

July 9, 1963

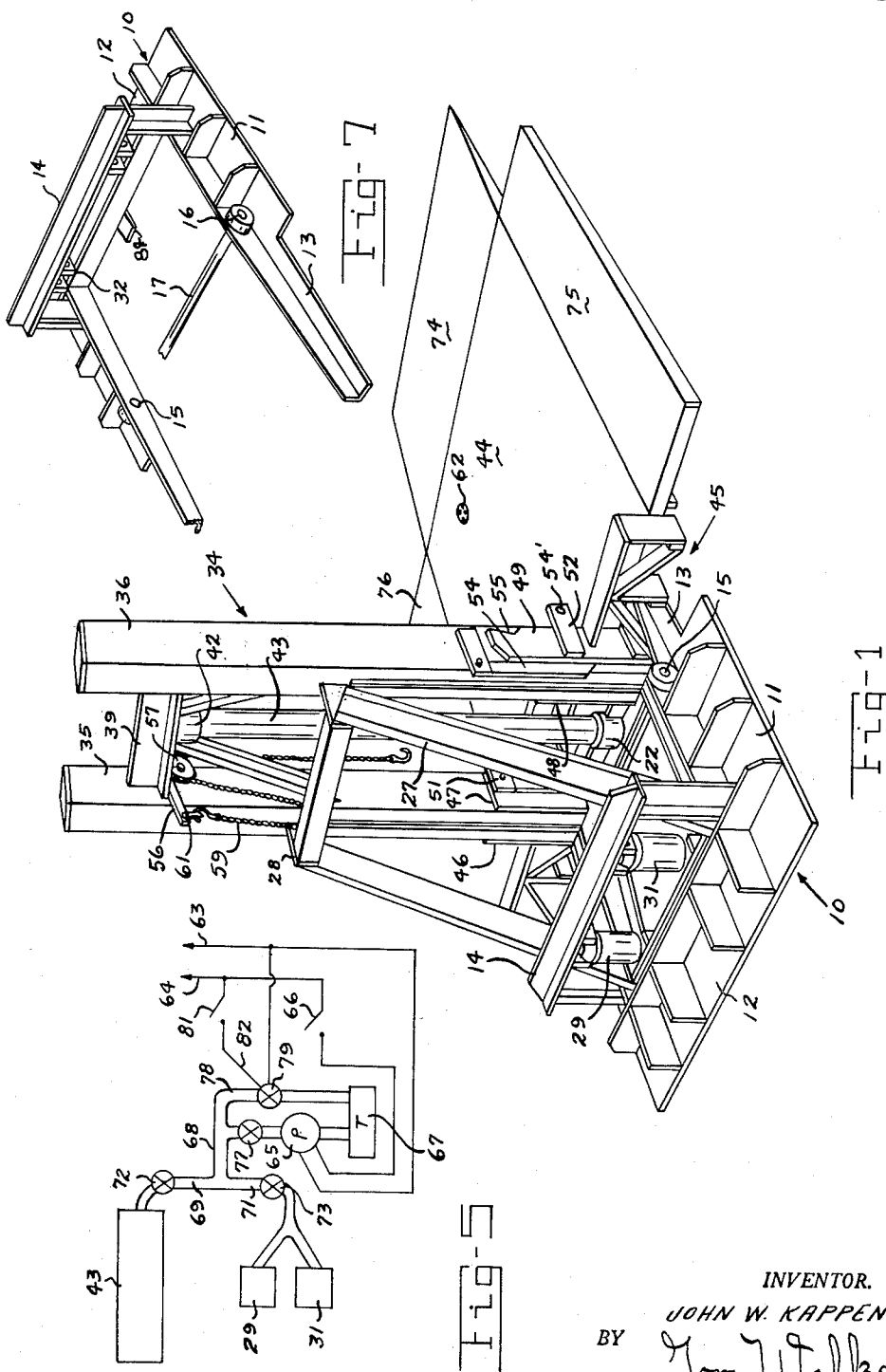
J. W. KAPPEN

3,096,895

LIFTING UNIT

Filed Feb. 13, 1957

3 Sheets-Sheet 1



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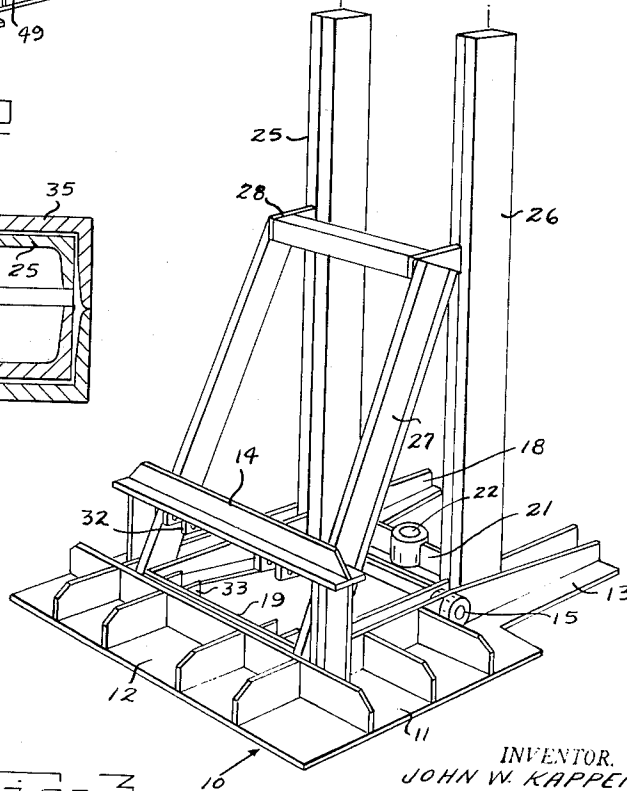
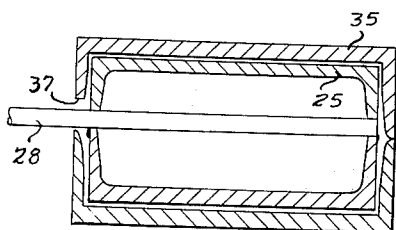
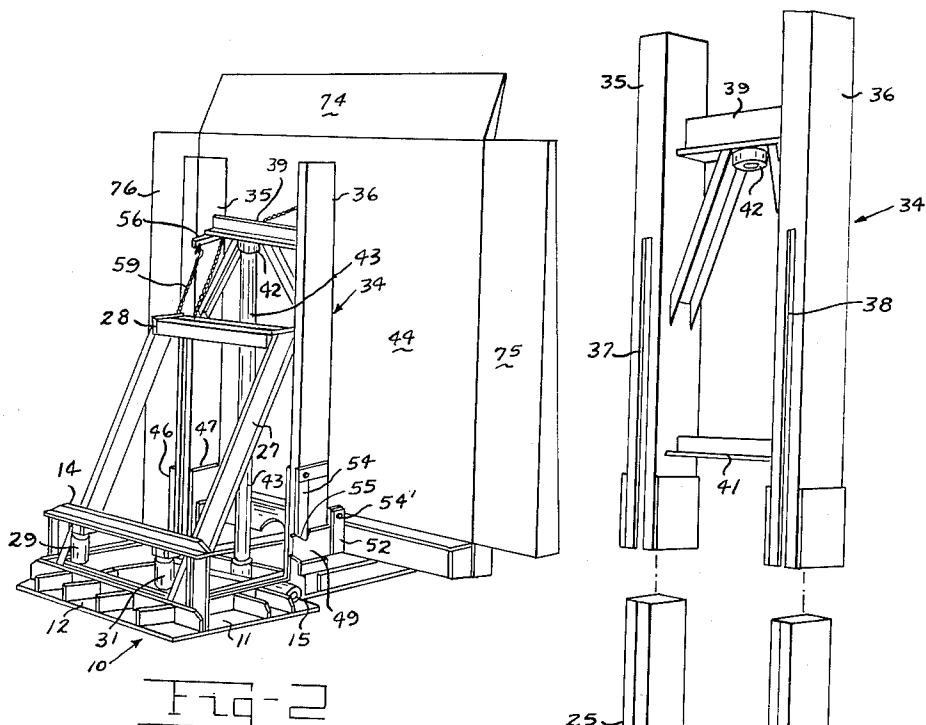
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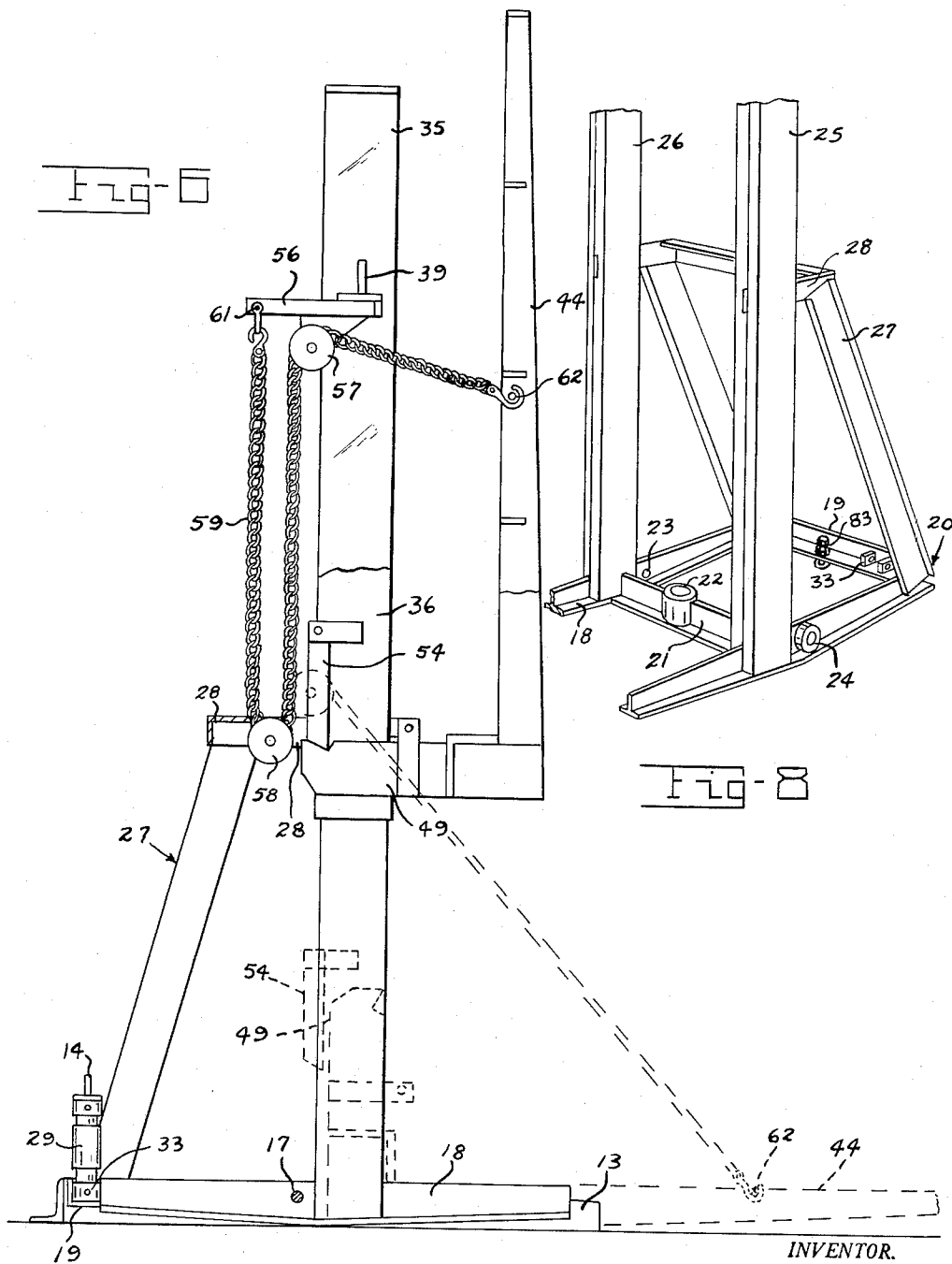
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3 Sheets-Sheet 3



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3,096,895

LIFTING UNIT

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4 Claims. (Cl. 214-674)

This invention relates to lifting units, and has especial although not limited reference to the loading and unloading of trucks in circumstances where the level of the truck bed interior is not aligned with the floor or dock level from which goods are to be placed into the truck or to which goods within the trucks are to be removed.

The object of the invention is to simplify the construction as well as the means and mode of operation of lifting units, whereby such units may not only be economically manufactured, but will be more efficient and satisfactory in use, adaptable to a wide variety of applications, and be unlikely to get out of order.

A further object of the invention is to provide a lifting unit as described including a load platform which can be quickly and easily elevated and lowered between truck level and dock or ground level.

Another object of the invention is to provide a lifting unit presenting a load platform accessible from multiple sides thereof for loading and unloading whereby to simplify its use and to permit the servicing of a plurality of trucks simultaneously.

A further object of the invention is to facilitate the movement of hand carts onto and off of the loading platform by providing for tilting adjustment thereof relative to the floor or ground level.

Still another object of the invention is to provide a simplified hydraulic actuating means for the lifting unit, characterized by a construction and arrangement of parts enabling the tilting of the load platform in a timed relation to the elevating and lowering thereof.

A still further object of the invention is to provide a simplified construction for the lifting unit according to which the unit may be adapted for portability or for permanent installation.

A further object of the invention is to provide a lifting unit possessing the advantageous structural features, the inherent meritorious characteristics and the mode of operation herein mentioned.

With the above and other incidental objects in view as will more fully appear in the specification, the invention intended to be protected by Letters Patent consists of the features of construction, the parts and combination thereof, and the mode of operation as hereinafter described or illustrated in the accompanying drawings, or their equivalents.

Referring to the accompanying drawing wherein is shown one but obviously not necessarily the only form of embodiment of the invention,

FIG. 1 is a view in perspective of a lifting unit in accordance with the illustrated embodiment of the invention, showing the lift assembly in lowered position and the load platform in an operating extended position;

FIG. 2 is a view similar to FIG. 1, at a reduced scale, showing the load platform rocked or folded to a substantially vertical position, for purposes of storing or transporting;

FIG. 3 is a detail view, in perspective, of the base supporting means and a part of the lift assembly, the latter being in exploded relation in order better to illustrate the construction and arrangement of the parts;

FIG. 4 is a view in cross section through a vertical post made up of telescoping parts of the lift assembly and supporting apparatus;

FIG. 5 is a diagram of hydraulic and electrical circuits provided for operation of the lifting unit;

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FIG. 6 is a detail view in side elevation showing the load platform in folded position, and the means for adjusting it to and from the illustrated position.

FIG. 7 is a fragmentary perspective view of the base;

FIG. 8 is a fragmentary perspective view of the intermediate support assembly.

Like parts are indicated by similar characters of reference throughout the several views.

Referring to the drawings, the lifting unit in its illustrative embodiment is of a fabricated steel construction, the several elements of each integrated unit being welded or otherwise permanently united with one another. The unit includes a base 10 formed of relatively flat and wide plates 11 in parallel relation to one another and interconnected at their one ends by a cross member 12. The opposite ends of the base plates 11 extend as projecting reduced width fingers 13 toward what may be considered to be the front of the lifting unit, the bottoms of such fingers lying in the same plane as the bottoms of the plates 11, with the result that the base is elongated in a direction from the front to the rear thereof for a relatively long contact with the ground or floor level upon which the lifting unit is received. The base is adapted to be bolted to a stationary foundation or to be installed upon wheels or casters for portability. Also forming a part of the base assembly is a unitary bridge 14 which spans the plates 11 at a point near the rear thereof or adjacent to the cross member 12. Still further, in upstanding walls of the plates 11 are aligned openings 15 and 16 providing bearings for the opposite ends of a shaft 17.

The base 10 provides a mounting for an intermediate support assembly 20 comprised of parallel legs 18 which are received between the legs 11 of the base assembly 10 and are interconnected at their one ends by a cross member 19 which is in substantially underlying relation to the bridge 14. Also interconnecting the legs 18 is an intermediate cross member 21 having in the mid portion thereof an upwardly opening thrust bearing 22. Transverse openings 23 and 24 in the legs 18 register with the openings 15 and 16, in the assembled position of the parts, and have the shaft 17 passed therethrough. The construction and arrangement of parts is such that the intermediate support 20 is mounted on the shaft 17 to be rocked to and fro upon the shaft as a pivot, the direction of rocking motion being toward the front and toward the rear of the unit as before designated.

At the ends of the cross member 21, on the legs 18, are respective upstanding guide posts 25 and 26, each made of channel shaped members, as seen in FIG. 4, the channel shaped members being in opposite relation with their longitudinal side edges in contact with one another and welded to make up a unitary post. At their bottom ends, the posts 25 and 26 are in intersecting relation to upstanding rib formations on the legs 18 and on the cross member 21 and are welded thereto for permanent interconnection of the parts. The guide posts further are braced by a brace member 27 which is anchored to the rear of the legs 18 and extends upward to an intermediate point between the ends of the posts, where integral parts 28 of the brace enter and are welded between the channel shaped portions of the posts 25 and 26.

Also interconnecting the base assembly 10 and the intermediate support assembly 20 are hydraulic cylinder devices 29 and 31, each comprising a cylinder anchored, as by brackets 32 to the underside of the bridge 14 and a piston anchored, as by brackets 33 to the rear cross member 19 of the assembly 20. The legs 18 of the assembly 20 extend in an upwardly divergent manner from an intermediate point beneath the pivot openings 23 and 24. The latter point is adapted substantially to rest

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upon the same surface as the plates 11 of the base 10, while the elevation of the ends of the legs 18 permit the assembly 20 as a unit to rock in a forward and rearward direction relatively to the base 10 and to the supporting surface upon which the unit rests.

The intermediate support assembly 20 provides a mounting for a lift assembly 34 which includes sleeves 35 and 36 in such telescoping relation to the posts 25 and 26 as to connect the lift assembly to the intermediate support assembly for unison rocking motion therewith and for relative elevating and lowering motions. The sleeves 35 and 36 are each made up of opposed channel shaped members like the members which make up the posts 25 and 26 and at their rear are cut by longitudinal slots 37 and 38 which permit the lift assembly to slide vertically upon the posts 25 and 26 without interference with the parts 28 of the brace 27. The sleeves 35 and 36 are integrally connected by upper and lower cross members 39 and 41, the former of which has a downwardly opening thrust bearing 42 in aligned, opposed relation to the similar bearing 22 in the cross member 21 of the intermediate support 20. Interposed between the thrust bearings 22 and 42 is a hydraulic cylinder device 43 comprising a cylinder based in one of the bearings and a relatively extensible piston received in the other. It will be understood that the hydraulic devices 29, 31 and 43 are adapted to be supplied with a hydraulic fluid under pressure and when so supplied will relatively extend the pistons therein with the result that the intermediate support 20 and mounted lift assembly will rock in a rearward direction relatively to the base and with the further result that the lift assembly will elevate or rise upon the posts 25 and 26.

Extending forwardly from the lift assembly 34, and in effect forming a part thereof is a platform 44 made rectangular and planar in form of suitable rigid materials. On what may be considered to be the rear edge of the platform 44 is mounted a frame work 45 the purpose of which is to present two pairs of bars 46 and 47 and 48 and 49 in laterally spaced apart relation at such rear edge of the platform. The bars 46 and 47 are adapted to receive between them the lower end of the sleeve 35 of the lift assembly while the bars 48 and 49 similarly receive the lower end of the sleeve 36. On each of the bars 46 and 47, in relatively elevated relation to the surface of the platform, is a forwardly projecting arm 51. Similarly, on each of the bars 48 and 49 is a forwardly projecting arm 52. On the front of each of the sleeves 35 and 36 is a block 53 adapted to be received between a respective pair of arms 51 and 52. A shaft 54 extends through aligned openings in the arms 51 and 52 and blocks 53 and so pivotally connects the platform 44 to the lift assembly. The rear edge of the platform engages the lower ends of the sleeves 35 and 36, beneath the blocks 53, in the assembled position of the parts so that the platform is limited in its downward rocking motion to a position in which it extends approximately normal to the vertical axis of the sleeves 35 and 36. Rocking motion of the platform upward or to what may be termed a folded position relatively to the upright sleeves 35 and 36 is possible and the platform may be held in such a position by engagement of a latch 54 swingably mounted upon the sleeve 34 with a notch 55 formed in the bar 49.

In such a rocked or raised position, which the platform is made to assume for more convenient storage or like purposes, the parts assume the position substantially as shown in full lines in FIG. 6. To accomplish its movement to this position, there is provided a bracket 56 on the sleeve 36, on which sleeve is a pulley wheel 57. On a relatively stationary part 28 of the brace 27 is another pulley wheel 58. A chain 59 is attached at 61 at its one end to the bracket 56. From the point 61, the chain 59 extends downward and around the pulley wheel 58 upward and around the pulley wheel 57 and at its

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other or opposite end is releasably hooked upon a pin 62 in the platform 44. In the normal use of the lifting unit, the chain 59 is disengaged from the platform 44. When the chain is engaged with pin 62 in the platform, however, it will be seen that a subsequent elevating motion of the lift assembly will pull the chain 59 over the pulley wheel 57, in effect shortening the length of the chain from the pulley wheel to the pin 62 and drawing the platform 44 gradually upward until it reaches the upright position illustrated. The lift assembly may be subsequently lowered, without lowering the platform, if in the interval the latch 54 is engaged in the notch 55 of the bar 49 in the manner indicated. When it is desired to release the platform for lowering, an elevating motion of the lift assembly is continued slightly above the position shown in FIG. 6 which will result in the latch 54 rising free of the bar 49. Accordingly, if the latch is now moved to an ineffective position, a subsequent lowering of the lift assembly will be accompanied by a lowering or downwardly rocking motion of the platform 44 to its normal operating position.

To control the rocking motion of the lift assembly, and of the elevating and lowering thereof, there is provided, as shown in FIG. 5, an electric and hydraulic circuit which may be substantially as there indicated. Thus, electrical conductors 63 and 64 extend from a source of electrical power (not shown) to an electric motor operated pump 65 and in one of such lines is a switch 66. The pump 65 is interposed in a hydraulic circuit and operates to withdraw hydraulic fluid from a place of storage 67 and directed through a common conductor 68 to parallel conductors 69 and 71, one of which leads to the hydraulic devices 43 and the other to the devices 29—31. Within the conduits 69 and 71 are respective metering orifices or valves 72 and 73. The conduit 71 is divided beyond the valve 73 into separate conduits leading to the individual devices 29 and 31. Accordingly, when the switch 66 is closed, the pump 65 is energized and draws fluid from the place of storage 67 and directs it by way of the conduits 68 and 69—71 simultaneously to the hydraulic device 43 and to the pair of devices 29—31. In combination, the devices 29—31 present a greater piston area to the pressure fluid than does the device 43 with the result that the devices 29—31 are more responsive to the pressure of the fluid than is the device 43.

Relating the hydraulic circuit to the operation of the lifting unit, the parts normally assume a position in which the intermediate support 20 and lifting assembly 34 thereon are rocked in a forward direction since the platform 44 projects in relatively offset relation to the base 10 and provides a weight tending to rock the support 20 forwardly about the pivot represented by shaft 17. Similarly, the weight of the platform maintains the lift assembly normally in a lowered position. With the lift assembly so lowered and so rocked in a forward direction, the platform takes up an angular position relatively to the base and relatively to the ground surface or floor level, the leading edge or that edge in opposing relation to the rear edge of the platform being tilted or inclined toward the ground. In conjunction with a wedge shaped part 74, which may be permanently installed in the ground or floor surface or be pivotally attached to the leading edge of the platform, the platform when thus tilted provides a ramp of low inclination upon which hand carts, fork lift trucks and the like may readily move from the ground or floor surface. Upon energizing of the pump 65 the initial hydraulic action is to rock the intermediate support 20 and lift assembly 34, including the platform 44, toward the rear of the unit in a manner to restore the platform to a position approximately parallel to the ground or floor surface. Then, as the operation of the pump 65 continues, the lift assembly and platform are elevated relatively to the base and intermediate support to a selected high level position. In the lowering of the lift assembly, the parts retain the rearwardly rocked posi-

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tion described until the lift assembly reaches its fully lowered position and pressure is released from the hydraulic device 43. Thereupon pressure similarly is released from the devices 29 and 31, enabling the weight of the platform 44 to rock the intermediate support 20 forwardly and restore the platform to an inclined position wherein the load may be more easily brought onto or removed from the platform.

There may also, as indicated, be used in similar manner with the platform, side wings or panels 75 and 76. In this connection, it will be apparent that the platform 44 extends laterally in a relatively free and unobstructed manner from the base and lift assembly of the lifting unit proper whereby not only the far or leading edge of the platform is available for the entrance and exit of goods but the both sides as well. The platform accordingly is accessible from three sides for loading and unloading and lends itself to an arrangement by which a plurality of trucks may be backed up to the lifting unit from different directions and their interiors loaded or unloaded simultaneously through use of the lifting unit.

Referring again to the hydraulic and electrical circuit of FIG. 5, this mechanism will preferably provide for interrupting the elevating and lowering movements of the lift assembly at any selected point, with the assembly being positively held in such position. According to one concept of control apparatus for this purpose, there is interposed in the common hydraulic conduit 68 a check valve 77 opening toward the hydraulic devices and closing toward the pump. Also, there is provided a by-pass return passage 78 from the conduit 68 to the tank 67 in by-passing relation to the pump 65 and check valve 77. In the passage 78 is a solenoid valve 79, normally closed and adapted to be energized in response to the closing of a switch 81 in a circuit 82 connecting the solenoid valve across the electrical conductors 63 and 64. In the operation of this form of the system, the switches 66 and 81 are both normally open, with the valves 77 and 79 both normally closed. Upon closing of switch 66, hydraulic fluid is forced by the pump 65 past the check valve 77 and to the hydraulic devices as described. When the lift assembly has achieved a height as desired, the switch 66 is released, and operation of the pump 65 discontinued. The valve 77 closes and the hydraulic fluid in advance thereof accordingly is trapped, whereby the lift assembly and platform are retained in their selected elevated position. When it is desired to lower the platform, switch 81 is closed whereby to close a circuit through the solenoid valves 79, opening the valve for return flow to the tank or place of storage 67 by way of the by-pass passage 78. Lowering of the lift assembly will in this manner continue as long as the switch 81 is held closed and may be discontinued at any time by release of the switch. It will be understood in this regard, and in regard to the tilting action of the platform 44 when fully lowered, that the platform may be moved between elevated and lowered positions intermediate the upper most and lower most positions freely without tilting of the platform. The rate of descent of the platform is controlled by the metering valves 72 and 73.

As shown in FIGS. 7 and 8 an adjustable positive stop is provided to limit the rocking motion of the intermediate support assembly 20 relative to the base assembly 10. Such stop comprises an adjustable screw 83 having threaded engagement with the lower portion of the rear cross member 19 in the intermediate support assembly 20. This screw 83 has an enlarged pad or shoulder on the bottom thereof for engagement with a projecting portion 84 extending inwardly from the rear cross member 12 of the base 10. Thus by adjustment of the screw 83 relative to the cross member 19 the degree of rocking motion of the intermediate support member relative to the base member in a clockwise direction can be accurately predetermined and controlled.

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In many installations the unit comprising the subject matter of this application is so located relative to a loading dock that it prevents normal use of the dock by trucks which do not require the use of the present lifting unit. In such instances the folding of the load platform to the position in FIG. 2 permits trucks to pass the lifting unit so as to be able to back up to the loading dock in a normal fashion.

From the above description it will be apparent that there is thus provided a device of the character described possessing the particular features of advantage before enumerated as desirable, but which obviously is susceptible of modification in its form, proportions, detail construction and arrangement of parts without departing from the principle involved or sacrificing any of its advantages.

While in order to comply with the statute the invention has been described in language more or less specific as to structural features, it is to be understood that the invention is not limited to the specific features shown, but that the means and construction herein disclosed comprise but one of several modes of putting the invention into effect, and the invention is therefore claimed in any of its forms or modifications within the legitimate and valid scope of the appended claims.

What is claimed is:

1. A lifting unit, including a base, rocking means supported by said base for relative rocking movement, a lift assembly supported by said rocking means for unison rocking and relative elevating and lowering motions, the weight of said lift assembly being disposed to rock said rocking means in one direction, a hydraulic piston and cylinder connection between said base and said rocking means, another hydraulic piston and cylinder connection between said rocking means and said lift assembly, means for supplying hydraulic fluid under pressure simultaneously to the first said connection in a manner to rock said rocking means in the opposite direction and to the said other connection in a manner to elevate said lift assembly, said connections presenting a differential piston area to the hydraulic fluid to effect said rocking and elevating motions in a predetermined sequence.

2. A lifting unit, including a base, a lift assembly supported on said base for relative elevating and lowering motions, a platform pivotally connected to said lift assembly, means limiting pivotal motion of said platform in one direction to cause said platform to assume normally a generally laterally extending position in approximately parallel relation to ground level, means for elevating and lowering said lift assembly while said platform remains in said laterally extending position, and a releasable, normally disabled connection between said lift assembly, said base and said platform utilizing motion of said lift assembly in an elevating direction to move said platform pivotally to a position approximately perpendicular to ground level.

3. A lifting unit according to claim 2, characterized by means for latching said platform in perpendicular position as described irrespective of movement of the lift assembly.

4. A lifting unit, including a base, rocking means supported by said base for relative rocking movement thereon, a lift assembly on said rocking means mounted for unison rocking motion and relative elevating and lowering movements, said lift assembly including a load platform connected for disposition in such offset relation to said base that the weight thereof tends to rock said rocking means in a direction to tilt an edge of said platform toward the ground surface when said lift assembly is in its lowermost position, control means for rocking said rocking means in the opposite direction to place said platform approximately parallel to the ground surface, elevating the lift assembly including said load platform, and for maintaining said platform in its position approximately parallel to the ground surface throughout vertical movement thereof, characterized by said control means includ-

ing a first assembly of hydraulic piston and cylinder elements interconnecting said base and said rocking means, a second assembly of hydraulic piston and cylinder elements interconnecting said lift assembly and said rocking means, and means for supplying hydraulic fluid under pressure to both said assemblies of piston and cylinder elements simultaneously, and to discontinue such supply simultaneously, the first assembly of cylinder piston elements exposing a relatively larger area to the hydraulic fluids so that the rocking of said load platform from tilted position precedes elevation thereof and the rocking to tilting position follows lowering thereof.

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2,220,450
2,349,352
2,569,053
2,591,544
2,792,079

683,692

References Cited in the file of this patent

UNITED STATES PATENTS

Howell Nov. 5, 1940
Johnson May 23, 1944
Healy Sept. 25, 1951
Hegarty Apr. 1, 1952
Gibson May 14, 1957

FOREIGN PATENTS

Great Britain Dec. 3, 1952