

June 24, 1969

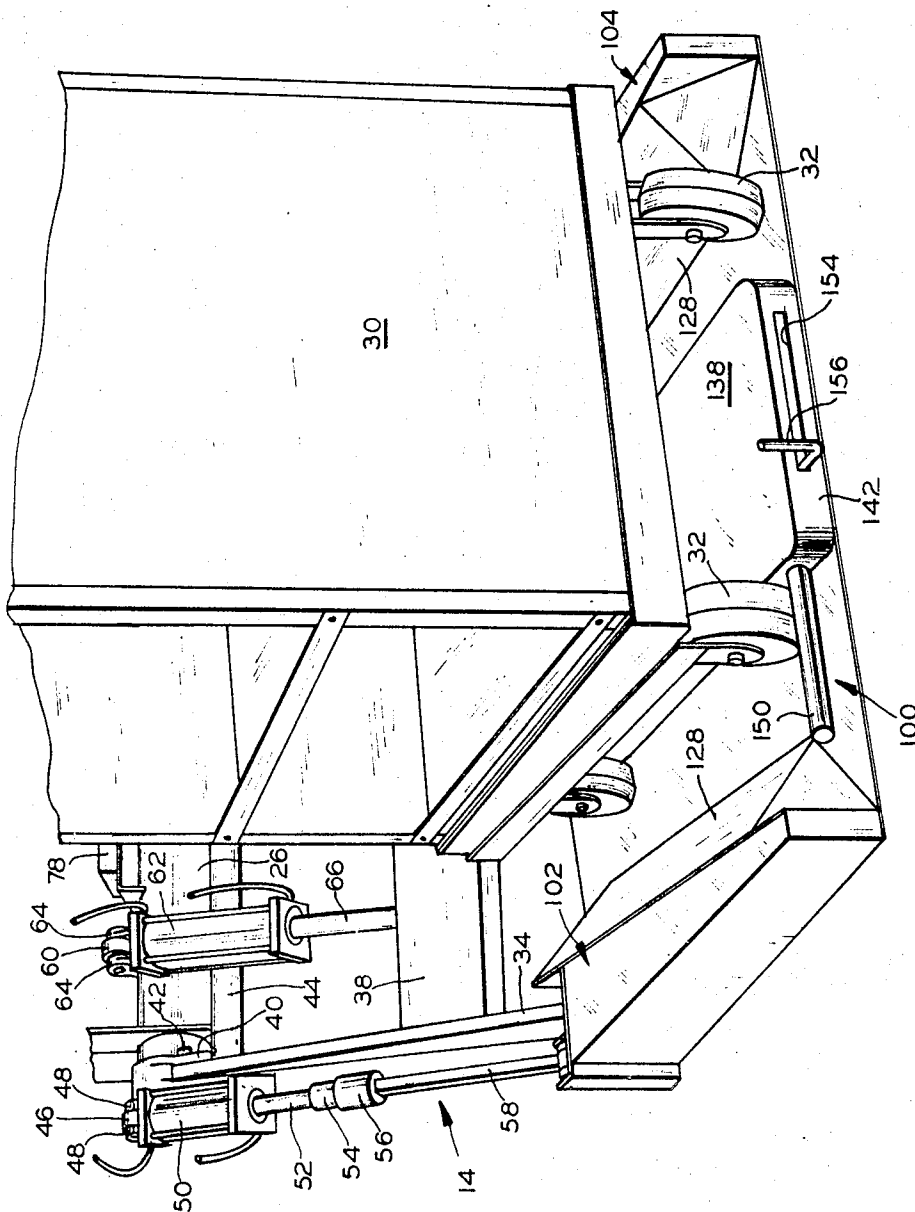
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3,451,572

LIFT TAILGATE

Filed Oct. 10, 1966

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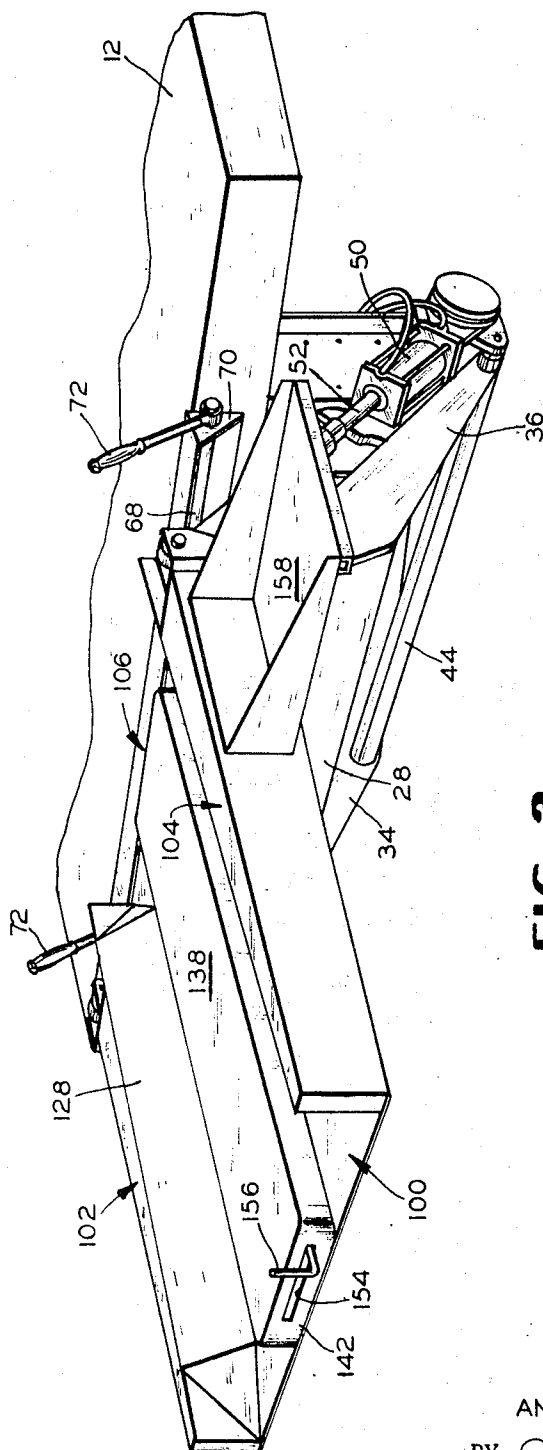
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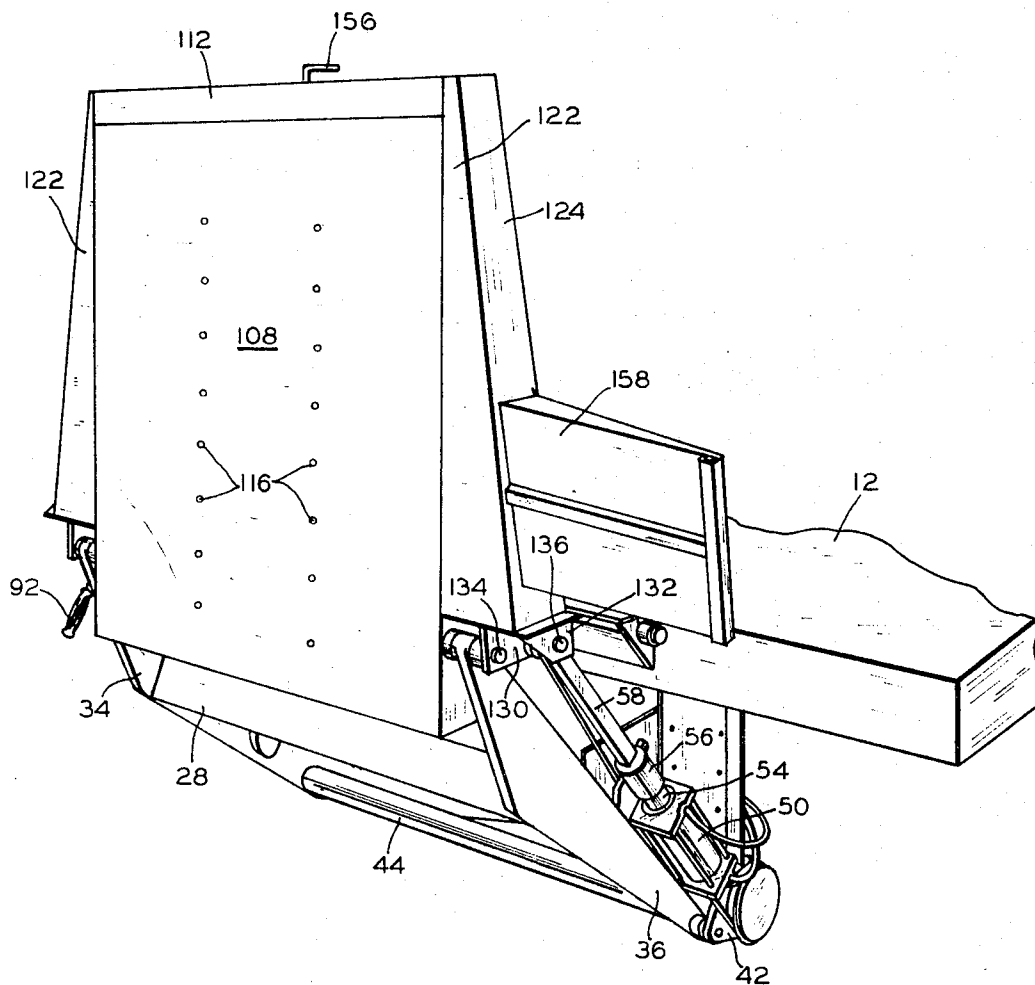


FIG. 4

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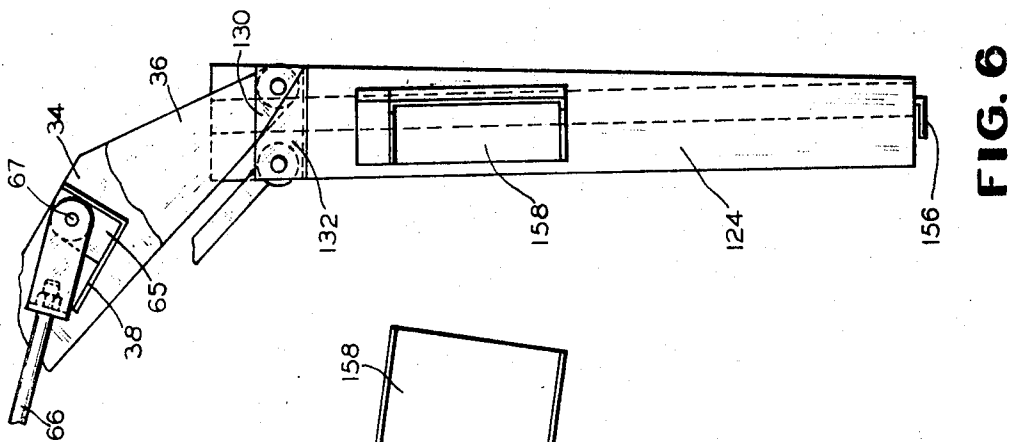


FIG. 6

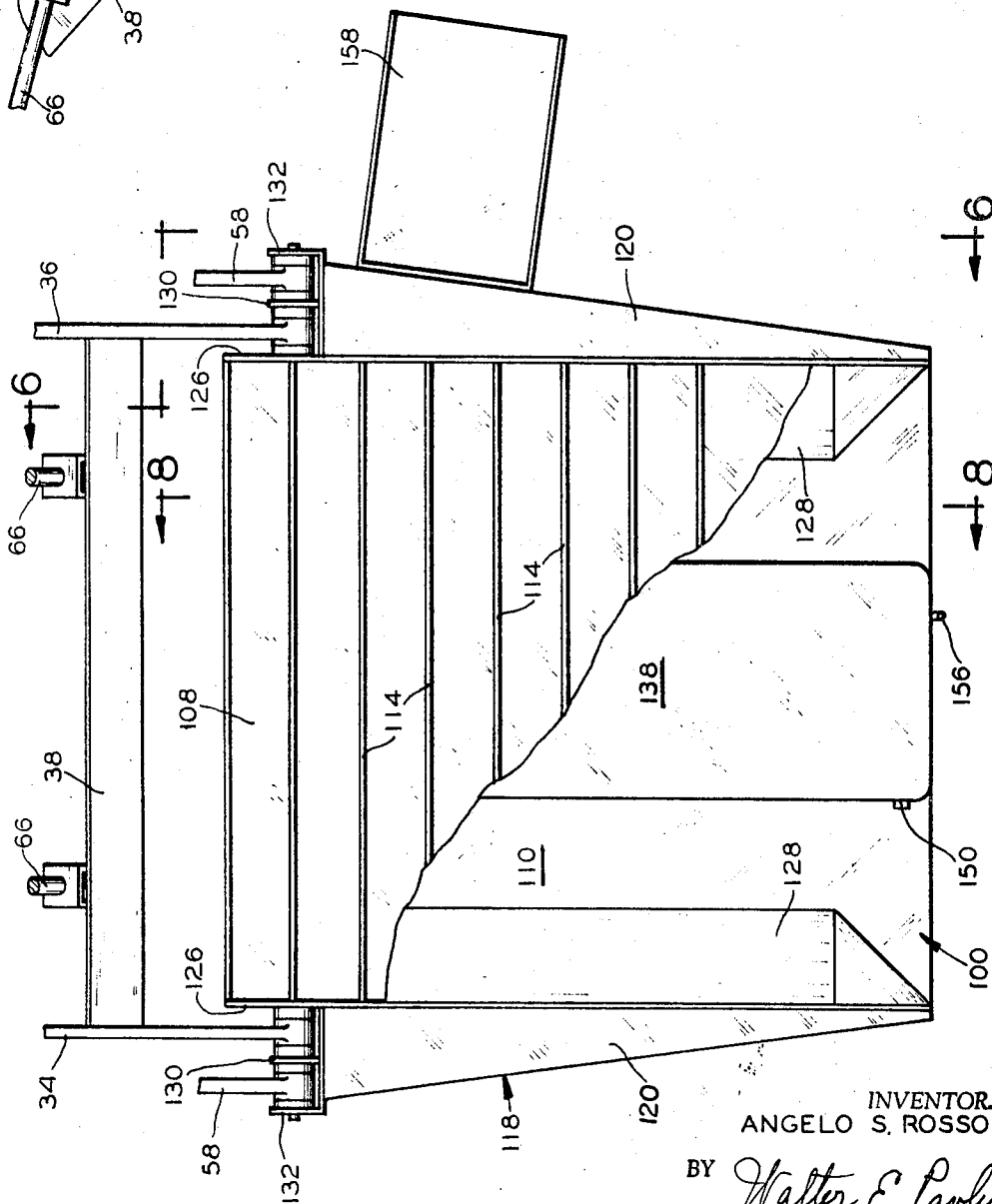


FIG. 5

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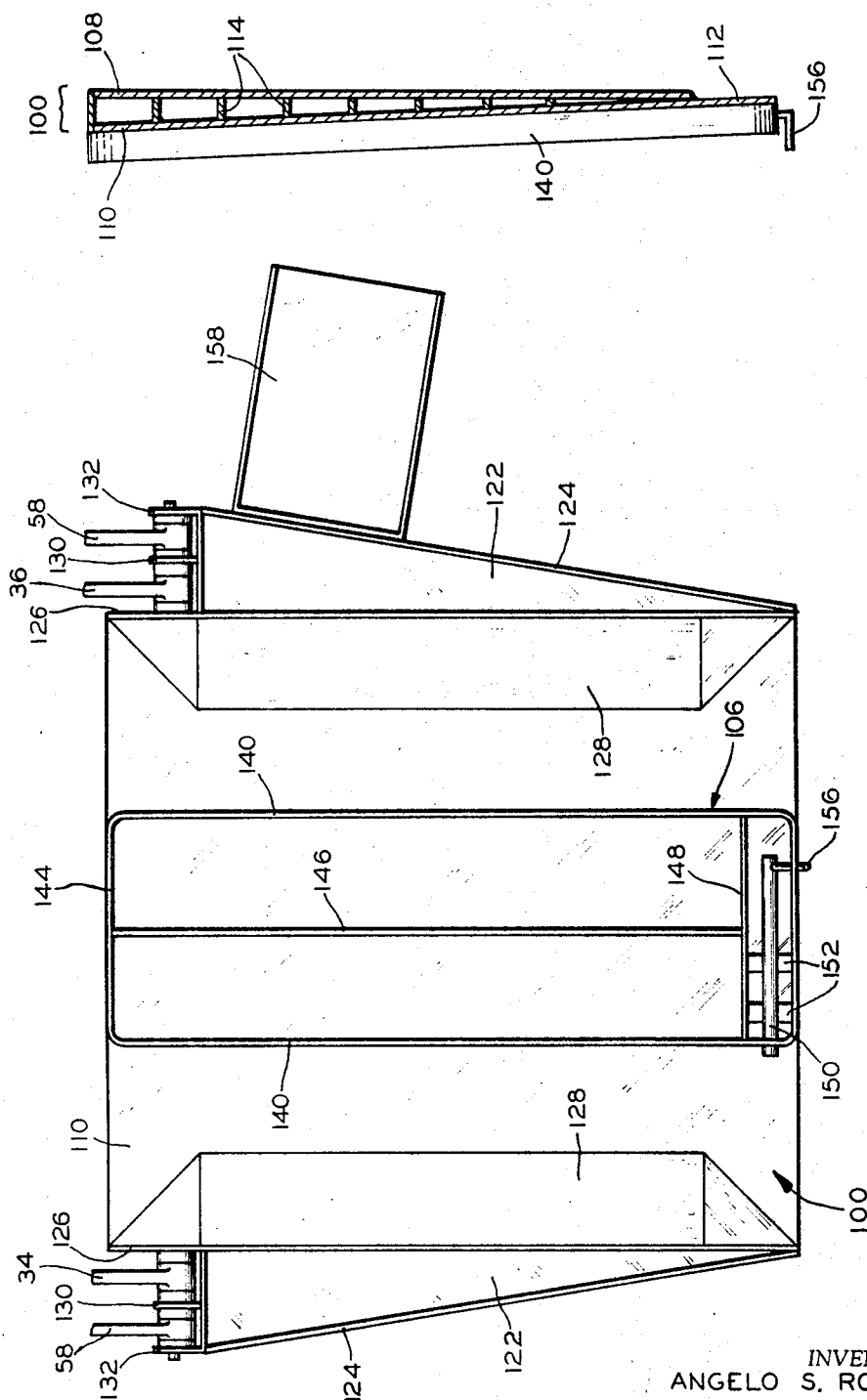


FIG. 8

FIG. 7

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3,451,572

LIFT TAILGATE

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Int. Cl. B60p 1/44, 1/48, 3/06

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15 Claims

ABSTRACT OF THE DISCLOSURE

This disclosure relates to a platform adapted to be secured to the rear of a vehicle and connected thereto by a pair of parallel arm linkage systems. The platform is adapted to be moved from a ground engaging position to a position adjacent the bed of the vehicle upon vertical arcuate movement of the parallel linkage systems. The platform itself comprises basically three sections: First, a deck having a gentle slope and, second, a pair of side supports secured along side the deck and to which the parallel linkage system is adapted to be connected. The side supports project above the deck and are secured thereto by angularly positioned reinforcing plates. The third section is a central rigid section secured on the deck to prevent sagging of the same. The central section may also house a slidable restraining bar which is moved into the path of the wheel of a truck to prevent its exit once it has been positioned on the platform.

Various load elevating devices have been provided to assist in loading vehicles. Many prior art devices for this purpose include a movable horizontal platform mounted on the vehicle, such platform being powered to carry the load from the ground or a loading deck to the level of the vehicle bed. Heavy objects are usually hand trucked onto the platform in its lowered position, lifted, and then trucked onto the vehicle bed.

Prior art devices have been of relatively thick column and sheet construction in order to withstand the repeated heavy loading to which they are subjected. Because of this heavy construction, however, these prior art devices have had a ramp angle at the entry to the platform or gate of approximately fifteen to thirty degrees. The remainder of the gate was then horizontally constructed with respect to the ground so as to maintain a wheeled truck or similar device on the platform during the lifting operation. This not only shortened the usable area of the platform but the entry slope or initial ramp angle was so steep that it was often impossible for a single individual to push the truck onto the platform when heavy loads were involved.

Furthermore, even when it was possible to push the truck up the slope, due to the steepness thereof, the hauled articles would often tumble or spill from the truck.

While some platforms or gates have, through complex structures, been able to reduce the entry slope to eight to fifteen degrees these have been costly to manufacture and have not been sturdy enough to withstand repeated heavy loading. Furthermore, such prior art devices have also provided such complex linkage mechanisms and power means for effecting lifting of the platform that they have been unsatisfactory.

It is also desirable that the platform be capable of folding to a position covering the end of the vehicle bed. Not only does this provide a double use of the platform or gate, thus obviating the need for a separate closure for the vehicle bed, but the projection of the platform from the end of the vehicle creates an unnecessary and unsightly object.

It is therefore an object of this invention to provide an improved lift tailgate for a vehicle which is simple and inexpensive to manufacture and yet rugged enough to withstand repeated heavy loading.

Another object of this invention is to provide a lift gate platform which has a gradually sloping entry or ramp angle so as to facilitate easy loading of the platform, the slope of the ramp being less than six degrees and preferably less than three degrees.

Still another object of this invention is the provision of a lift gate platform having guided runways for the entry of a wheeled truck.

It is a further object of this invention to provide means on the lift gate for preventing inadvertent movement of the wheeled truck from the platform once it has been so placed.

It is still another object of this invention to provide a lift gate of the above type, which gate may be automatically held in a closed position against the vehicle bed.

In one preferred embodiment of this invention a lift tailgate for a vehicle is provided in the form of a platform which is pivotally secured to a mounting means adapted to be secured transversely of the frame of a vehicle under the rear of the bed thereof by means of two parallel linkage systems. Each parallel linkage system is pivotally secured at one end to the mounting means and at the other end to the platform so that upon pivotal movement of the linkage system by any suitable power means the platform is adapted to move from a position adjacent the ground to a position adjacent the bed of the vehicle. The platform comprises a planar sheet metal member with its upper surface sloping gently upwardly with respect to the ground so that a wheeled truck may be easily pushed onto the platform. The entry thickness of the platform is generally less than one inch, preferably less than one-quarter inch, to permit a wheeled truck to be easily pushed thereon.

Other objects and advantages will become apparent from the following description taken in connection with the accompanying drawings, in which:

FIG. 1 is a perspective view of the lift tailgate in its lowered ground engaging position particularly disclosing the linkage and power mechanism;

FIG. 2 is also a perspective view of the lift tailgate in its lowered position with a wheeled truck suitably positioned on the platform;

FIG. 3 is another perspective view with the lift tailgate being placed in a horizontal position adjacent to the vehicle bed;

FIG. 4 is a perspective view similar to FIG. 3 with the lift tailgate pivoted to a position wherein it forms a closure for the rear of the vehicle bed;

FIG. 5 is a plan view of the lift tailgate platform with a part thereof cut away to reveal the interior sandwich construction;

FIG. 6 is a side elevational view of the lift tailgate platform shown in FIG. 5;

FIG. 7 is a plan view similar to FIG. 5 with the cover portion of the lift tailgate platform center section removed to show the interior construction and the slidable wheel bar; and

FIG. 8 is a cross sectional view of the lift tailgate platform taken along lines 8—8 of FIG. 5.

Referring now to FIG. 1, a lift tailgate designated generally at 10 is movably secured under the rear of a vehicle bed 12 by a pair of parallel linkage systems 14 and 16. This invention may be used with a variety of vehicles constructed in many different ways; however, the vehicle usually comprises at least the bed 12 which is supported on longitudinal frame members 18 and 20 of the vehicle. The longitudinal frame members are suitably attached to the wheels of the vehicle (not shown).

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The longitudinal frame members also have spaced downwardly extending bracket assemblies 22 and 24 suitably secured thereto as by welds and such bracket assemblies rigidly secure a large torque tube 26 transversely of the vehicle under the rear of the bed 12. The torque tube 26 and brackets 22 and 24 serve as a means for mounting the remainder of the lift tailgate 10 to the vehicle.

The bed 12 is open at the rear so that a platform designated generally at 28 may be loaded, as for instance with the hand truck 30 having wheels 32 as shown in FIG. 2, and raised to the position adjacent the bed 12 and parallel thereto as shown in FIG. 3. From this position the truck 30 may be pushed onto the vehicle bed 12 and the lift tailgate 10 pivoted to the position shown in FIG. 4 wherein it forms a closure for the rear of the vehicle bed.

In order to mount the platform 28 for this specialized horizontal and vertical pivotal movement the pair of parallel linkage systems 14 and 16 are each mounted at one end to the torque tube 26 and at the other end to the platform. More particularly, each parallel linkage system consists of a tension arm and a compression arm. The compression arms 34 and 36 of the two systems are elongated members with the central portions thereof of greater depth than the ends. A rigid cross member 38, angular in cross section, has its ends welded to the inner surface of each of the compression arms 34 and 36 to secure the same together for unitary movement.

To secure the compression arms to the torque tube 26, a pair of ears 40 extend forwardly and downwardly from each end of the torque tube and the compression arms 34 and 36 are positioned between the ears. A removable pin 42 extends through suitable openings in each set of ears 40 and its respective compression arm 34 or 36 to secure the compression arms to the torque tube while permitting pivotal movement thereof. Another rigid member, cross bar 44, extends between the inner ends of the compression arms 34 and 36 and is also welded to the inner surface thereof to further strengthen the compression arm structure and make it an integral unit.

Spaced slightly outwardly on each end of the torque tube 26 from the ears 40 is a lug 46 (FIGURE 2). The lugs 46 extend forwardly and upwardly and are received between a pair of ears 48 projecting from the inner end of a pair of multiple position power cylinders 50. A pin extends through suitable apertures in each pair of ears 48 and their respective lug 46 to provide a pivotal connection between the torque tube 26 and the two power cylinders 50. The two power cylinders 50 are conventional in nature and comprise basically a cylinder housing which accommodates the movement of a piston, having a piston rod 52, which movement depends upon which side of the piston is subjected to pressure fluid.

The piston rods 52 have external threads on the outer end thereof which are adapted to cooperate with internal threads on a pair of cylinders 54 and 56. The cylinders 56 are larger in diameter and length than the cylinders 54 and are secured to an elongated square member 58. Together, the square members 58 and the power cylinders 50 form the tension arms of the parallel linkage systems 14 and 16 and through rotation of the piston rods 52 adjustment of the overall length of the tension arms may be effected by telescoping the externally threaded piston rods 52 within the internally threaded cylinders 56. The cylinders 54 may also be rotated through their threaded connection with piston rods 52 to adjust the position of the cylinders 54. This adjustment of the cylinders 54 determines the stroke of the power cylinders 50 through engagement of the cylinders 54 with the power cylinders and, accordingly, the vertical position of the platform when it is pivoted to form a closure for the vehicle bed may be adjusted.

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To effect lifting of the platform from its ground engaging position to vehicle bed height, two additional upwardly extending lugs 60 are provided on the torque tube 26. The lugs 60 are each positioned inwardly on the torque tube 26 with respect to the bracket assemblies 22 and 24 but are spaced with respect to each other. A pair of multiple position power cylinders 62, similar to power cylinders 50 except that the former are slightly larger, are provided on one end with ears 64 between which are received the lugs 60. A pin extends through each set of ears 64 and their respective lug 60 to pivotally mount the power cylinder 62 with respect to the torque tube 26. Piston rods 66 connected to pistons reciprocal within the power cylinders 62 have their outer ends pivotally secured to the cross member 38 connecting the compression arms 34 and 36. To this end, a pair of plates 65 (FIGURE 6) are welded to the under section of the angular member 38 at spaced apart positions. The outer ends of piston rods 66 are enlarged and each receives a pin 67 which extends through a suitable aperture therein as well as an aperture in the plates 65.

Accordingly, when it is desired to raise the platform 28 from its ground engaging position to vehicle bed height, a control bar 68 which is mounted for rotation in a bracket 70 secured to the rear of the vehicle bed 12 is rotated by manually moving one of the actuating levers 72 extending upwardly from each side of the control bar 68. Rotation of the control bar causes a link 74 secured thereto to pivot resulting in longitudinal movement of a second link 76 which actuates a suitable valve encompassed within valve body 78. This movement of the valve evacuates power fluid from the inner end of power cylinders 62 and supplies power fluid to the outer end thereof through appropriate hoses 80. Thus, the piston rods 66 become telescoped within power cylinders 62 and effect lifting of the platform 28. The platform is therefore raised while maintaining a substantially horizontal position due to the parallel linkage systems 14 and 16 in a manner well known in the art until the platform 28 reaches bed height at which time inwardly extending locking members 82 on the internal surface of the compression arms 34 and 36 engage spring biased hooklike lock members 84. When it is desired to lower the platform 28 to the ground, again the actuating levers 72 are pivoted which effects movement of linkage mechanisms 86 to first release the locking members 82 and 84 while simultaneously causing actuation of the power cylinders through links 74 and 76.

Once the platform 28 has reached its horizontal position at vehicle bed height (as shown in FIG. 3) and has been locked in such position, if it is desired to pivot the platform 28 vertically to close the end of the vehicle bed 12, a second control bar 88 pivotally suspended underneath the rear of the vehicle bed by spaced brackets 90 is rotated by manually pivoting an actuating lever 92 provided on the outer end thereof. This rotation of the control bar 88 actuates linkage 94 to move a control valve within valve housing 96 to effect evacuation of power fluid from the inner end of power cylinders 50 and to supply power fluid to the opposite side of the piston causing telescoping of the pistons rods 52 within the power cylinders 50 both through appropriate hoses 98. Thus, the tension arms of the parallel linkage systems 14 and 16 become shorter and the platform 28 is pivoted vertically about its connection with the compression arms 34 and 36 to the position shown in FIG. 4. To pivot the platform 28 back to its original position, the control bar 88 is merely rotated in the opposite direction.

The platform 28 has been uniquely constructed to facilitate loading thereof while being of sufficient strength to withstand repeated heavy loadings. The platform comprises basically four main sections. These are a deck section 100, a pair of side supporting columns 102 and 104

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connected to the sides of the deck section 100 and a rigid center section 106 which is disposed on and connected to the upper surface of the deck section 100.

More particularly, the deck or deck section 100 comprises two planar members 108 and 110 of sheet construction. The planar member 110 is slightly longer than the planar member 108 and is disposed on top of the same. The two are connected together along the forward edge of planar member 108 by an appropriate weld and thus the forward edge 112 of planar member 110 extends beyond planar member 108. Disposed transversely between the planar members 108 and 110 are a plurality of elongated ribs 114. In the construction shown (see FIGS. 5 and 8) there are seven ribs with the ribs disposed toward the forward end of the planar members being smaller in depth. The ribs 114 progressively increase in depth as you move rearwardly. The ribs are welded to both planar members 108 and 110 and due to the progressively increasing depth of the ribs, the planar member 110 is disposed at an angle of approximately two degrees with respect to the planar member 108 which is adapted to be seated upon the ground when the platform is in its lowered position. It is readily apparent that a deck construction may be provided with a different number of ribs without departing from the scope of this invention. In the particular embodiment shown the deck section is constructed by welding the ribs 114 to the planar member 110 and then inverting the composite structure and placing the planar member 108 which is provided with a plurality of spaced holes upon the composite structure. The spaced holes are aligned with ribs 114 and the two are connected through appropriate plug welds as indicated at 116 in FIG. 4. While this invention will encompass many different ways of providing a composite deck section, the foregoing method has been found to be particularly desirable.

The side supporting columns 102 and 104 are similar in construction and comprise formed members of progressively increasing channel section construction. Thus the columns 102 and 104 are positioned with their open portion extending inwardly and consist of triangular shaped top and bottom legs 120 and 122 integrally connected to a side web 124. A pair of rectangular plates 126, which are slightly greater in length than the columns 102 and 104 are positioned in upright fashion and welded to the top and bottom legs 120 and 122 to complete the side supporting columns 102 and 104. The inner surface of each of the upstanding rectangular plates 126 (FIGURE 7) is welded to the side edges of the planar members 108 and 110 of the deck section to form an integral unit therewith.

Means are provided on the rear face of the columns 102 and 104 to accommodate attachment of the outer ends of the parallel linkage systems 14 and 16 to the platform 28. More particularly, as most clearly shown in FIGS. 4, 6, 7 and 8, a pair of mounting plates 130 and 132 are secured to the back face of each of the formed columns 102 and 104. Each mounting plate 130 is rectangular in shape and has an aperture adjacent the lower end thereof which receives a pivot pin 134 extending through an aperture boss on the outer end of its respective compression arm 34 or 36 and an aligned aperture in the portion of rectangular plate 126 which extends beyond the columns 102 and 104. Each mounting plate 132 extends outwardly parallel to its respective mounting plate 130 but is angularly truncated and has an aperture positioned adjacent its upper end. A pivot pin 136 extends through the aperture in each mounting plate 132 and an aperture in the outer end of each tension arm member 58 and into a suitable aperture provided in the upper portion of the appropriate mounting late 139 to pivotally mount each tension arm to the platform but at a position disposed vertically above the pivotal mounting of the compression arm when the deck section 100 is substantially horizontal.

The deck section and side supporting column structure (and the pivotal parallel linkage mounting) thus far described, while of greater strength than prior art constructions, could still be subject to transverse bending in the central area of the deck under extremely heavy loading (since the deck is supported at its sides). Thus, this invention contemplates additional strengthening means for the deck. Accordingly, on each side of the deck section a reinforcing plate 128 is disposed at approximately a 45° angle with respect to the deck section and is welded thereto along one of its side peripheries while the other side periphery is welded to the top of the rectangular plate 126. The front and rear sections of the reinforcing plates are bent at approximately a 45° angle (see FIGS. 1 and 7) and welded to the deck and rectangular plate 126 to close any opening that existed between the two. It should be noted from these two figures, that such construction of the reinforcing plate provides a funneled entry to the platform and the angular position of the reinforcing plate serves as a guide to position the wheels of a truck adapted to be disposed upon the deck. Furthermore, since the reinforcing plates extend inwardly along the deck structure and are rigidly secured thereto at such a position, the unsupported width of the platform is reduced and the cooperation of the various components provides a rigid triangular form.

Additionally, the side supporting columns 102 and 104 and the reinforcing plates 128 as so connected to the deck section 100 limit longitudinal bending of the outer portion of the deck with respect to the inner attachment to the parallel linkage systems 14 and 16.

To provide even firmer support for the deck section 100 and limit transverse as well as longitudinal sagging, a rigid center section 106 rectangular in shape and extending the full length of the platform is disposed centrally on the deck section and is welded thereto. The center section comprises a top wall 138, a pair of side walls 140 and a front and rear wall 142 and 144 respectively. Also, a longitudinally extending strut 146 is provided intermediate the side walls 140. The strut extends substantially the full length of the center section but terminates short thereof and in engagement with a transversely extending member 148 which is parallel to the front wall 142. Thus, a rigid box-like or sandwich construction is also provided in the center section to provide exceptional strength.

Means is provided in the center section 106 (FIGURE 7) to permit or prevent the movement of wheeled truck to and from the platform 28. More particularly, a slide bar 150 slightly shorter in length than the width of the center section is mounted for reciprocal movement within suitable apertures in a pair of plates 152 disposed perpendicularly between the transverse member 148 and front wall 142. The slide bar is adapted to move through an aperture in the left side wall 140 and into a position blocking exit of the wheel of a truck from a wheel runway defined by the center section 106 and the angularly extending reinforcing plate 128. To effect reciprocal movement of the slide bar 150 an elongated slot 154 (FIGURE 1) is provided in the front wall 142 and a foot cam in the form of a right angle rod 156 extends through the slot 154 and has one end secured to the slide bar 150. Thus, the other end of the rod 156 extends upwardly externally of the center section and may be conveniently moved by the foot of an individual loading the platform.

In operation, it is now becoming common for manufacturers to reduce hauling costs by providing a complete container for goods to be shipped with the container itself being moved from the manufacturer's factory to the retailer's showcase as a unit and without the costly operations of loading and unloading the individual articles from the shipping containers. For instance, the wheeled truck 30 may be loaded with containers of milk at the finish of the packaging operation in the manufacturer's

plant. A vehicle having a lift gate as described herein is driven to the manufacturer's factory and through manipulation of control bar 68, the platform 28 is moved to its ground engaging position as shown in FIG. 1. The wheeled truck 30 is then pushed by a single individual up the runways provided on the platform. Should the wheeled truck tend to turn in the loading operation, the center section 106 and/or the angularly extending reinforcing plates 128 will guide the same into its proper position. The wheeled truck may be so pushed onto the platform by a single individual since he need only push the truck initially over a thickness of one-eighth of an inch (the thickness of the planar member 110) and up a gentle slope (approximately 2° in the embodiment shown) to the position shown in FIG. 2 at which time the individual pushes the slide bar actuating rod 156 with his foot so that the wheel 32 of the truck engages the same and restrains movement of the truck 30 from the platform. The individual then stands on a small side platform 158 welded to and extending from one side of the side supporting column 104 and actuates the control bar 68 through actuating lever 72 thus causing movement of the platform to the position shown in FIG. 3.

The individual then steps onto the vehicle bed 12 and pulls the truck onto the vehicle bed. To pivot the platform 28 to the position shown in FIG. 4 the individual merely pivots actuating lever 92 to cause contraction of the tension arms of the parallel linkage systems 14 and 16.

After the truck has been driven to the retail store location, the individual then reverses the foregoing operations to again lower the platform from the position shown in FIG. 4 to the position shown in FIG. 3 and then FIG. 1. The wheeled truck 30 is moved from the platform by first sliding the control bar within the center section 106, again by actuation of the individual's foot, to clear the platform runway. The wheeled truck then is pushed into the retail store. The consumer may thus withdraw articles directly from the wheeled truck 30.

From the foregoing detailed description and the accompanying drawings, it is apparent that a lift tailgate has been provided which is strong enough to withstand repeated heavy loadings and which will readily accommodate wheeled trucks without causing spillage of articles from such truck and without the aid of a second individual to position the truck upon the platform.

What is claimed is:

1. A lift tailgate for vehicles comprising (a) mounting means adapted to be secured into the frame of a vehicle under the rear of the bed thereof, (b) two parallel linkage systems each being pivotally secured at one end to said mounting means, (c) a platform pivotally secured to the other ends of said linkage systems and adapted to be moved from a position adjacent the ground to a position adjacent the bed of the vehicle upon vertical arcuate movement of said parallel linkage systems, (1) said platform comprising first and second planar members, one disposed at least partially upon the other, (2) ribs of progressively greater depth extending between and connecting said planar members so that the second extends angularly upwardly with a slope of less than six degrees with respect to the first, (3) a side supporting column connected to each of the two sides of said two planar members to limit longitudinal bending of said platform and providing a means for connection to said two parallel linkage systems, (4) a reinforcing plate connected to each side supporting column adjacent the top thereof and connected to said second planar member inwardly from each side thereof to reduce the unsupported width of said platform, (5) a rigid longitudinally extending section disposed upon and connected to said second planar member between said reinforcing plates to limit sagging of said platform, (6) said rigid longitudinally extending section and each of said reinforcing plates forming the

outer boundaries of a pair of runways on said platform for the reception of a wheeled truck.

2. The lift tailgate of claim 1 wherein said rigid longitudinal extending section is provided with a transversely movable wheel retaining member manually slidable into and out of one of said runways.

3. The lift tailgate of claim 1 wherein said second planar member extends forwardly of its connection with said first planar member so that the entry thickness of the platform is solely the thickness of said second planar member.

4. The lift tailgate of claim 1 wherein the forward portion of each of said reinforcing plates is bent outwardly so as to provide a funnel like entry to the platform.

5. A lift tailgate for vehicles comprising (a) mounting means adapted to be secured to the frame of a vehicle under the rear of the bed thereof, (b) two parallel linkage systems each being pivotally secured at one end to said mounting means, (c) a platform pivotally secured to the other ends of said linkage system and adapted to be moved from a position adjacent the ground to a position adjacent the bed of the vehicle upon vertically arcuate movement of said parallel linkage systems, (1) the deck of said platform engaging the ground and having a gentle slope from front to rear whereby a wheeled truck may be easily loaded onto said platform, (2) a longitudinally extending rigid center section secured on said deck to reduce sagging thereof, and (3) restraining means slidably mounted in said center section and manually movable from a position contained by said center section whereby a truck may be freely wheeled onto said deck to a position wherein a wheel of the truck is engaged by the restraining means to prohibit inadvertent exit of the truck.

6. The lift tailgate of claim 5 wherein said center section is provided with an elongated slot and a foot cam is attached to said restraining means and extends from said slot for convenient actuation.

7. A lift tailgate for vehicles comprising (a) mounting means adapted to be secured to the frame of a vehicle under the rear of the bed thereof, (b) two parallel linkage systems each being pivotally secured at one end to said mounting means, (c) a platform having (1) a deck adapted to engage the ground and having a gentle upward slope from front to rear, (2) a pair of side supports connected to and projecting upwardly one from each side of said deck, said side supports extending substantially from the front to the rear of the deck, and (3) reinforcing means connected to said side supports and said deck at a position inwardly of said side supports to provide a rigid structure and reduce the unsupported width of said deck, (4) said side supports being pivotally secured at their rearward ends to the other ends of said linkage systems for raising and lowering by said linkage systems whereby a wheeled truck may be easily loaded onto said platform and the platform is adapted to be moved from a position adjacent the ground to a position adjacent the bed of the vehicle upon vertically arcuate movement of said parallel linkage systems.

8. The lift tailgate of claim 7 wherein the slope of the deck of the platform is less than six degrees.

9. The lift tailgate of claim 7 wherein the slope of the deck of the platform is less than three degrees.

10. The lift tailgate of claim 7 wherein the entry thickness of the deck is less than one inch.

11. The lift tailgate of claim 7 wherein the entry thickness of the deck is less than one-quarter inch.

12. The lift tailgate of claim 7 wherein the deck of said platform comprises a first planar member and a second planar member extending forwardly of its connection with said first planar member so that the entry thickness of the platform is solely the thickness of said second planar member.

13. The lift tailgate of claim 7 wherein a longitudinally extending rigid center section is provided on said deck to reduce sagging thereof.

14. The lift tailgate of claim 13 wherein restraining means is slidably mounted in said center section and is manually movable from a position contained by said center section whereby a truck may be freely wheeled onto said deck to a position wherein a wheel of the truck is engaged by said restraining means to prohibit inadvertent exit of the truck.

15. The lift tailgate of claim 14 wherein said center section is provided with an elongated slot and a foot cam is attached to said restraining means and extends from said slot for convenient actuation.

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U.S. Cl. X.R.

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