Dec. 6, 1966 H. C. LA TOURNEAU ETAL 3,289,871

METHOD AND MEANS PROVIDING OVERHEAD PROTECTION AND ACCESS TO INDUSTRIAL TRUCKS

Filed Dec. 9, 1963 3 Sheets-Sheet 1

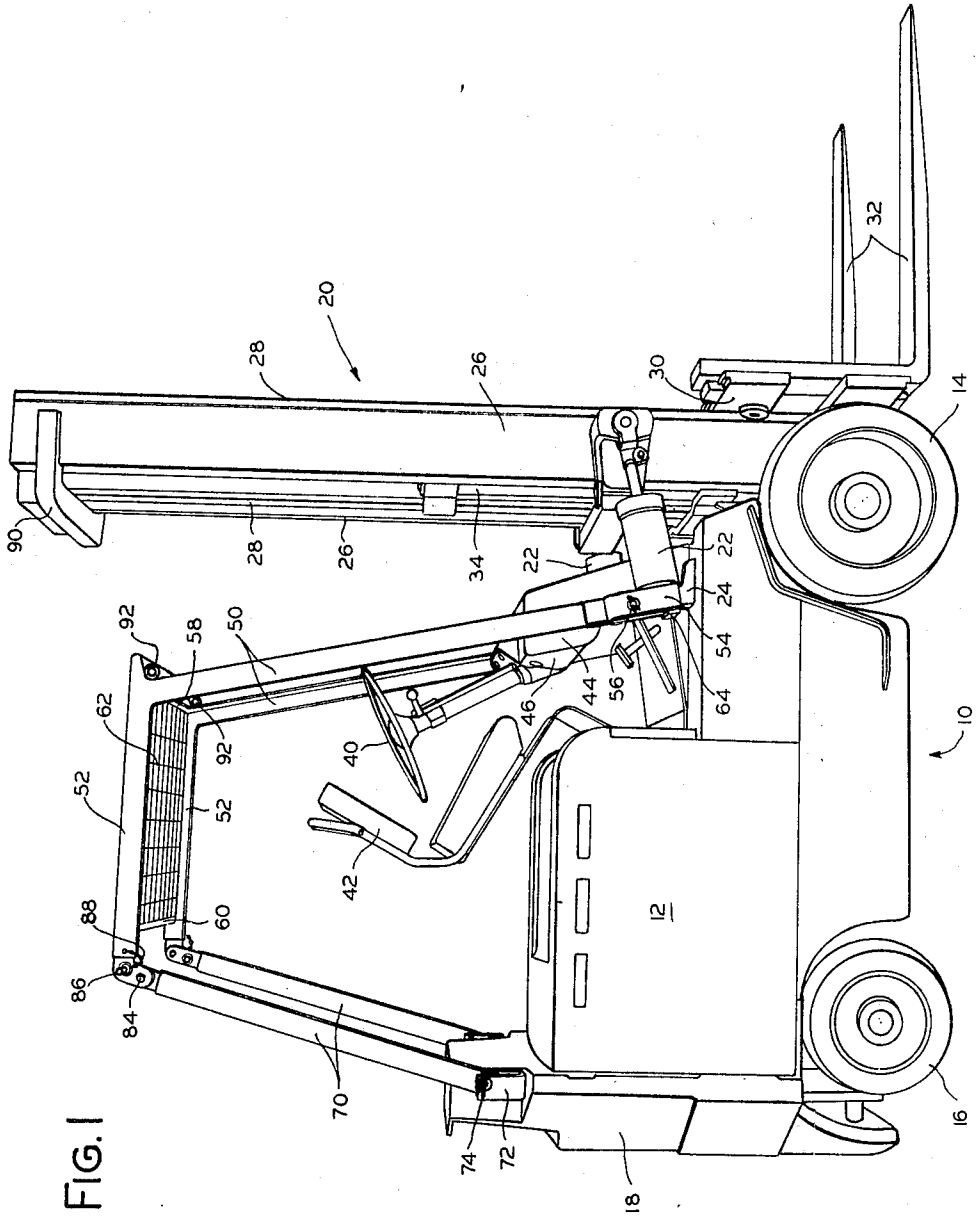

FIG. 1

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FIG. 2

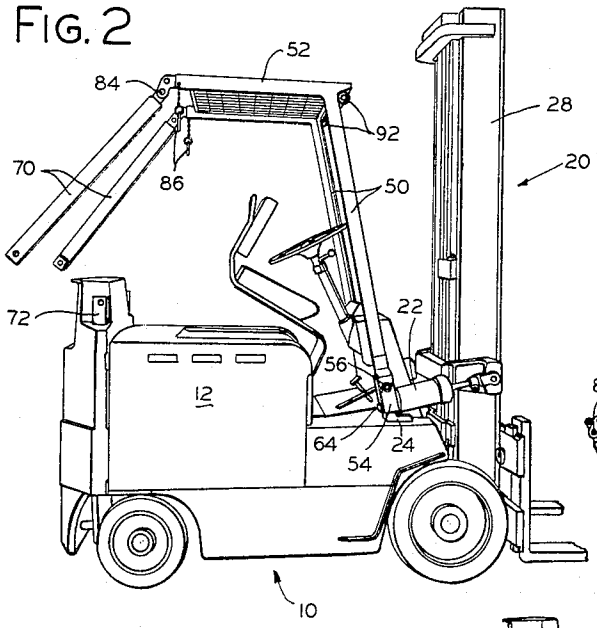

FIG. 3

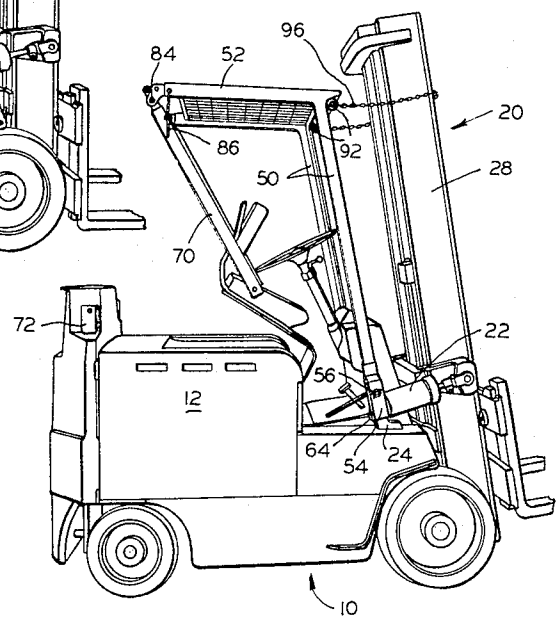

FIG. 4

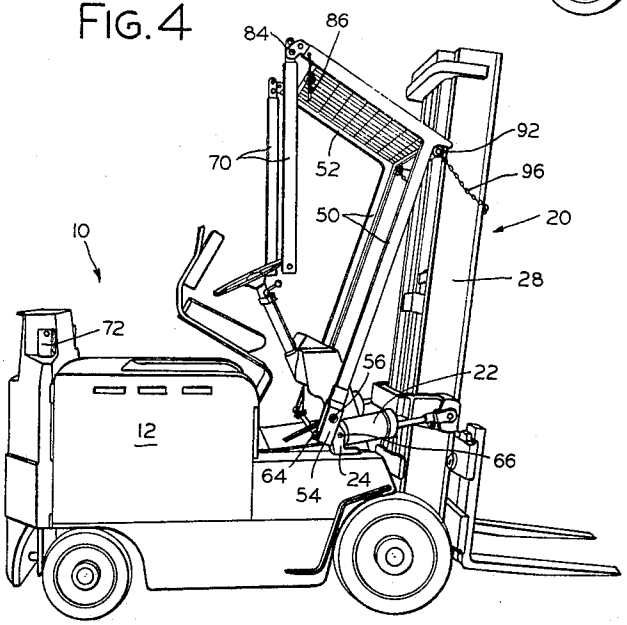

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FIG. 5

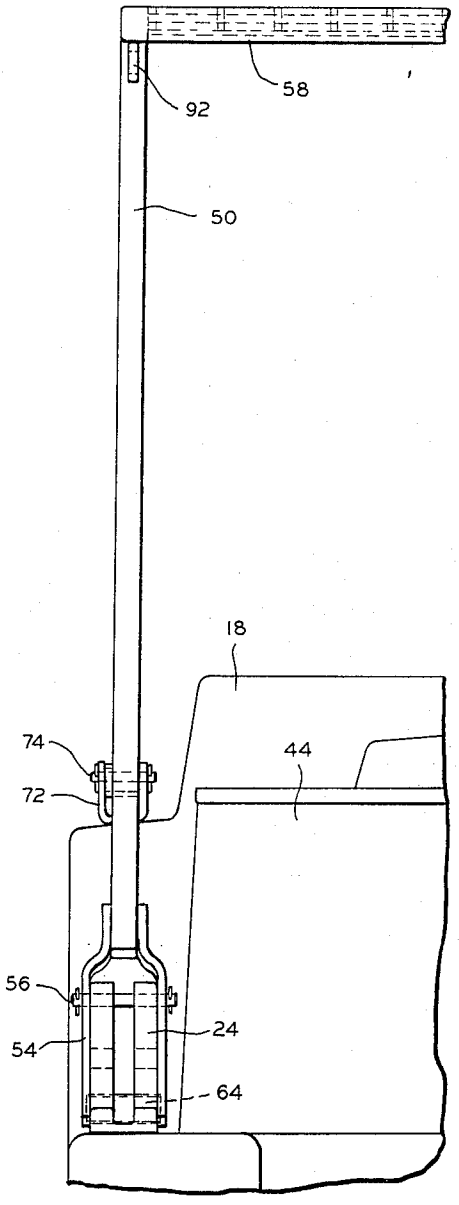


FIG. 6

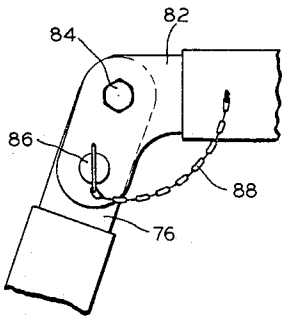
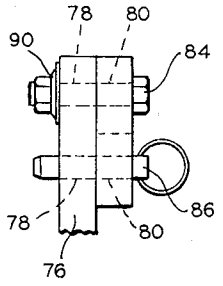


FIG. 7



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3,289,871

METHOD AND MEANS PROVIDING OVERHEAD PROTECTION AND ACCESS TO INDUSTRIAL TRUCKS

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11 Claims. (Cl. 214—674)

This invention relates to overhead guards for the protection of operators of industrial lift trucks, and to a method of operating such guards to provide unobstructed access to a portion of such trucks.

These trucks have a tiltable mast structure ahead of the operator's station, and a forwardly projecting fork frame or other load handling device is mounted for vertical movement on the mast structure. Such trucks are commonly utilized to transport materials on the fork frame, and to stack these materials vertically to various heights to which the fork frame can be elevated on the mast structure. In the manipulation of the truck during such stacking operations, if a load shifts because of careless handling or because of a rough floor or for any other reason, material may fall from the load handling device and injure the operator of the truck, and various types of overhead guards have heretofore been provided to prevent injuries to the operator by falling objects.

Considerable inconvenience has been encountered heretofore by lift truck operators and maintenance men whenever it has become necessary to gain access to the power plant of an industrial lift truck which has mounted thereon an overhead guard. Such inconvenience, as well as an excessive consumption of maintenance or service time, has primarily resulted from the fact that such guards have generally been mounted on the truck in such a manner that they interfere in a vertical direction with full access to truck compartments, thereby frequently necessitating partial or complete disconnection and removal of the guard from the truck to facilitate access to the power plant and/or to permit disassembly of the counterweight from the truck.

It is a primary object of the present invention to provide an overhead guard structure which is mounted for forward movement relative to the truck and out of the vicinity of the rear portion thereof so as to permit unobstructed access in a vertical direction to the rear portion.

It is an important object of the invention to provide an improved overhead guard structure for industrial trucks which is simple in construction, relatively inexpensive to produce, and applicable to most types of such trucks.

It is a further important object of this invention to provide a novel method for actuating the entire overhead guard structure out of the vicinity of a portion of the truck structure.

It is another object of the invention to provide a much improved and versatile overhead guard construction which is capable of being manipulated optionally in various ways at the election of the operator.

In carrying out our invention we provide a generally inverted L-shaped rigid structure connected pivotally to a front portion of the truck and extending over the operator's compartment, and generally downwardly depending leg means pivotally mounted on the L-shaped portion and connected to a rear portion of the truck by quick disconnect means, the entire guard structure being movable forwardly of the truck about the forward pivot connections thereof to a position removed from the immediate vicinity of the rear portion of the truck. Additionally we provide connecting means between tiltable mast structure and the guard structure operable to actuate the guard structure as

aforesaid when the mast is actuated to a forwardly tilted position.

Other objects, advantages and features of our invention will be readily apparent to those skilled in the art from the following detailed description taken in conjunction with the accompanying drawings wherein:

FIGURE 1 is a side view of an industrial lift truck having mounted thereon an overhead guard structure which employs our invention;

FIGURES 2, 3 and 4 comprise partial side views of the structure shown in FIG. 1 wherein the overhead guard structure is illustrated in different positions of adjustment;

FIGURE 5 is a partial front elevational view of the overhead guard structure shown in the preceding figures; and

FIGURES 6 and 7 are enlarged side and front elevational detail views, respectively, showing the connecting means between upper and rear leg portions of the guard structure.

Referring now in detail to the drawings, the numeral **10** indicates generally an industrial lift truck which includes a body and frame portion indicated generally at numeral **12** mounted suitably upon front drive wheels **14** and rear steer wheels **16**, a counterweight **18** which ordinarily is made of metal and is removably secured to the rear end of the truck to counterbalance loads which are carried on the fork tines at the front end of the truck, and a mast structure **20** mounted on the front axle, not shown, in known manner for tilting or pivotal movement in forward and rearward directions from a vertical position as shown in FIG. 1. A pair of transversely spaced tilt piston and cylinder assemblies **22** are pivotally connected at the rear ends to upright legs of a pair of brackets **24** mounted on the frame of the truck, and at the forward or piston rod ends are pivotally connected to opposites sides of fixed channel members **26** of the mast structure **20**, said assemblies being double-acting hydraulic cylinders controlled by the operator for actuating mast **20** to selected tilt angles forward and rearwardly of a vertical position.

Channel members **26** of mast **20** form outer guideways for receiving a pair of telescoped, transversely spaced I-beams **28** nested therein and on which is mounted in known manner a load supporting carriage **30** carrying a pair of load engaging fork tines **32** which project forwardly of the truck for engaging beneath loads to be transported and raised. Vertical movement of mast **20** is produced in a conventional manner by a hydraulic cylinder-piston hoist motor assembly which is adapted to cooperate with a chain and sprocket mechanism, not shown, to raise and lower the load supporting carriage **30** on I-beam sections **28**, and to raise and lower I-beam sections **28** on outer guideways **26**. A detailed disclosure of a suitable mast structure will be found in the copending application of Hastings & Backofen, Serial No. 111,070, filed May 18, 1961, (common assignee).

An operator's station includes a steering wheel **40**, a seat **42**, a cowl portion **44** mounted at the forward portion of body **12** and including an instrument panel **46**, and a plurality of control levers and pedals which enable the operator to control variously the forward and rearward motion of the truck, and the elevation and tilt of the mast **20**.

Within the body of the truck is mounted the main power plant and accessories associated therewith for operating the truck. The truck as illustrated is an electric motor driven truck, in the rear upper body portion of which between counterweight **18** and the front of seat **42** is located a large battery compartment in which are mounted batteries for operating the drive motor. The present invention applies as well, of course, to other vehicles with which it might be used, whether driven by electric motor means, internal combustion engine means, or other drive means.

The description thus far relates to conventional lift truck construction, in connection with which the overhead guard apparatus and the method of operating same will now be described.

The overhead guard structure of our invention comprises a pair of generally upwardly and then rearwardly extending transversely spaced rigid members **50**, **52** forming an inverted generally L-shaped structure which extends rearwardly over the operator's compartment and has mounted at the lower forward end of each leg **50** a bifurcated bracket **54** which straddles the upwardly extending leg of each bracket **24** such that a pivot pin **56** is received in axially aligned openings which extend transversely through brackets **24** and **54**, thus supporting for forward pivotal movement from the position shown in FIG. 1 the inverted L-shaped guard structure **50**, **52**. The sides **50**, **52** of the guard structure are connected together at the forward upper corners by means of a transverse beam **58** and rearwardly thereof by means of a transverse beam **60**, between which beams and the side portions **52** of the guard structure is mounted a rigid metal framework **62** comprised of spaced longitudinally and transversely extending members for preventing objects which might fall from above from striking the operator. Secured to the lower rear edge portions of each bracket **54** is a stop member **64** which engages the rear surface of the upwardly extending leg of bracket **24** to prevent the overhead guard structure from being pivoted rearwardly beyond the position shown in FIG. 1, while permitting said guard structure to be pivoted forwardly of said position, as will be described below. The cylinder portion of assembly **22** is pivotally mounted by means of a pin **66** to the upwardly extending leg of bracket **24**, as best shown in FIG. 4. As illustrated, the pivot pins **56** are provided with openings at opposite end portions thereof for receiving cotter pins, or the like, for permitting the forward guard structure to be readily assembled with and disconnected from the truck.

A pair of transversely spaced upwardly extending rear leg portions **70** of the guard structure are pivotally mounted at the lower ends thereof in a pair of spaced bifurcated bracket members **72**, which are securely mounted on opposite sides of counterweight **18**, by means of pivot pins **74** which are held in fixed axial position in openings formed in brackets **72** and leg portions **70** by cotter pins or other suitable means permitting ready installation and removal of the pins so that leg portions **70** can be easily connected to and disconnected from the brackets. The upper ends of rear leg portions **70** each includes an extension bracket portion **76** having a pair of spaced openings **78** therein adapted to register with a pair of similarly spaced openings **80** in an L-shaped bracket end portion of each of the upper legs **52**, said registrable openings in the end portions of legs **52** and **70** being connectible together by means of a bolt **84** and a pull pin **86**. Each pin **86**, as illustrated, is connected to an upper leg **52** by a small chain **88**. Bolts **84** and pull pins **86** are interchangeable in respective pairs of openings **78** and **80** for a purpose to be described. A spring washer **90** is mounted on each bolt **84**, and during assembly the bolts **84** are tightened to provide a friction mounting between each pair of connected legs **52** and **70** so that when legs **70** are disconnected from brackets **72** they will remain in any angular position relative to upper legs **52** in which they may be positioned, such as shown in FIGS. 2, 3 and 4. When the pull pins **86** are disengaged from the upper openings of brackets **76** and **82** and the bolts **84** are located in the lower openings thereof, as shown in FIGS. 2–4, rear leg portions **70** can be manipulated together or independently to any desired angular position relative to upper legs **52**, assuming also that pivot pins **74** are disengaged, between a maximum forward adjusted position in which the lower ends of legs **70** abut legs **50** and a rearward adjusted position approximately as shown in FIG. 2. If bolts **84** and pins **86** are interchanged in openings **78** and **80** so that the bolts are now located in the upper openings and the pull pins in the lower openings, such as shown in FIGS. 6 and 7, then, following removal of pins **86** from the openings, rear legs **70** can be adjusted in a plurality of positions relative to upper legs **52** between a generally vertically downwardly extending position and an upwardly directed position, not shown, in which legs **70** are pivoted in a clockwise direction to an extreme position extending upwardly over and forwardly of upper legs **52** and frame **62**. Normally, it is preferred to locate bolts **84** in lower openings **78** and **80**, with pull pins **86** located in the upper openings, so that legs **70** are locatable in or between positions shown in FIGS. 2–4, although in some instances it is desirable to be able to locate legs **70** above said upper guard portion, in which case the bolts and pull pins are interchanged, as aforesaid.

In the operation of industrial trucks, particularly of the electric driven type utilizing large wet cell storage batteries as a source of power, it is frequently necessary for the purpose of maintaining and servicing the truck to have unimpeded access to the power plant components within frame and body portion **12**. Overhead guard structure previously employed has long presented a serious problem in that it has seriously impeded certain required maintenance and servicing procedures because of interference with the removal of components from the truck. An important improvement in the overhead guard art which provides a partial solution to this problem is disclosed in U.S. Patent No. 2,911,232. The present invention provides a complete solution to the problem, as will become apparent to persons skilled in the art as the description of operation proceeds.

Our invention provides both an extremely novel overhead guard structure and also a method of locating all portions of such structure in a position generally forwardly of the truck so that the major power plant components and accessories of the truck within body and frame **12** thereof are made more readily accessible for maintenance, servicing, and the like. In the use of battery powered lift trucks which are normally in more or less continuous operation for two or more eight hour work shifts of each working day, for example, it is normal procedure to remove the batteries from the truck for recharging after each such work shift, and install immediately fully charged replacement batteries for the subsequent work shift. These large and cumbersome batteries are removed from the truck by removing the cover portion of the battery compartment which exposes the batteries, and then engaging the batteries by means of an overhead chain fall to elevate the batteries above the operator's compartment and then transversely of the truck to transport the batteries to a location for recharging the same. Use of overhead guard equipment in such exemplary operations has heretofore necessitated dismantling of the overhead guard from the truck at the end of each work shift so as to avoid interference thereof with removal of depleted batteries and installation of charged batteries by means of overhead chain falls and the like. During the second work shift, of course, the depleted set of batteries are recharged, at the end of which work shift the batteries are again interchanged, which cycling continues daily during operation of the truck. This procedure, of course, causes an economic loss to the business involved to the extent of "downtime" of the truck equipment as a result of the use of overhead guards and the prior necessity of removal and reinstallation thereof at the end of each work shift for the reasons stated.

The present invention avoids such problems by providing structure as described above, which operates as follows: Let it be assumed that the batteries in the electric truck illustrated in the figures are depleted and require immediate replacement by a second set of fully

charged batteries. The overhead guard structure is, of course, normally located in position for operation as illustrated in FIG. 1, wherein a rigid guard structure is provided. That is, rear legs **70** and upper legs **52** are securely held together in fixed relation by means of bolts and pins **84** and **86** with legs **70** also connected by pins **74** to brackets **72**, and the forward legs **50** are maintained in rigid positions by means of pivot pins **56** in brackets **24** and the engagement of stop bars **54** with the upper legs of brackets **24**. This arrangement effectively eliminates the possibility of any portion of the guard structure pivoting in any direction. If it is now desired to remove the batteries, or to gain unobstructed access to body portion **12** for any reason, pivot pins **74** and **86** are removed and rear legs **70** preferably actuated forwardly to positions relative to upper legs **52** approximately as shown in FIGS. 3, in which relative angular position legs **70** will be held due to the friction connections between legs **52** and **70** provided by bolts **84**. Cylinder assemblies **22** are then energized to retract the pistons thereof which actuates mast **20** to a rearwardly tilted position as shown in FIG. 3. It will be observed that we have provided two rings **92** located adjacent opposite sides of the upper corner portions of the inverted L-shaped structure **50**, **52**. A chain or rope member **96** of predetermined length having snap-on links at opposite ends thereof is arranged to encircle mast **20** and is connected to rings **92** as shown in FIG. 3. Cylinder assemblies **22** are then energized to extend the piston rods thereof so as to tilt the mast structure to a forward position, as in FIG. 4, which, as a result of the action of chain or rope **96**, causes the entire overhead guard structure to be pivoted forwardly about pins **56**. As shown in FIG. 4 the entire overhead guard structure is actuated forwardly to a position in which no portion thereof obstructs the air space above the battery compartment of the truck. The cover plate structure of the battery compartment may be thereupon removed, a chain fall, or the like, moved over the battery compartment and connected to the depleted batteries for removal thereof as aforesaid, subsequent to which recharged batteries are installed in the truck. Mast **20** is then actuated rearwardly to the position shown in FIG. 3 wherein chain or rope member **96** is disconnected from either one or both rings **92**, and rear legs **70** thereupon are pivoted in a clockwise direction and reconnected to brackets **72** by pins **74**, in which position pull pins **86** are reinserted in openings **80**, thus reorienting the guard structure as shown in FIG. 1 for subsequent operation, including tilting operation of the mast **20** for handling loads on fork tines **32**.

It will be appreciated that any suitable means for securing the mast to the overhead guard may be used in place of the chain and ring connection illustrated in the figures. For example, permanent adjustable connecting means can be supplied in place of the removable chain member **96**, such as a sliding rod connection between legs **50** and upright channels **26** permitting the upright channels to be tilted forwardly and rearwardly during normal operation of the truck without actuating the overhead guard structure, and providing an adjustable nut or other member threaded on the rods for engaging mast members **26** in a rearwardly tilted position so that forward movement thereof would actuate the guard structure to the position shown in FIG. 4. Furthermore, if desired and as apparent in FIG. 4, it is not essential to provide any connecting means between the guard and mast structures inasmuch as with the mast structure located in a forwarly tilted position as in FIG. 4, the guard structure can be manually pivoted by the operator about pins **56** from the FIG. 3 position to that of FIG. 4, in which the center of gravity of the guard structure is located on the forward side of pivot pins **56**, and the guard structure will remain in the position illustrated. This fact is further exemplified in FIG. 4 in that the chain member **96** is in a slack condition. For safety reasons, however, a positive connection such as chain **96** is preferred in the operation as above described.

Although only one preferred embodiment of our invention has been illustrated and described, with certain variations, this disclosure is merely for purpose of illustration and not as a limitation of the scope of the invention. It is therefore to be expressly understood that the invention is not limited to the specific embodiment shown, but may be used in various other ways, and that various modifications may be made to suit different requirements, and that other changes, substitutions, additions and omissions may be made in the construction, arrangement and manner of operation of the parts without necessarily departing from the scope of the invention as defined in the following claims.

We claim:

1. A method of manipulating overhead guard structure for industrial trucks and the like having an upright mast mounted forwardly of the truck and wherein the guard is of generally U-shaped configuration and is invertedly mounted on the truck independently of the mast for pivotal movement in a forward direction, comprising the steps of tilting the mast of the truck relative to the guard from a substantially vertical to a forwardly inclined position, conditioning the guard structure for forward pivotal movement including disconnection of a portion of the guard structure from the rear portion of the truck, and pivoting the U-shaped guard structure about a horizontal axis in a forward direction into the space formerly occupied by the mast and into abutment with the mast structure providing an unobstructed space above the rear portion of the truck to facilitate the removal therefrom of equipment therein.

2. A method of manipulating overhead guard structure for industrial trucks and the like having an upright tilttable mast mounted forwardly of the truck and wherein the guard is of generally U-shaped configuration and is invertedly mounted on the truck independently of the mast for forward pivotal movement, comprising the steps of actuating the mast to a rearwardly tilted position, conditioning the guard structure for forward pivotal movement including disconnection of a portion of the guard structure from a rear portion of the truck, thereafter temporarily connecting the U-shaped guard structure to the mast, and actuating the mast and guard structure together to a forwardly tilted position.

3. A method of manipulating overhead guard structure of industrial trucks and the like having an upright tiltable mast mounted forwardly of the truck and wherein the guard is of generally U-shaped configuration and is mounted invertedly on the truck independently of the mast for forward pivotal movement relative to the truck, comprising the steps of actuating the mast to a rearwardly tilted position, disconnecting a rear leg portion of the guard structure from a rear portion of the truck, pivoting the disconnected rear leg portion of the guard in a forward direction, thereafter temporarily connecting the U-shaped guard structure to the mast, and actuating the mast and guard together to a forwardly tilted position.

4. A method of removing equipment from the rear portion of industrial lift trucks, and the like, having an upright pivotable mast mounted forwardly of the truck and overhead guard structure pivotally mounted adjacent the forward end of the truck extending over and connected to the rear portion of the truck, comprising the steps of disconnecting the guard structure from the rear portion of the truck, actuating the rear portion of the guard structure toward the mast, actuating the mast to a rearwardly tilted position, thereafter temporarily connecting the guard structure to the mast, actuating the mast and connected guard structure together to a forwardly tilted position to provide unobstructed vertical air space above the rear portion of the truck, and utilizing equipment above the rear portion of the truck for removing

from the rear portion of the truck by way of said vertical air space component devices thereof.

5. A method as claimed in claim 4 wherein the guard is reconnected to the truck for operation therewith by the additional steps of actuating the mast rearwardly from its forwardly tilted position, disconnecting the guard structure from the mast, actuating rearwardly the rearward portion of the guard, and connecting the rearward portion of the guard to the rear portion of the truck.

6. For use with industrial lift trucks having a front portion, an upright mast located forwardly of the front portion and an operator's station located rearwardly of the front portion, an overhead guard structure mounted on the truck independently of the mast comprising generally inverted L-shaped means extending upwardly from the front portion and over the operator's station, pivot means connecting the lower ends of the inverted L-shaped means to said front portion, and stop means limiting pivotal movement of the inverted L-shaped means rearwardly about said pivot means, said overhead guard structure being pivotable in a forward direction about said pivot means a distance toward said mast structure sufficient to move the rearwardly extending elevated portion of said guard structure forwardly of the operator's station to provide an unobstructed vertical space above the rear portion of the truck.

7. An overhead guard as claimed in claim 6 wherein said mast structure is pivotable forwardly and rearwardly of a vertical position, means for securing the overhead guard to said mast structure with said mast structure located in a rearwardly pivoted position, said guard being actuated forwardly about said pivot means with forward pivotal movement of the mast structure from said rearwardly tilted position.

8. An overhead guard as claimed in claim 6 including support means detachably connected to the rear portion of the truck and pivotally connected to the rear portion of said inverted L-shaped means, said latter pivotal connection being so constructed as to provide a friction mounting of said support means for retaining said support means in any selected pivoted relation to said inverted L-shaped means.

9. An overhead guard as claimed in claim 6 including support means detachably connected to the rear portion of the truck and connected to the rear end portions of said inverted L-shaped means, said latter connection including pairs of registrable spaced openings in adjacent end portions of said L-shaped means and said support means, pivot means connecting one pair of registrable openings and detachable pin means connecting the other pair thereof, said pin means and pivot means being interchangeable as between said pairs of openings for providing variable pivoting movement of said support means in relation to the L-shaped means when said pin means is detached and when said support means is detached from the rear portion of the truck.

10. For use with industrial lift trucks having a front portion, a rear portion, an upright mast structure located forwardly of the front portion and an operator's station located between said portions, an overhead guard mounted on the truck independently of the mast comprising generally inverted L-shaped means extending upwardly from the front portion and over the operator's station, pivot means connecting the guard to said front portion, support means detachably connected to said rear portion and pivotally connected to the overhead portion of said guard, detachable means and pivot means both connecting said support means to said overhead portion of said guard, said overhead guard being pivotable in a forward direction about said forwardly located pivot means when said support means are disconnected from said rear portion, and means limiting the rearward pivotal movement of said overhead guard about said forwardly located pivot means when said support means is detached from said rear portion.

11. An overhead guard as claimed in claim 10 wherein said support means are pivotable forwardly independently of the inverted L-shaped means when disconnected from said rear portion and disconnected in part from said overhead portion of the guard for pivotal movement with respect thereto, said overhead guard, including said support means, being pivotable forwardly to a location which provides an unobstructed vertical space above the rear portion of the truck for facilitating the removal of equipment therefrom.

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