United States Patent

Weisker

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[54] OVERHEAD GUARD

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[73] Assignee: C & M Manufacturing Company, Inc., Bethesda, Md.

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[51] Int. Cl. E04g 1/26

[58] Field of Search 182/112, 129, 141, 148, 103, 182/102; 187/9, 10, 11

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[57] ABSTRACT

An operator's platform which moves up and down with a carriage on a stacker mast has an overhead guard which is hinged for lowering so that the operator's platform and carriage may be moved close to the roof of a warehouse. The operator moves the guard over to a position where it rests upon the mast. Upward movement of the carriage lowers the guard, and downward movement of the carriage raises the guard to an intermediate position. The operator returns the guard to the protective position. Switches prevent upward movement of the carriage beyond a predetermined mast position when the guard is up and prevent downward movement of the carriage below a predetermined mast position when the guard is inoperative.

13 Claims, 5 Drawing Figures

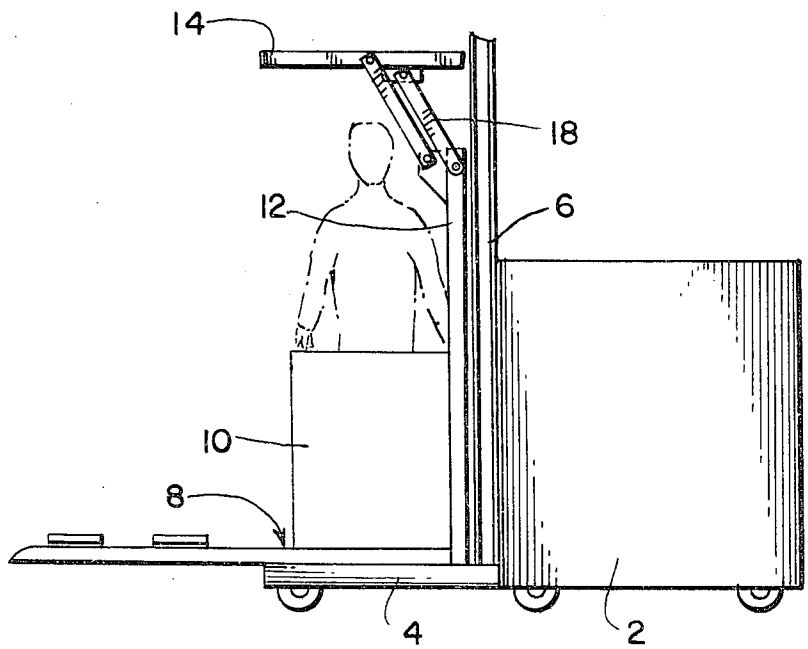


FIG. 1A

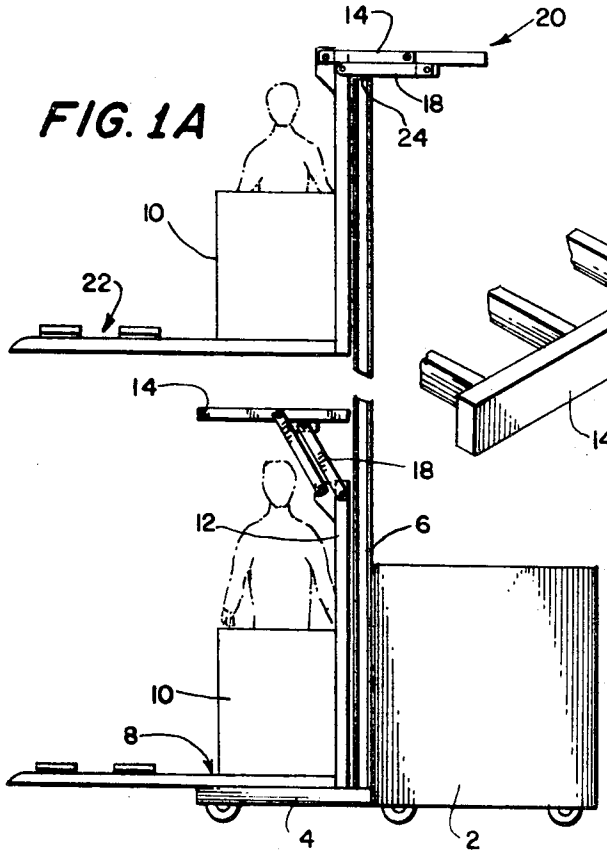


FIG. 1

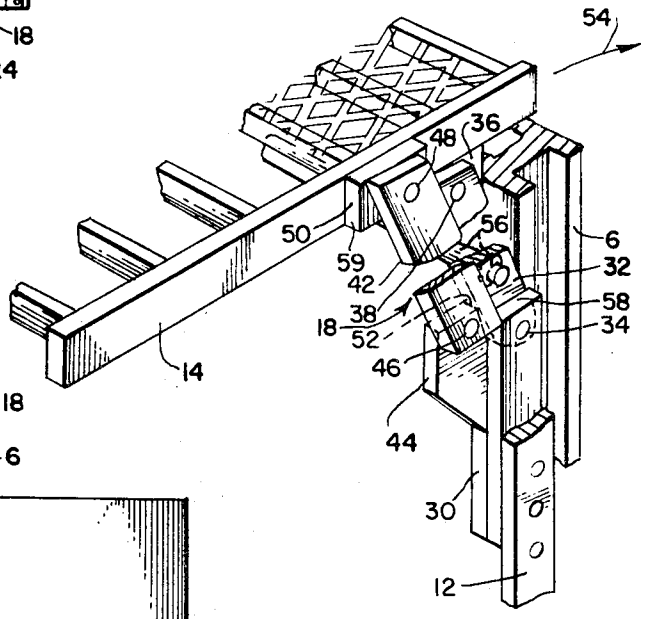


FIG. 2

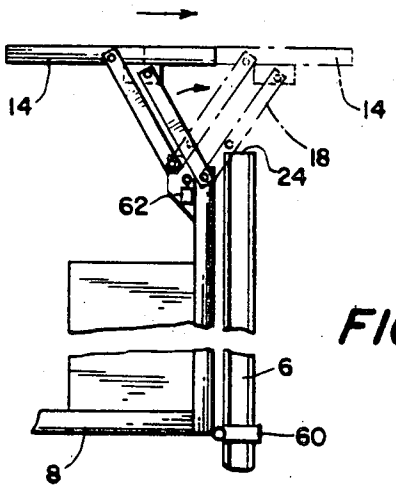


FIG 3

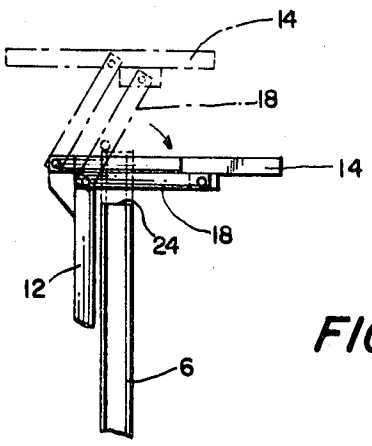


FIG. 4

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OVERHEAD GUARD

BACKGROUND OF THE INVENTION

A principal hazard of warehousing systems is that stored items may fall upon an equipment operator. Material-handling equipment such as stacker cranes and trucks provide protection against accidents with overhead guards which are positioned above operator's cab. Safety codes and plant-operating regulations usually require such overhead guards.

In storage systems where an operator rides on an operator's platform which moves up and down a mast, it is usually desirable for an operator to be able to stand to perform some desired functions, such as picking orders from bins stored within a rack. When a guard is provided over an operator's platform with sufficient room for the operator to stand, the guard often prevents movement of the platform near overhead structures of a warehouse building. When the operator's platform and carriage are rigidly interconnected, such prevention of upward movement results in an economic loss of warehousing space which is available for storage. If an overhead guard or operator's cab is designed to be so short as to accommodate only a sitting man, more of the available warehouse space can be used for storage since loads can be lifted and stored higher. However, a sitting operator is unable to pick orders from stored containers, and he is unable to stand, which is necessary to conveniently guide and maneuver the material-handling vehicle from aisle to aisle or in other areas throughout the warehouse.

The problem has been overcome in some stacker cranes in a very costly manner. An operator's cab or platform is provided on such stacker cranes that can be moved up and down independently of the load carriage. Thus, when a pallet on the carriage is raised to its maximum elevation, the operator's platform may be lowered with respect to the carriage so that the operator is below his normal position. While the operation of such devices may be satisfactory, their construction is economically unsatisfactory. The cost of the extra guiding and raising and lowering equipment for the operator's platform makes the known solution much more expensive than conventional devices. The added weight of the equipment reduces the payload capability of the stacker.

SUMMARY OF THE INVENTION

The present invention accomplishes the use of upper warehouse spaces by providing a guard which falls down and out of the way of overhead structure when an operator's platform has been elevated to such a position that there is no further danger of stored goods falling on the platform. In a preferred embodiment of the invention, the movable overhead guard is employed in conjunction with a safety seat switch so that an operator must be seated when the overhead guard is down, to avoid the possibility of the operator contacting any overhead structure. A suitable safety seat arrangement for use with the present invention is described in copending patent application filed by Alexander Weisker for "Material Handling Truck Apparatus."

The broad objectives of the invention are accomplished by providing an overhead guard which is movable from an operative protective position over an operator's platform to a lowered protectively inoperative position along the platform. The apparatus has particular use with stackers which have an operator's platform mounted on a carriage which is movable along a vertical mast. The mast may be mounted on a material-handling truck or may be suspended on or between rails in a warehouse aisle between storage racks.

In a preferred form of the invention, the lowering and raising of the overhead guard is accomplished by harnessing the relative movement of the carriage and mast. Such a form of movement may be accomplished, for example, by mounting a gear-toothed rack near an upper extremity of the mast and connecting a driving gear with the overhead guard so that the guard is automatically moved from an operative position to an inoperative position as the gear is dragged across the toothed

rack by the carriage. In a preferred embodiment of the invention, the mast has a horizontal surface and the guard has a laterally extending surface which rests upon the mast surface when an operator moves the guard from the operative protective position to an intermediate position in which gravity causes the guard's weight to be borne by the mast surface. Upon continued upward movement of the carriage on the mast, the guard continues to rest upon the mast surface and lowers with respect to the carriage and operator's platform until it reaches its stored position. The carriage may continue upward with the guard becoming disengaged from the mast surface. As the carriage moves downward, the mast surface encounters the guard, and further downward movement of the carriage causes the raising of the guard with respect to the operator's platform. When the guard has reached the intermediate position in which it is raised to nearly its full upward extension yet is resting on the mast surface, an operator moves the guard to its operative position. Alternatively, the mast surface may cooperate with the guard to a point where it has pushed the guard so far that gravity carries the guard further to its operating protective position.

In a preferred form of the invention, safety interlock switches of a well-known commercially available type which are commonly used in material-handling devices are provided to permit maximum upward extension of the carriage only when the guard is lowered and to prevent lowering the carriage below a predetermined point only when the guard occupies a protective position.

One objective of the invention is the provision of an overhead guard for a materials-handling vehicle which is movable between an upward operative position and a lowered inoperative position.

Another objective of the invention is the provision of a movable overhead guard for a carriage-mounted operator's platform which moves along a vertical mast, in which the guard is moved by interaction of the mast and guard.

The invention has as a further object the provision of a materials-handling stacker vehicle having a vertically movable operator's platform with an overhead guard which is swingable in a parallel movement manner from a horizontal operative position above the platform to a horizontal inoperative position behind the platform, with initial shifting controlled by an operator and subsequent shifting effected automatically through the movement between the platform and the mast.

The foregoing and other objects of the invention will be apparent from the description which is included in the foregoing and continuing specification and claims and in the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic representation of a materials-handling truck having a carriage-mounted operator's platform with an overhead guard in an operative position.

FIG. 1A shows the carriage in the upper position; an operator is seated, and the guard is lowered to an inoperative position.

FIG. 2 is a perspective detail of the overhead guard.

FIG. 3 is a detail of the movement of the guard from an operative position to an intermediate position.

FIG. 4 is a detail of the lowering of the guard to an inoperative stored position.

DETAILED DESCRIPTION OF THE DRAWINGS

Referring to FIG. 1 a materials-handling truck has a body 2 having a power unit. Outrigger 4 and body 2 comprise a mount for a vertical mast 6 on which carriage 8 may be vertically driven. Operator's platform 10 is mounted on the carriage, and controls for operation of the truck and carriage are positioned in a conventional manner within the operator's platform. Vertical supports 12 are positioned at each side of the truck, and an overhead guard 14 with conventional rigid protective grill work is positioned above the operator's platform 10 to protect an operator from any materials which may fall

from the storage rack near which the truck moves. Hinges 18 connect guard 14 to supports 12.

In the upper position 22 of the carriage 8 and platform 10 as shown in FIG. 1A guard 14 is lowered to its inoperative position which is generally indicated by the numeral 20. Preferably, the operator is seated when the guard has been lowered so that the carriage may be moved near fixed overhead members such as roof trusses in a warehouse. As shown in upper position 22 of the carriage, upright supports 12 on operator's platform 10 extend above an upper surface 24 of mast 6. Guard 14 has been rotated to its inoperative position wherein hinge members 18 are substantially horizontal.

As shown in the perspective detail of FIG. 2 vertical support 12 has a guard fixture 30 secured to a side thereof. Hinge means generally indicated by the numeral 18 comprise a first hinge member 32 which is connected at a first lower end to a fixture 30 by pin 34. An upper end of first hinge member 32 is connected to a downward extension 36 of guard 14 by a pin 38. Hinge member 32 is permitted to rotate on both pins 34 and 38.

Second hinge member 42 is connected to a forward extension 44 on element 30 by pin 46. Pin 48 connects the upper end of second hinge bar 42 to limit block 50 which is secured to the side of guard 14. The rear face 52 of block 44 acts as a limit to prevent forward motion of hinge bar 32 beyond the shown position which corresponds with the operative protective position of guard 14.

Hinge bars 32 and 42 are arranged parallel to each other, and the distance between pins 34 and 38 is similar to the distance between pins 46 and 48. Consequently, when the guard 14 is moved toward an inoperative position by moving the guard in the direction shown by arrow 54, hinge bars 32 and 42 remain parallel, and guard 14 remains parallel to its original orientation.

Lowering of guard 14 is accomplished with the initial step of rocking guard 14 rearward in the direction of arrow 54. Roller 56, which extends horizontally between the first hinge bars 32 on opposite sides of the guard, comes to rest on the upper surfaces 24 of mast beams 6. The center of gravity of guard 14 is then slightly rearward in the direction of arrow 54 from the position of the roller 56 on mast surface 24. Further upward movement of the carriage, platform and supports 12 permits further rearward and downward movement of the guard 14 with respect to supports 12 while the roller 56 supports the weight of guard 14 on mast top 24. When the hinge bars 32 and 42 become substantially horizontal, bar 42 abuts surface 58 on mounting element 30, and bar 32 abuts the lower surface 59 of limit block 50. In that configuration, guard 14 has reached its stored inoperative position in a full reward extension, and no further lowering movement of the guard with respect support 12 is permitted. The carriage may still carry the support 12 upward, lifting roller 56 from surface 24 of the mast.

As the carriage descends, roller 56 engages surface 24 and further lowering of the carriage causes the upward movement of the roller and the upward and forward movement of guard 14 and hinges 32 and 42. When the carriage has reached the previous position which corresponds to the intermediate position of the guard 14 with the center of gravity just rearward of roller 56 on mast 24, carriage is stopped, and the operator rocks guard 14 forward to its operative position wherein hinge bar 32 abuts surface 52 of limit block 44.

The operative intermediate and stored positions of guard 14 are schematically shown in FIGS. 3 and 4. As shown in FIG. 3, when carriage 8 reaches a predetermined position on mast 6, switch 60 is tripped, cutting off the power supply which prevents movement of the carriage. Moving guard 14 rearward trips switch 62 which reconnects the power supply so that the carriage 8 may be moved upward along mast 6 to its predetermined upward limit. When switch 60 is tripped again on the lower of carriage 8, the power supply is interrupted until switch 62 is again tripped by moving guard 14 to the operative position. Wiring of the switches is accomplished in a conventional manner in which two switches are connected to one power circuit so that the changing of the position of either switch causes the changing of the state of completion of the power circuit.

The intermediate position of guard 14 and hinges 18 is shown in phantom lines in FIG. 3 and FIG. 4. The solid lines in FIG. 4 show guard 14 in the stored or protectively inoperative position in which hinge means 18 are generally horizontal. The overhead guard of the present application is firmly locked in position against downward movement by falling objects. The guard is readily rocked over the center so that its weight causes it to move into its folded position under the smooth control of the mast top. When the mast top raises the guard upon lowering of the carriage, little effort is required to shift the center of weight of the guard so that it automatically moves into the operative position over the operator's platform.

While the invention has been particularly shown and described with reference to a preferred embodiment thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the spirit and scope of the invention.

What is claimed is:

1. Overhead guard apparatus for liftable operator's platform on a materials-handling equipment comprising a mounting means for horizontal movement, mast means connected to the mounting means and extending generally vertically therefrom, carriage means mounted on the mast means for moving vertically therealong, the carriage means including an operator's platform, vertical support means positioned on the carriage means adjacent operator's platform and extending upward therefrom, guard means hingedly connected to the vertical support means for swinging movement between an operative protective position above the support means and over the operator's platform and an inoperative position along the operator's platform and at a side of the support means.

2. Overhead guard apparatus for a liftable operator's platform on a materials-handling equipment comprising a mounting means for horizontal movement adjacent a storage rack, mast means connected to the mounting means and extending generally vertically therefrom, carriage means mounted on the mast means for moving vertically therealong, the carriage means including an operator's platform, vertical support means positioned on the carriage means adjacent operator's platform and extending upward therefrom, guard means hingedly connected to the vertical support means for movement between an operative protective position above the operator's platform and an inoperative position along the operator's platform, and laterally extending means for engaging a surface of the mast means when the guard means is moved between operative and inoperative positions.

3. The apparatus of claim 2 wherein the laterally extending means remains in contact with the mast means as the carriage means and operator's platform are moved upward along the mast means while the guard means is protectively inoperative.

4. Overhead guard apparatus for a liftable operator's platform on a materials-handling equipment comprising a mounting means for horizontal movement adjacent a storage rack, mast means connected to the mounting means and extending generally vertically therefrom, carriage means mounted on the mast means for moving vertically therealong, the carriage means including an operator's platform, vertical support means positioned on the carriage means adjacent operator's platform and extending upward therefrom, guard means hingedly connected to the vertical support means for movement between an operative protective position above the operator's platform and an inoperative position along the operator's platform, and limit means connected between the vertical support means and the guard means for limiting downward movement of the guard means on the support means to a horizontal operative protective position and for limiting movement of the guard means about the support means to a horizontal protectively inoperative position which is displaced from the operative position.

5. The apparatus of claim 4 further comprising surface means on the guard means for engaging a surface of the mast means when the guard means is moved to an intermediate position toward an inoperative position and for remaining in contact with the mast means until the guard means is in the full inoperative position permitted by the limit means.

6. Overhead guard apparatus for a liftable operator's platform on a materials-handling equipment comprising a mounting means for horizontal movement adjacent a storage rack, mast means connected to the mounting means and extending generally vertically therefrom, carriage means mounted on the mast means for moving vertically therealong, the carriage means including an operator's platform, vertical support means positioned on the carriage means adjacent operator's platform and extending upward therefrom, guard means hingedly connected to the vertical support means for movement between an operative protective position above the operator's platform and an inoperative position along the operator's platform, and hinge means having first ends rotatably connected to the upright support means and having second ends rotatably connected to the guard means, and having a surface means intermediate the first and second ends for resting on a surface of the mast means when the guard means is moved between operative and inoperative positions.

7. The apparatus of claim 6 wherein the hinge means comprises first and second hinge bars connected at the first ends thereof to the upright support means and connected at second ends thereof to the guard means, and wherein the first and second hinge bars have substantially equal lengths between connection points, whereby movement of the guard means is constrained for maintaining the guard means parallel to its operative position.

8. The apparatus of claim 7 further comprising first limit means connected to the upright support means for engaging the first hinge bar and preventing movement past a position of the first hinge bar which corresponds with the operative position of the guard means, and second limit means connected to the guard means for contacting the first hinge bar and preventing movement of the first hinge bar beyond a position which corresponds with the inoperative position of the guard means.

9. Overhead guard apparatus for a liftable operator's platform on a materials-handling equipment comprising a mounting means for horizontal movement adjacent a storage rack, mast means connected to the mounting means and extending generally vertically therefrom, carriage means mounted on the mast means for moving vertically therealong, the carriage means including an operator's platform, vertical support means positioned on the carriage means adjacent operator's platform and extending upward therefrom, guard means hingedly connected to the vertical support means for movement between an operative protective position above the operator's platform and an inoperative position along the operator's platform, and motive power means connected to the mounting means, to the mast means, and to the carriage means for moving the carriage means vertically along the mast means, first switch means connected between the carriage means and an upper portion of the mast means for actuation when the carriage means reaches a predetermined height on the mast means, and second switch means connected between the guard means and the vertical support means for actuation when the guard means is moved into and out of operative position, the first and second switch means being connected to the power means, whereby actuation of the first switch means during upward movement of the carriage interrupts the power means, and wherein actuation of the second switch means by moving the guard toward an inoperative position completes the power means, and whereby actuation of the first switch means by downward movement of the carriage means interrupts the power means, and actuation of the second switch means by moving the guard into an operative position completes the power means.

10. Overhead guard apparatus for liftable operator's platform on a materials-handling equipment comprising a mounting means for horizontal movement adjacent a storage rack, mast means connected to the mounting means and extending generally vertically therefrom, carriage means mounted on the mast means for moving vertically therealong, the carriage means including an operator's platform, vertical support means positioned on the carriage means adjacent operator's platform and extending upward therefrom, guard means hingedly connected to the vertical support means for movement between an operative protective position above the operator's platform and an inoperative position along the operator's platform, wherein the mast is mounted on a truck body, and wherein the mast means has an upper surface which receives a horizontally extending surface on the guard means for supporting the guard means in movement between a position slightly displaced from the operative position to the inoperative position.

11. Overhead guard apparatus for a liftable operator's platform on a materials-handling equipment comprising a mounting means for horizontal movement adjacent a storage rack, mast means connected to the mounting means and extending generally vertically therefrom, carriage means mounted on the mast means for moving vertically therealong, the carriage means including an operator's platform, vertical support means positioned on the carriage means adjacent operator's platform and extending upward therefrom, guard means hingedly connected to the vertical support means for movement between an operative protective position above the operator's platform and an inoperative position along the operator's platform, wherein the mounting means further comprises a truck body connected to a lower end of the mast means, and wherein the mast means comprises first and second parallel vertical beams, wherein the vertical support means comprise spaced parallel vertical supports and wherein the apparatus further comprises first parallel hinge bars having first ends connected to upper ends of the vertical supports and having second ends connected to the guard means, first stops mounted forward on the vertical supports adjacent the first hinge bars for preventing forward motion of the first hinge bars beyond positions which correspond with an operative position of the guard means, second stops mounted laterally on the guard means near and slightly forward of the first hinge bars for preventing motion of the first hinge bars beyond positions which correspond with the inoperative position of the guard means, and second hinge bars connected to the first and second stops parallel to the first hinge bars, the first and second hinge bars having substantially equal distances between connection points, whereby the hinge bars maintain parallel relation throughout movement, and whereby the guard means remains generally horizontal throughout movement, and further comprising a horizontal roller means interconnecting the first hinge bars near the vertical supports for engaging upper surfaces of the mast beams when the guard means is initially moved toward an inoperative position, whereby the roller rests on the upper surfaces, and whereby continued upward movement of the carriage means permits relative downward movement of the roller means, thus permitting further movement of the guard means toward the inoperative position, whereby the roller means is positioned above the mast means in the inoperative position of the guard means, and whereby downward movement of the carriage means with the guard means in the inoperative position causes the contact of roller means with the upper surfaces of the mast beams, and continued downward movement of the carriage means causes the movement of the roller means upward with respect to the vertical supports which causes movement of the guard means toward the operative position.

12. The method of operating a stacker having a vertically movable carriage and an operator's platform mounted thereon, comprising moving the carriage upward along a vertical mast stopping the carriage, moving an overhead guard from an upward operative protective position to a lowered protectively inoperative position, and continuing upward movement of the carriage, lowering the carriage, stopping the carriage, raising the guard to an upward operative position and continuing lowering of the carriage.

13. The method of claim 12 wherein the moving step comprises moving the guard from the operative position to an intermediate position and leaning the guard on a portion of the mast, whereby the continuing upward movement of the carriage with respect to the mast effects downward moving the guard with respect to the carriage, and wherein lowering the carriage with respect to the mast effects raising the guard with respect to the carriage, and whereby stopping the carriage lowering is effected concurrently with returning of the guard to the intermediate position.

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