

May 15, 1962

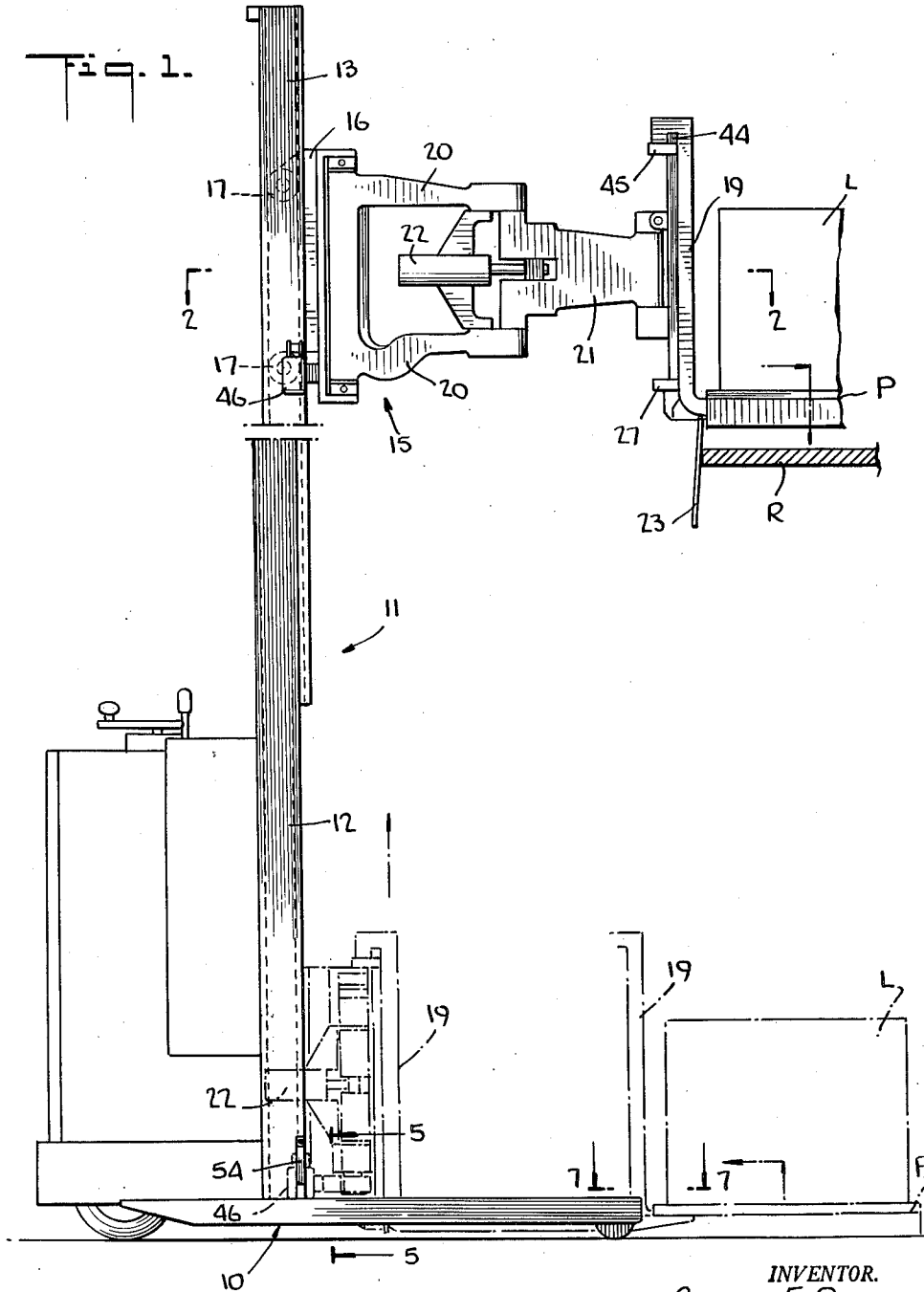
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3,034,675

CARRIAGE CONTROL FOR LIFT TRUCKS

Filed Oct. 2, 1959

6 Sheets-Sheet 1



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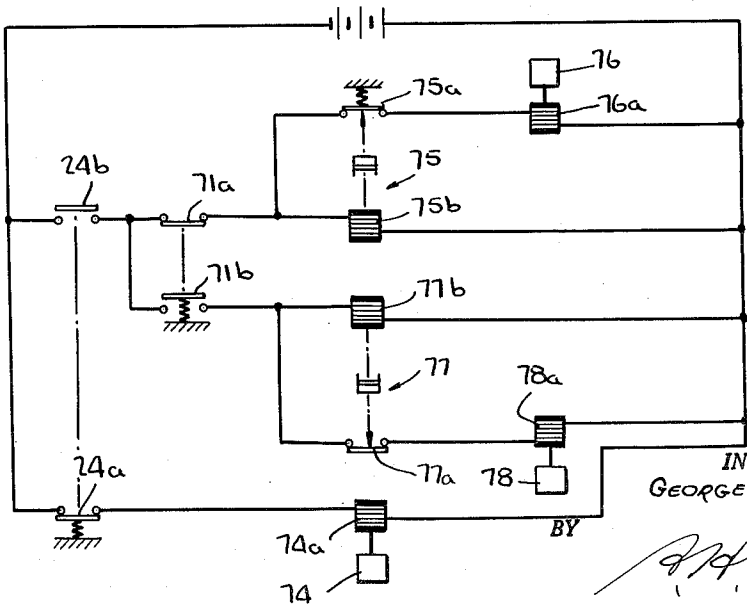
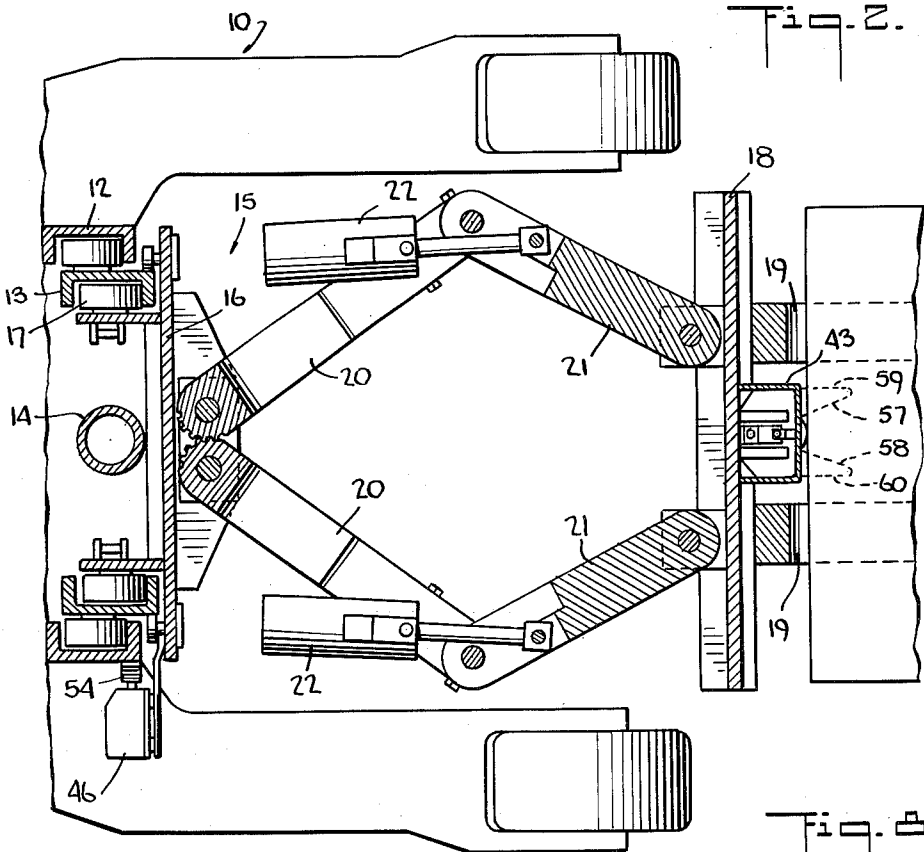
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CARRIAGE CONTROL FOR LIFT TRUCKS

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6 Sheets-Sheet 2



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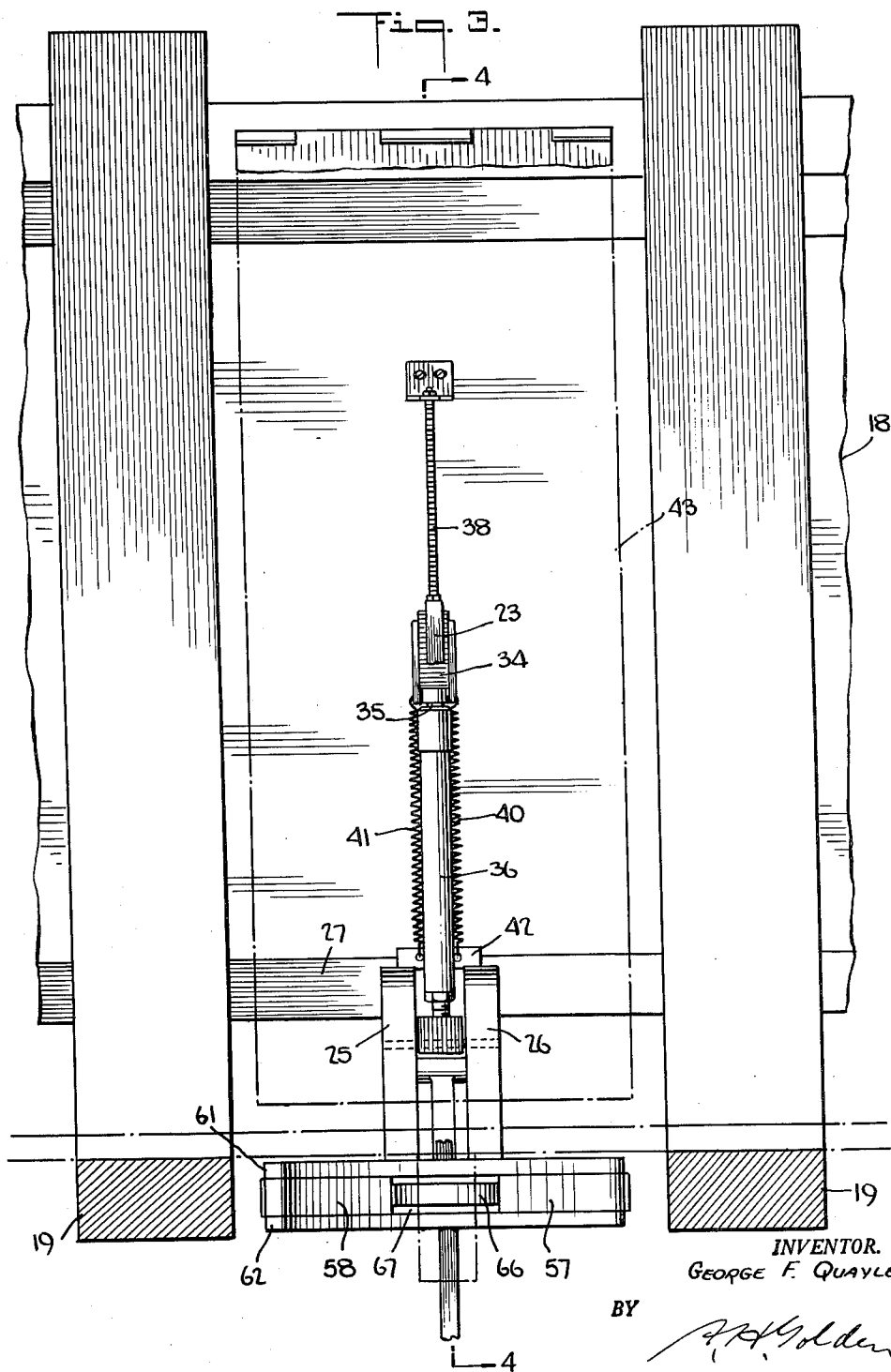
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CARRIAGE CONTROL FOR LIFT TRUCKS

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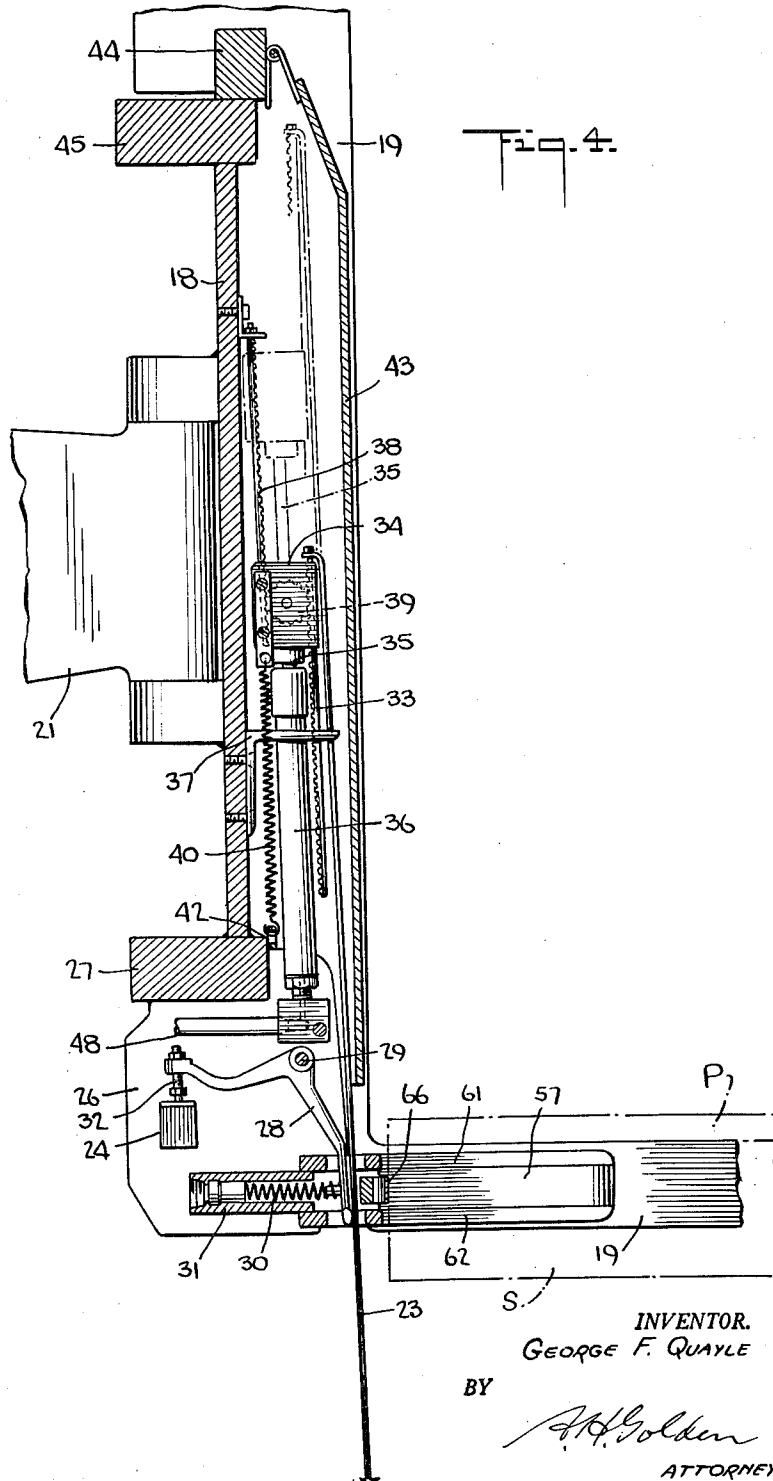
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CARRIAGE CONTROL FOR LIFT TRUCKS

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6 Sheets-Sheet 4



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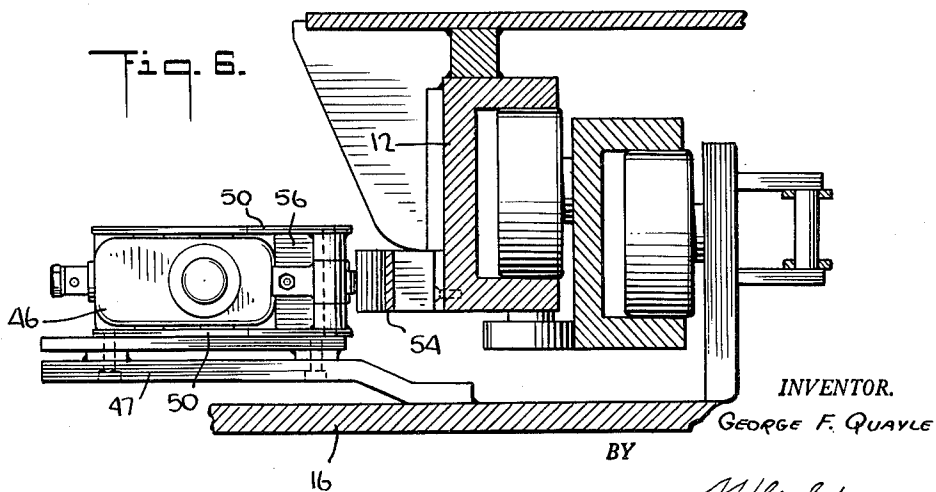
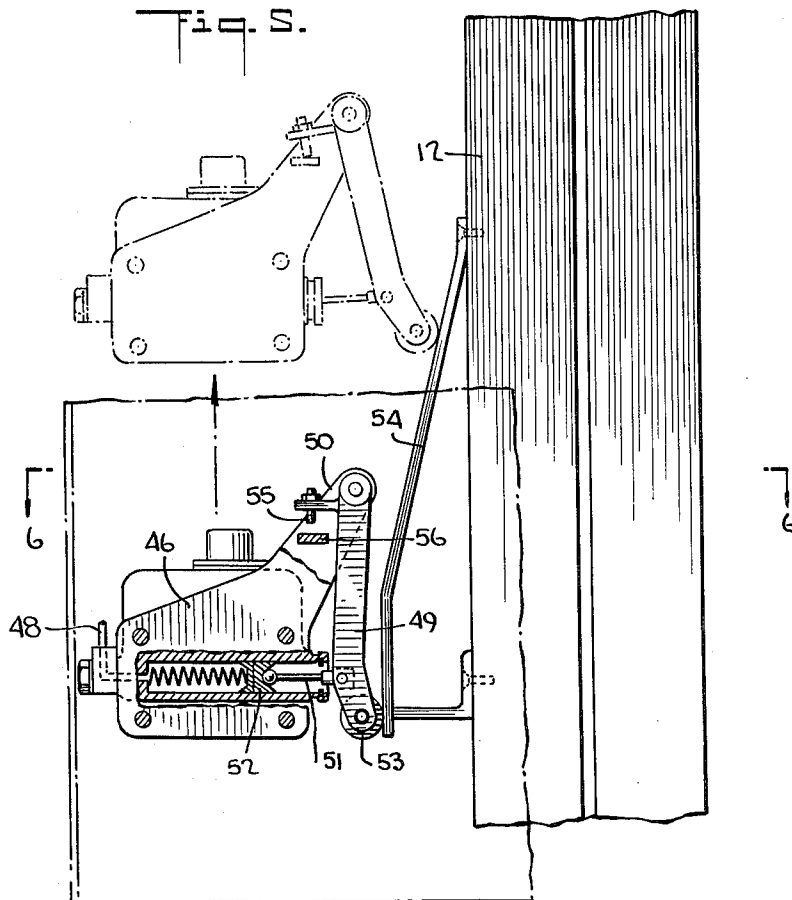
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CARRIAGE CONTROL FOR LIFT TRUCKS

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6 Sheets-Sheet 5



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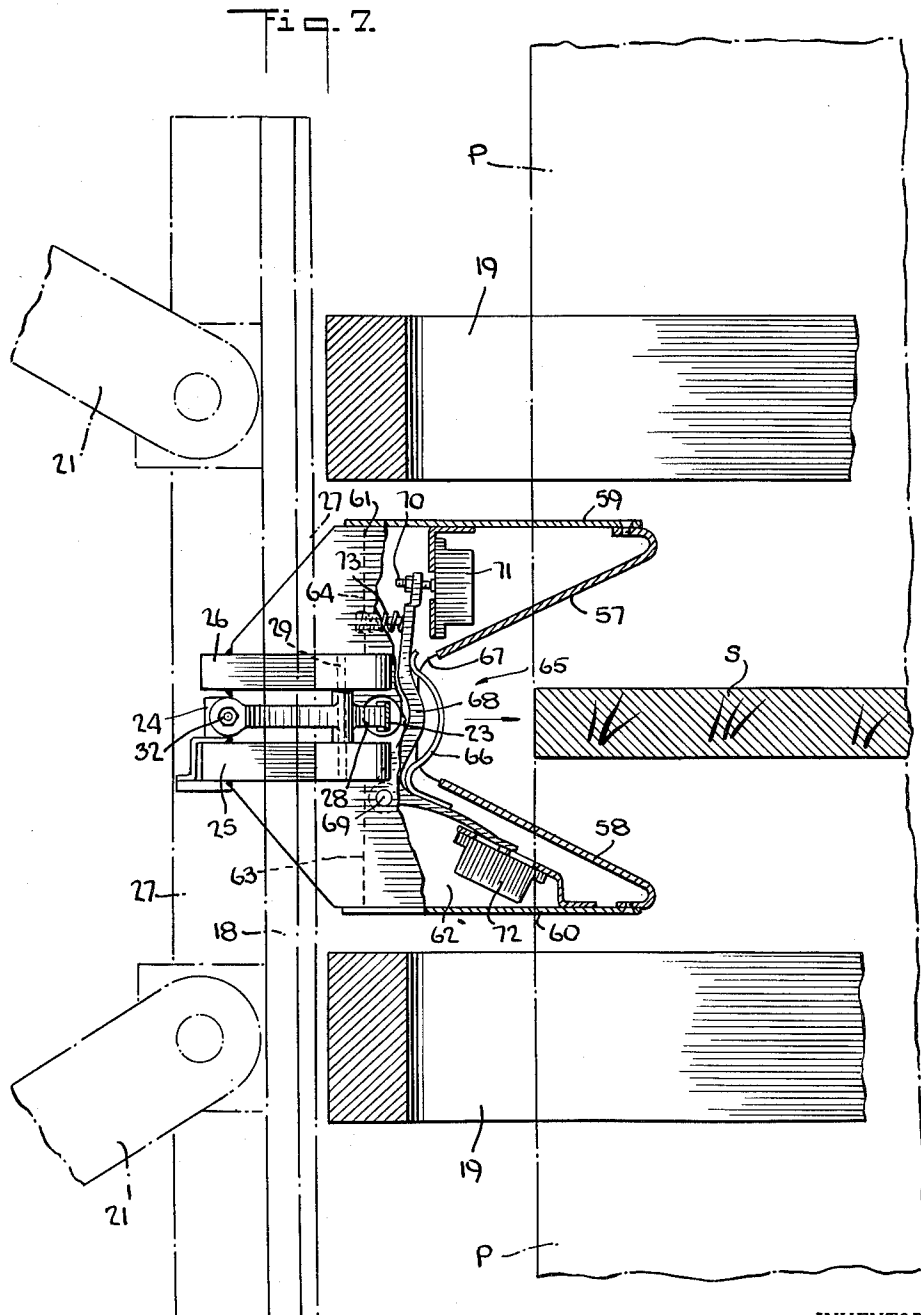
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CARRIAGE CONTROL FOR LIFT TRUCKS

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6 Sheets-Sheet 6



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CARRIAGE CONTROL FOR LIFT TRUCKS

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11 Claims. (Cl. 214-730)

This invention relates to lift trucks and more particularly to control apparatus for facilitating the use of such trucks in the placement and removal of loads from high overhead racks or shelves.

In attempting to place or remove a pallet-supported load from a high overhead rack or shelf, it is difficult for the operator of the truck to see and judge the extent of movement of the forks of the truck relatively to the shelf or rack.

The present invention provides control apparatus which will automatically sense when the forks have been extended a sufficient distance inwardly of the edge of the rack or shelf in the placement or removal of a load from the rack or shelf, and automatically stop further extension of the forks relatively to the rack or shelf. The present invention also provides control apparatus which will automatically sense the presence of a pallet on the forks to provide automatic control of the vertical movement of the load carriage in the placement of a loaded pallet on a rack or shelf.

In accordance with the invention, the control apparatus includes an elongated sensing rod which extends downwardly below the lower surfaces of the forks of the load carriage when the carriage is elevated so that the sensing rod is engaged and moved by the edge of a shelf when the forks of the load carriage have been extended over the shelf a predetermined distance. Movement of the sensing rod actuates a suitable control member, such as a switch or valve, which may be used to stop further movement of the carriage inwardly relatively to the edge of the shelf and to actuate other automatic control circuits. In accordance with the invention, means are provided for automatically raising the elongated sensing rod above the lower surfaces of the forks as the forks are moved against the floor to thereby prevent the sensing rod from being damaged.

The control apparatus of the invention also includes a sensing element carried by the carriage and engageable and movable by a pallet when the forks are extended into the pallet. Movement of the sensing element by the pallet actuates a control member, such as an electric switch or valve which may be used to set up permissive automatic control circuits for controlling vertical movement of the load carriage, and in particular the lowering of the pallet on to the shelf after the pallet has been extended over the shelf. As a feature of the invention, centering means are provided to center the pallet on the forks and guide the pallet so that it will engage the sensing element.

The control apparatus of the present invention may be used very advantageously in conjunction with a control system for automatically raising the load carriage of a lift truck to a predetermined level corresponding to the height of a shelf or rack on which the load is to be deposited or removed. By suitable integration of the control apparatus of the instant invention with such a control system, substantially automatic loading and unloading of pallet-supported loads from high overhead shelves or racks may be obtained. In removing a loaded pallet from an overhead shelf, such an integrated system would automatically raise the carriage to a height at which the forks would be in alignment with the pallet on the shelf. The forks would then be automatically extended over the shelf to engage the forks in the pallet. The forks would be automatically stopped at the proper position relatively to the shelf by

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movement of the sensing rod of the present invention and actuation of the control member associated therewith when the sensing rod was engaged by the edge of the shelf. At the same time, actuation of the control member associated with the sensing rod would initiate slight elevation of the forks from the shelf and retraction of the forks with the loaded pallet from the shelf. The pallet would then be automatically lowered.

In placing a loaded pallet on a shelf, the pallet-sensing element of the present invention would indicate the presence of the pallet on the forks and cause the pallet to be raised a few extra inches above the shelf level so that the bottom of the pallet would clear the shelf as the forks were extended to deposit the pallet on the shelf. The sensing rod of the present invention would engage the edge of the shelf and the control member associated therewith would be actuated to stop extension of the forks at the proper position relatively to the edge of the shelf. At the same time, simultaneous actuation of the control member associated with the sensing rod and the control member associated with the pallet-sensing element would initiate lowering of the carriage to place the pallet on the shelf. Thereafter the forks would be automatically withdrawn from the pallet and lowered to the ground.

The invention having been broadly described, a more detailed description is given hereafter by reference to the accompanying drawings herein.

FIG. 1 is an elevational view of a lift truck incorporating control apparatus in accordance with the present invention. The forks of the truck are shown in full lines in their elevated and extended position and are shown in broken lines in both their extended and retracted lowered position.

FIG. 2 is a sectional view taken of the line 2-2 of FIG. 1 showing the forks in their extended position.

FIG. 3 is a sectional view taken of the line 3-3 of FIG. 1 showing the mechanism for supporting and raising the elongated sensing rod when the forks are lowered to the ground and showing the position of the pallet centering and sensing device between the forks.

FIG. 4 is a sectional view taken of the line 4-4 of FIG. 3 showing further details of the mechanism for raising the sensing rod.

FIG. 5 is a view taken in the direction of the arrows 5-5 of FIG. 1 showing a control pump for automatically actuating the mechanism for raising the sensing rod when the forks are lowered to the ground.

FIG. 6 is a sectional view taken of the line 6-6 of FIG. 5.

FIG. 7 is a view taken in the direction of the arrows 7-7 of FIG. 1, with parts broken away to show the details of the pallet-centering device and the pallet-sensing device.

FIG. 8 is an electrical diagram of a control circuit adapted to be utilized with the control apparatus of the invention.

Referring to the drawings, and in particular to FIGS. 1 and 2, the control apparatus of the present invention is shown by way of illustration incorporated in a truck of the type disclosed in U.S. application, Serial No. 766,998, filed October 13, 1958, by Bronislaus I. Ulinski, and entitled, "Swinging and Extending Forks." It will be appreciated, however, that while the invention is described hereafter in conjunction with such a truck, the invention is also equally applicable to other types of lift trucks.

It is sufficient for an understanding of the present invention to point out that the truck illustrated includes a wheeled chassis 10 on which is mounted a mast structure, generally designated by the reference numeral 11. The mast structure 11 includes a pair of primary or stationary channeled uprights 12 and a pair of secondary

uprights 13 which are mounted for vertical movement on the primary uprights 12 and movable by a suitable elevating ram 14 (FIG. 2) in the conventional manner.

A load carriage, designated by the reference numeral 15, is mounted for vertical movement on the secondary uprights 13. The carriage 15 is movable in the conventional manner by means of chains (not shown) as the secondary uprights 13 are raised by the elevating ram 14.

The carriage 15 is of the extendable fork type and includes a base plate 16, which is mounted by rollers 17 for vertical movement on the secondary uprights 13, and a load plate 18 on which load-supporting forks 19 are carried. The load plate 18 is supported on the base plate 16 for extending and retracting movement relatively to the base plate 16 by levers or hinge members 20 and 21. Hinge members 20 and 21 are hinged together at one of their ends and hinged at their other ends respectively to the base plate 16 and the load plate 18. Folding movement of the hinge members 20 and 21 to extend or retract the load plate 18 and the forks 19 relatively to the base plate 16 is effected by operation of rams 22 which extend between and are pivotally secured at each end respectively to the hinge members 20 and 21.

In accordance with the present invention, the load plate 18 is provided with an elongated flexible sensing rod 23 which extends downwardly below the lower surfaces of the load forks 19 when the load carriage 15 is in an elevated position. When the load forks 19 are extended over a shelf, such as indicated at R in FIG. 1, to deposit or remove a load L from the shelf, the sensing rod 23 is engaged and moved by the edge of the shelf when the forks have been extended the proper distance inwardly of the edge of the shelf. Movement of the rod 23 serves to release a switch 24, best shown in FIG. 4, to stop further extension of the forks 19 relatively to the shelf R and, as will be described in detail hereafter, to set up permissive control circuits to lower the load carriage 15, if a load is being placed on the shelf, or to raise the load carriage 15, if a load is being removed from the shelf.

As best shown in FIGS. 4 and 7, switch 24 is positioned between a pair of brackets 25 and 26 and is secured to bracket 26. Brackets 25 and 26 are secured to a reinforcing bar 27. Reinforcing bar 27 is in turn secured to the bottom of the load plate 18. Movement of the sensing rod 23 is transmitted to the switch 24 by a bell crank lever 28, best shown in FIG. 4, which is pivotally mounted on a pin 29 secured to the brackets 25 and 26. One end of the lever 28 is spring-pressed against the sensing rod 23 by a spring 30. Spring 30 is carried in a housing 31 secured between the brackets 25 and 26. The other end of the lever 28 carries an adjustable screw 32 which engages the switch 24 and holds the switch actuated until the lever 28 is moved by the sensing rod 23.

The mechanism for supporting and automatically raising the sensing rod 23 above the lower surfaces of the forks 19 to prevent damage of the sensing rod 23 when the load carriage 15 is moved against the floor to pick up or deposit a load on the floor is best shown in FIGS. 3, 4, 5 and 6.

Referring to FIG. 4, the sensing rod 23 is secured at its upper end to the upper end of an elongated rack 33. Rack 33 is in turn slideably received in an opening through a head member 34 secured to the upper end of a piston rod 35 of a ram 36. Ram 36 is supported by a bracket 37 which is secured to the load plate 18. A second elongated rack 38 is secured to the load plate 18 with the free end thereof slideably received in an opening through the head member 34. A pinion 39 is rotatably supported on the head member 34 and meshes with racks 33 and 38 on opposite sides thereof. It will be apparent that when the ram 36 is operated to extend the piston rod 35 thereof, the pinion 39 will be rotated by reason of its engagement with the fixed rack 38. Rotation of pinion 39 will in turn raise the rack 33 and sensing rod 23 secured thereto a greater

distance than the movement of the piston rod 35, as indicated in broken lines in FIG. 4. This arrangement therefore permits a shorter ram to be used than would be possible if the sensing rod 23 were connected directly to the piston rod 35.

As best shown in FIG. 3, the piston rod 35 is urged to retracted position by a pair of extension springs 40 and 41 which are secured at their upper ends to the head member 34 and secured at their lower ends to a plate 42. Plate 42 is secured to reinforcing bar 27. As best shown in FIG. 4, the mechanism for raising the sensing rod 23 is positioned between the forks 19 and is protected by a cover 43 hinged to a fork supporting bar 44 which is carried by a reinforcing bar 45 secured to the top of load plate 18.

The ram 36 is adapted to be automatically operated to raise the sensing rod 23, as the load carriage 15 is lowered against the ground, by a pump 46, best shown in FIGS. 5 and 6. The pump 46 may conveniently be of the type commonly used as the master brake cylinder for automobiles. As shown in FIG. 6, the pump 46 is carried on a bracket 47 which in turn is secured to the base plate 16. The pump 46 is hydraulically connected to the lower end of the ram 36 by a flexible conduit 48. As best shown in FIG. 5, the pump 46 is adapted to be actuated by an arm 49 which is pivotally secured at one end to extension plates 50 secured to the sides of the pump 46 and is pivotally secured intermediate its ends to the piston rod 51 of the piston 52 of the pump 46. The arm 49 carries a roller 53 at its free end which is adapted to engage a cam plate 54.

Cam plate 54 is secured to the lower side of one of the stationary uprights 12. As the load carriage 15 approaches its lower position, the roller 53 engages the cam plate 54, as shown in broken lines in FIG. 5, and as the load carriage 15 continues its downward movement the arm 49 is cammed by the cam plate 54 in a clockwise direction, as viewed in FIG. 5, to move piston 52 of the pump 46 in a direction to force fluid through conduit 48 to cause the piston rod 35 of the ram 36 to extend and thereby raise the sensing rod 23 above the lower horizontal surfaces of the forks 19 to prevent the sensing rod 23 from being damaged. When the load carriage 15 is again raised and the arm 49 is released by the cam plate 54, the springs 40 and 41 retract the piston rod 35 of the ram 36 to again lower the sensing rod 23 to a position in which it may be engaged by the edge of a shelf as the forks 19 are extended over the shelf in the placement or removal of a load. Counterclockwise movement of the arm 49 is limited by engagement of an adjustable screw 55, carried by the arm 49, with a stop plate 56 secured between extension plates 50.

The pallet-centering device and the pallet-sensing device are best shown in FIGS. 3 and 7. Referring to FIG. 7, the pallet-centering device includes converging plates 57 and 58 which are secured to parallel side plates 59 and 60. A top plate 61, shown partly broken away in FIG. 7, is secured to the top edge of the converging plates 57 and 58 and the side plates 59 and 60. A bottom plate 62 is similarly secured to the bottom edges of the converging plates 57 and 58 and the side plates 59 and 60. The top plate 61 and the bottom plate 62 are secured to the brackets 25 and 26 and also to triangular shaped filler blocks 63 and 64 interposed between the rear ends of the top and bottom plates 61 and 62 and secured to the brackets 25 and 26.

As can best be seen in FIGS. 3 and 7, the centering device is positioned between the forks 19 and between the upper and lower horizontal surfaces of the forks 19. In this position, the centering device is adapted to be engaged by the center stringer S of a pallet as the forks 19 are extended into the pallet. The converging plates 57 and 58 form a generally V-shaped guide which engages and guides the center stringer S of the pallet toward the center of the guide. This insures that the center stringer

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S properly engages the pallet-sensing device, generally designated by the reference numeral 65, which includes a spring element 66 which extends through an opening 67 at the vertex of the V-shaped recess between the converging plates 57 and 58.

The spring element 66 is secured to a bell crank lever 68 which is pivotally mounted on a pin 69. Pin 69 extends between and is secured to the top plate 61 and the bottom plate 62. One end of the bell crank lever 68 carries an adjustable screw 70 which is adapted to engage and actuate a switch 71 which is secured to the inner surfaces of side plate 59. The other end of the bell crank lever 68 engages and actuates a switch 72 which is secured to the inner surface of the side plate 60. As will be described hereafter in detail, switch 71 serves to set up permissive circuits for automatically lowering or raising the load carriage 15, depending on whether a load is or is not supported on the forks 19. The switch 72 may be used for other automatic operations, such as for raising the load carriage an extra few inches above the shelf when a load is positioned on the forks so that the pallet will clear the shelf as the forks are extended to place a load on the shelf. The bell crank lever 68 is urged to switch actuating position by a compression spring 73 which is interposed between one end of the bell crank lever 68 and the filler block 64.

When the forks 19 are extended into a pallet P, the center stringer is centered by the converging plates 57 and 58 and engages the spring element 66 and moves the bell crank lever 68 to release the switches 71 and 72.

Control Circuit and Operation

Referring to FIG. 8, there is shown a simplified diagram of an electrical control circuit for use with the control apparatus previously described. In the diagram, the contacts of the various switches are shown in the position they would have if there were no load on the forks and the sensing rod 23 had not been moved by engagement with the edge of the shelf R.

Assuming that the carriage has been raised to the proper level so that the forks 19 are in alignment with a pallet carried by the shelf R, and that fluid has been admitted to rams 22 to extend the forks 19 toward the pallet, the following would occur.

The forks would extend until the sensing rod 23 was engaged by and moved by the edge of the shelf. The movement of the sensing rod 23 would be transmitted to the bell crank lever 28 thereby releasing switch 24. Releasing switch 24 would allow contacts 24a thereof to open and contacts 24b to close. Opening of contacts 24a would break the circuit to a solenoid 74a of a suitable control valve 74 to stop operation of the rams 22, and therefore extension of the forks 19. Closing of the contacts 24b would complete a circuit through closed contacts 71a of switch 71 and closed contacts 75a of a time delay relay 75 to energize the solenoid 76a of a suitable valve 76. At the same time, the solenoid 75b of the time delay relay 75 would be energized. Contacts 71a of switch 71 would be closed at this time even though the forks 19 had been extended into the pallet because contacts 24b are closed to stop extension of the forks 19 before switch 71 can be released by the center stringer S of the pallet P. Energizing solenoid 76a actuates valve 76 to cause the elevating ram 14 to raise the forks 19 and the load carried thereby off the shelf. After a short time delay, contacts 75a would open thereby breaking the circuit to solenoid 76a so that valve 76 is released to stop further elevating movement of the ram 14. The forks 19 would then be retracted and the load carriage 15 lowered by manual operation of suitable valves or by additional suitable automatic control circuits (not shown).

In picking up a pallet supported load from the ground, and placing the pallet on the shelf, the forks 19 would be extended a sufficient distance into the pallet P that the center stringer S of the pallet P would move the bell crank

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lever 68 to release the switch 71. Releasing switch 71 would allow contacts 71a to open and contacts 71b to close. After the pallet had been placed on the forks 19, the forks would be retracted, the load carriage 15 would be elevated to a position a few inches above the level of the shelf R, and the forks 19 would then be extended by actuation of suitable manual or automatic controls (not shown). The forks 19 would continue to extend until the sensing rod 23 was engaged and moved by the edge of the shelf. Movement of the sensing rod 23 by the edge of the shelf would allow contacts 24a to open to thereby break the circuit to the solenoid 74a of valve 74 to stop operation of the rams 22, and therefore further extension of the forks 19. At the same time, contacts 24b would close completing a circuit through contacts 71b and closed contacts 77a of a time delay relay 77 to energize a solenoid 78a of a valve 78 to actuate valve 78. Actuation of valve 78 would cause the elevating ram 14 to lower the forks and load on to the shelf. At the same time, the solenoid 77b of time delay relay 77 would be energized and contacts 77a would open after a time delay breaking the circuit to solenoid 75b so that valve 78 stops lowering of the forks 19 by the elevating ram 14.

From the preceding description, it can be seen that there is provided novel control apparatus for a lift truck which will facilitate the use of a truck in the placement and removal of loads from high overhead racks or shelves. While the invention has been described in conjunction with a truck having forks which are extendable relatively to the load carriage, it will be appreciated that the invention is equally applicable to the more conventional type of trucks in which the forks are not extendable relatively to the load carriage. In using the apparatus with such latter type of trucks, the sensing rod and the control member associated therewith would be used to control the traction and braking system of the truck to stop horizontal movement of the truck relatively to a shelf when the sensing rod was engaged and moved by the edge of the shelf.

While a specific embodiment of the invention has been shown and described, it will be appreciated that changes and modifications can be made therein without departing from the spirit and scope of the invention.

I now claim:

1. In an industrial truck having a vertically movable load carriage, said load carriage having a horizontally extendable load supporting portion, means for vertically moving said load carriage, means for horizontally extending said load supporting portion, an elongated sensing rod carried by said load supporting portion and extending downwardly below the lower surface of said load supporting portion when said load carriage is in an elevated position whereby said elongated sensing rod is adapted to be engaged and moved by the edge of a shelf when said load supporting portion is extended over the shelf, first control means actuated by movement of said elongated sensing rod to stop extension of said load supporting portion, means on said load supporting portion for centering a load on said load supporting portion, a movable sensing member mounted on said load supporting portion and movable by a load centered on said load supporting portion, second control means actuated by movement of said sensing member to initiate lowering of said carriage to lower said load on to said shelf when said first control means are actuated by movement of said elongated rod, and means for raising said elongated sensing rod to a position above said lower surface of said load supporting portion when said load carriage is lowered to the ground.

2. In an industrial truck having a vertically movable load carriage, said load carriage having a horizontally extendable load supporting portion, means for vertically moving said load carriage, means for horizontally extending said load supporting portion, an elongated sensing rod carried by said load supporting portion extending

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downwardly below the lower surface of said load supporting portion when said load carriage is in an elevated position whereby said elongated sensing rod is adapted to be engaged and moved by the edge of a shelf when said load supporting portion is extended over the shelf, first control means actuated by movement of said elongated sensing rod to stop extension of said load supporting portion, a movable sensing member mounted on said load supporting portion and movable by a load positioned on said load supporting portion, second control means actuated by movement of said sensing member to initiate lowering of said load carriage to lower said load on to said shelf when first control means are actuated by movement of said elongated rod, and means for raising said elongated sensing rod to a position above said lower surface of said load supporting portion when said load carriage is lowered to the ground.

3. In an industrial truck having a vertically movable load carriage, said load carriage having a load supporting portion, means for vertically moving said load carriage, an elongated sensing rod carried by said load supporting portion and extending downwardly below the lower surface of said load supporting portion when said load carriage is in an elevated position whereby said elongated sensing rod is adapted to be engaged and moved by the edge of a shelf when said load supporting portion is extended over said shelf, means for extending said load supporting portion horizontally over said shelf, control means actuated by movement of said elongated sensing rod for controlling horizontal movement of said carriage, and means for raising said elongated sensing rod to a position above said lower surface of said load carriage when said load carriage is lowered to the ground.

4. In an industrial truck having a vertically movable load carriage, said load carriage having a load supporting portion, means for vertically moving said load carriage, an elongated sensing rod extending downwardly below the lower surface of said load supporting portion when said load carriage is in an elevated position whereby said elongated sensing rod is adapted to be engaged and moved by the edge of a shelf when said load supporting portion is extended over said shelf, means for extending said load supporting portion horizontally over said shelf, control means actuated by movement of said elongated sensing rod for controlling horizontal movement of said carriage, and a ram connected to said elongated sensing rod for raising said elongated sensing rod to a position above said lower surface of said load carriage when said load carriage is lowered to the ground.

5. In an industrial truck having a vertically movable load carriage, said load carriage having a load supporting portion, means for vertically moving said load carriage, an elongated sensing rod extending downwardly below the lower surface of said load carriage when said load carriage is in an elevated position whereby said elongated sensing rod is adapted to be engaged and moved by the edge of a shelf when said load carriage is extended over said shelf, means for extending said load supporting portion horizontally over said shelf, control means actuated by movement of said elongated sensing rod for controlling horizontal movement of said carriage, a ram for raising said elongated sensing rod to a position above said lower surface of said load supporting portion when said load carriage is lowered to the ground, and movement multiplying means interconnecting said ram and said elongated sensing rod whereby said elongated sensing rod is moved a greater distance than the movement of said ram when said elongated sensing rod is raised above said lower surface of said load supporting portion.

6. In an industrial truck having a pair of stationary uprights, a load carriage mounted for vertical movement on said uprights, said load carriage having a load supporting portion, means for vertically moving said load carriage relatively to said uprights, an elongated sensing rod carried by said load supporting portion and extending downwardly

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below the lower surface of said load supporting portion when said load carriage is in an elevated position whereby said elongated sensing rod is adapted to be engaged and moved by the edge of a shelf when said load supporting portion is extended over said shelf, means for extending said load supporting portion horizontally over said shelf, control means actuated by movement of said elongated sensing rod for controlling horizontal movement of said carriage, means for raising said elongated sensing rod to a position above said lower surface of said load carriage, and cooperating means on said load carriage and on said uprights for actuating said sensing rod raising means to raise said sensing rod when said carriage is moved adjacent to the lower ends of said uprights.

7. In an industrial truck having a pair of stationary uprights, a load carriage mounted for vertical movement on said uprights, said load carriage having a load supporting portion, means for vertically moving said load carriage relatively to said uprights, an elongated sensing rod extending downwardly below the lower surface of said load supporting portion when said load carriage is in an elevated position whereby said elongated sensing rod is adapted to be engaged and moved by the edge of a shelf when said load supporting portion is extended over said shelf, means for extending said load supporting portion horizontally over said shelf, control means actuated by movement of said elongated sensing rod for controlling horizontal movement of said carriage, a ram carried by said load carriage and connected to said elongated sensing rod for raising said elongated sensing rod to a position above said lower surface of said load carriage, and cooperating means on said load carriage and on said uprights for actuating said ram to raise said elongated sensing rod when said carriage is moved adjacent to lower end of said uprights.

8. In an industrial truck having a vertically movable load carriage including a pair of laterally spaced forks adapted to be engaged in a pallet, a generally V-shaped guide member carried by said carriage between said forks, said V-shaped guide member being engageable with the center stringer of a pallet to center the pallet on the forks as the forks are extended into the pallet, a movable sensing member extending into the space between the sides of said V-shaped guide member and movable by said center stringer of said pallet when said pallet is positioned and centered on said forks, and control means actuated by movement of said sensing member for controlling movement of said carriage.

9. In an industrial truck, a vertically movable load carriage having a load supporting portion, means for vertically moving said load carriage, a sensing device carried by said load carriage and extending below the lower surface of said load supporting portion when said load carriage is in an elevated position whereby said sensing device is adapted to be engaged and moved by the edge of a shelf or the like, control means actuated by movement of said sensing device for controlling movement of said load carriage, and means for raising said sensing device to a position above said lower surface of said load supporting portion when said load carriage is lowered to the ground.

10. In an industrial truck having a vertically movable load carriage, said load carriage having a horizontally extendable load supporting portion, means for vertically moving said load carriage, means for horizontally extending said load supporting portion, a sensing device carried by said load supporting portion and extending downwardly below the lower surface of said load supporting portion when said load carriage is in an elevated position whereby said sensing device is adapted to be engaged and moved by the edge of a shelf when said load supporting portion is extended over the shelf, first control means actuated by movement of said sensing device to stop extension of said load supporting portion, means on said load supporting portion for centering a load on said load supporting

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portion, a movable sensing member mounted on said load supporting portion and movable by a load centered on said load supporting portion, second control means actuated by movement of said sensing member to initiate lowering of said carriage to lower said load on to said shelf when said first control means are actuated by movement of said sensing device, and means for raising said sensing device to a position above said lower surface of said load supporting portion when said load carriage is lowered to the ground.

11. In an industrial truck having a vertically movable load carriage, said load carriage having a horizontally extendible load supporting portion, means for vertically moving said load carriage, means for horizontally extending said load supporting portion, a sensing device carried by said load supporting portion and extending downwardly below the lower surface of said load supporting portion when said load carriage is in an elevated position whereby said sensing device is adapted to be engaged and moved by the edge of a shelf when said load supporting portion

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is extended over the shelf, first control means actuated by movement of said sensing device to stop extension of said load supporting portion, a movable sensing member mounted on said load supporting portion and movable by a load positioned on said load supporting portion, and second control means actuated by movement of said sensing member to initiate lowering of said carriage to lower said load on to said shelf when said first control means are actuated by movement of said sensing device.

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