 4 of the drawings. As therein shown, the post 58 is not rigidly attached to the truck frame members 13, but instead is movable relative thereto in the following manner. It will be noted in Figure 4 that the forward end of the truck is provided with a vertically extending plate 76 which carries adjacent its lower end a forwardly directed channel 77. Disposed for sliding movement within said channel is a roller 78, such roller being attached to a bracket member 79 which is secured to a lower portion of the post 58. To maintain the post 58 in a vertical position, the chassis plate 76 is provided with a generally horizontal portion 81, which is provided with a generally upwardly directed channel 82 in which a roller 83, similar to roller 78, is rotatably positioned. This roller is likewise journaled on the bracket 79 by means of suitable plates 84. In this manner, it will be clear that the cooperation between the rollers 78 and 83 in the respective chassis channels will permit the post 58 and consequently the fork assembly rotatably journaled thereon to move transversely of the truck chassis. Such movement is preferably power actuated, and as here illustrated, bracket 79 is provided with a rack 86 which extends transversely of the chassis, and such rack is engaged by a rack gear 87 which is operatively driven by a motor 88 carried on the chassis. It will be readily understood that as the motor 88 is actuated, and the rack gear 87 rotated, the rack 86 will be moved laterally of the truck chassis and carry with it the post and fork assembly.

From the foregoing description of the details of construction of the fork truck apparatus, the operation thereof should be readily understood. Assuming first that the apparatus is intended to be utilized as a self-loader, the fork will initially be positioned as illustrated in Figure 1 of the drawing wherein the truck may move forwardly towards the pallets and engage the same. The fork is then raised through the action of motor 49 and chain 46 until the fork tines are above the level of the conveyor platform 22, 23. The motor 61 is then actuated, causing a rotation of the fork through 180 degrees to the position illustrated in Figure 4, wherein the fork may be lowered until the pallet engages the upper surface of the conveyor 22, 23. At this time, in order to remove the pallet from the fork, the upper reaches of the conveyors are driven rearwardly through the actuation of drive motors 27, 28, until the fork is longitudinally separated from the space 67 between the pallet surfaces. The fork may be then rotated back through 180 degrees, lowered to the ground and a new cycle commenced. Obviously, the limiting factor in the number of pallets which may be loaded onto the truck is determined solely by the length of the truck, and if sufficiently long, a large number of loads may be

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placed thereon until the first loaded pallet is moved to the rear of the truck. Then, the loaded truck may be driven in the manner of a conventional truck to a new destination, with the fork extending rearwardly and still in engagement with the last loaded pallet.

Insofar as the side loading is concerned, it has been found that this arrangement is particularly useful, such as for picking up pallets along a road without requiring the truck to move transversely of the road in order to pick up each pallet stack. With the present apparatus, the driver may merely move the truck along the length of the road with the fork extending transversely to the truck axis. The fork is raised and lowered as previously explained, and the necessary transverse fork movement required to either engage or disengage a pallet is effected through actuation of the rack and rack gear as previously explained. The load may of course be deposited upon the conveyor by merely rotating the fork through 90 degrees of rotation.

What is claimed is:

1. Apparatus of the character described comprising a mobile chassis, a load engaging assembly mounted adjacent one end of said chassis and including a bearing member, rail members rotatably journaled on said bearing member, a load engaging element vertically movable on said rail members, and means for rotating said rail members about said bearing member through an angle of 180 degrees together with said bearing member, and means for moving said load engaging assembly laterally of said chassis.

2. Apparatus of the character described comprising a truck chassis, a fork lift mechanism operatively mounted adjacent the front end of said chassis and including vertically extending means and a load supporting fork vertically movable along said means, means rotatably mounting said fork supporting means on said chassis whereby said fork may be rotated through substantially 360 degrees about a vertical axis, and track means extending transversely of said chassis operatively supporting said fork supporting means whereby said fork supporting means and said fork may be moved transversely of said chassis in any desired rotational and elevational fork disposition.

3. Apparatus of the character described comprising a mobile chassis, a transversely extending track positioned adjacent the front end of said chassis, a supporting post mounted on said track for movement thereon transversely of said chassis, vertically extending rails rotatably journaled on said supporting post, a load bearing member vertically movable on said rails, means for selectively raising and lowering said load supporting member on said rails, means for selectively rotating said rails about said post, and means for selectively moving said post along said track.

4. Apparatus of the character described comprising a longitudinally extending mobile chassis, a post member operatively mounted on the front end of said chassis, a sleeve journaled on said post and having drive means connected thereto, vertically disposed rail members secured to said sleeve, a fork extending generally normal to and mounted on said rail members for vertical movement therealong, drive means for selectively raising and

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lowering said fork on said rail members, and means defining a transversely extending track on said chassis, and roller means carried by said post operatively engaged with said track whereby said post may be moved transversely of said chassis.

5. Apparatus as set forth in claim 4 in which said post is provided with a rack, and a power-driven gear carried by said chassis and operatively engaged with said rack for selectively moving said post transversely of said chassis.

6. Apparatus of the character described comprising a mobile chassis, a cab positioned along one side of said chassis whereby the central portion of the chassis and the other side thereof are substantially unobstructed, a longitudinally extending conveyor mounted on said chassis, means for selectively moving said conveyor along the length of said chassis, a fork lift operatively connected to the front end of said chassis and including vertical rail members and a fork selectively vertically movable on said rail members, means rotatably mounting said rail members about a vertical axis whereby said fork may be rotated from a first position extending forwardly of said chassis through substantially 180 degrees to overlie said conveyor and means for moving said fork lift laterally of said chassis.

7. Elevating and handling means for use with a self-loading vehicle including a mobile chassis, said means comprising an upstanding post member carried at one end of said chassis for rotation about its axis, a fork lift mechanism carried by said post for rotation therewith, track means carried by said one end of the chassis to extend transversely thereof, and means for moving said post laterally of said chassis including a bracket member carried by said one end of the chassis and secured to said post, and roller means carried by said bracket and operatively engaged with said track means.

8. The apparatus as set forth in claim 7 wherein said bracket member is provided with a toothed rack extending transversely of said chassis, a rack gear carried by said chassis in driving engagement with said rack, and drive means carried by said chassis for driving said gear for selectively moving said bracket member and said post laterally of said chassis on said track and said roller means.

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