March 10, 1970 J. E. FORRY ET AL 3,499,563

CONTAINER LIFT FRAME

Filed Dec. 21, 1967 4 Sheets-Sheet 1

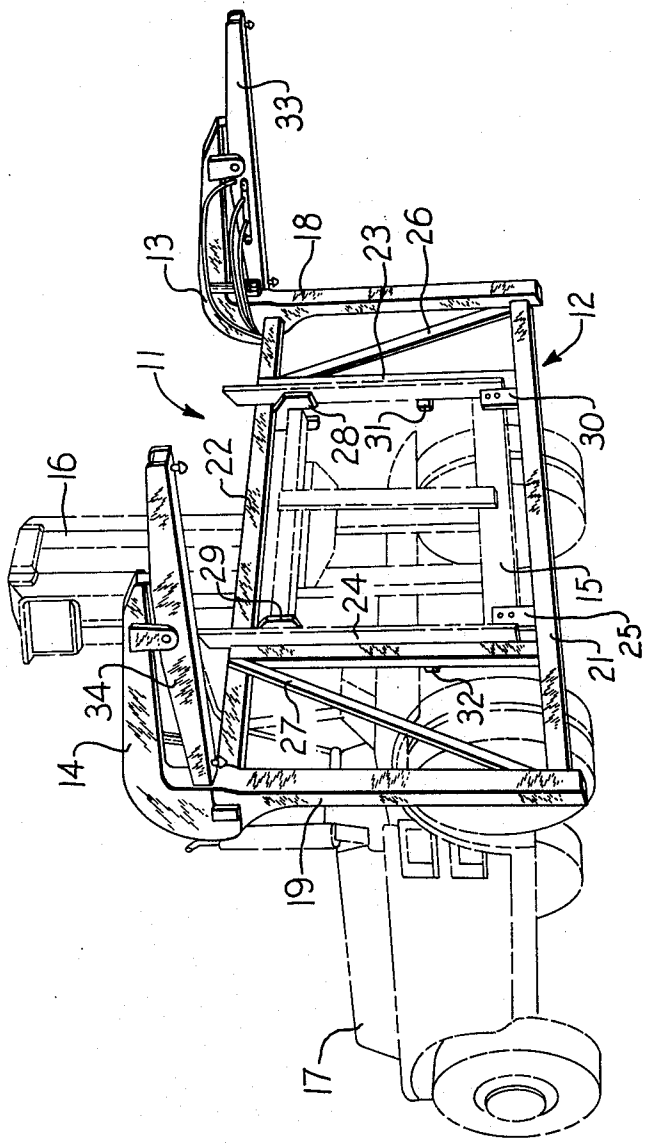


FIG. 1

INVENTORS
JAMES E. FORRY
CYRIL J. NISBETT
NORMAN D. THOMPSON

BY
Fraser, Trimmer, Feit, Phillips & Langois
ATTORNEYS

March 10, 1970 J. E. FORRY ET AL 3,499,563

CONTAINER LIFT FRAME

Filed Dec. 21, 1967 4 Sheets-Sheet 2

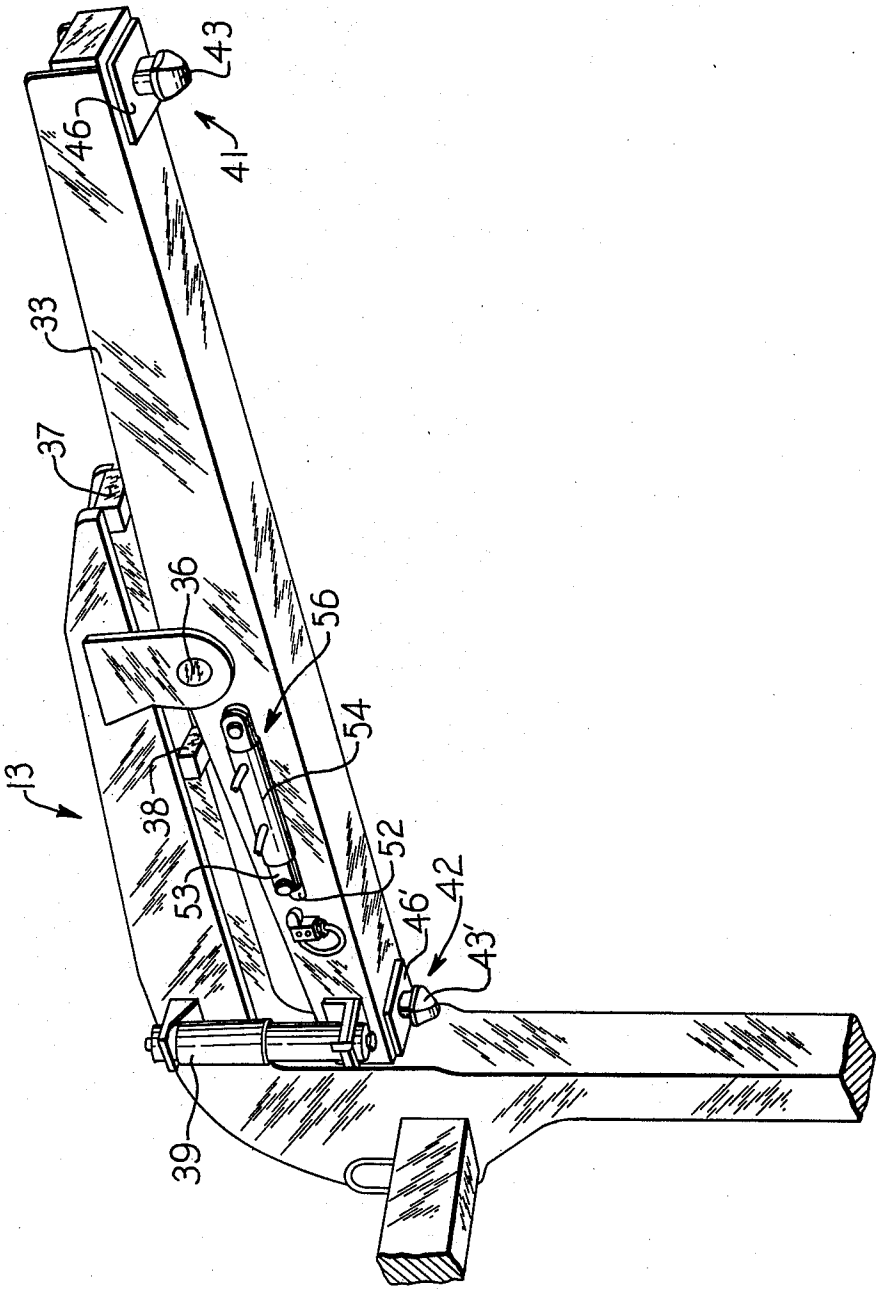


FIG. 2

INVENTORS
JAMES E. FORRY
CYRIL J. NISBETT
NORMAN D. THOMPSON

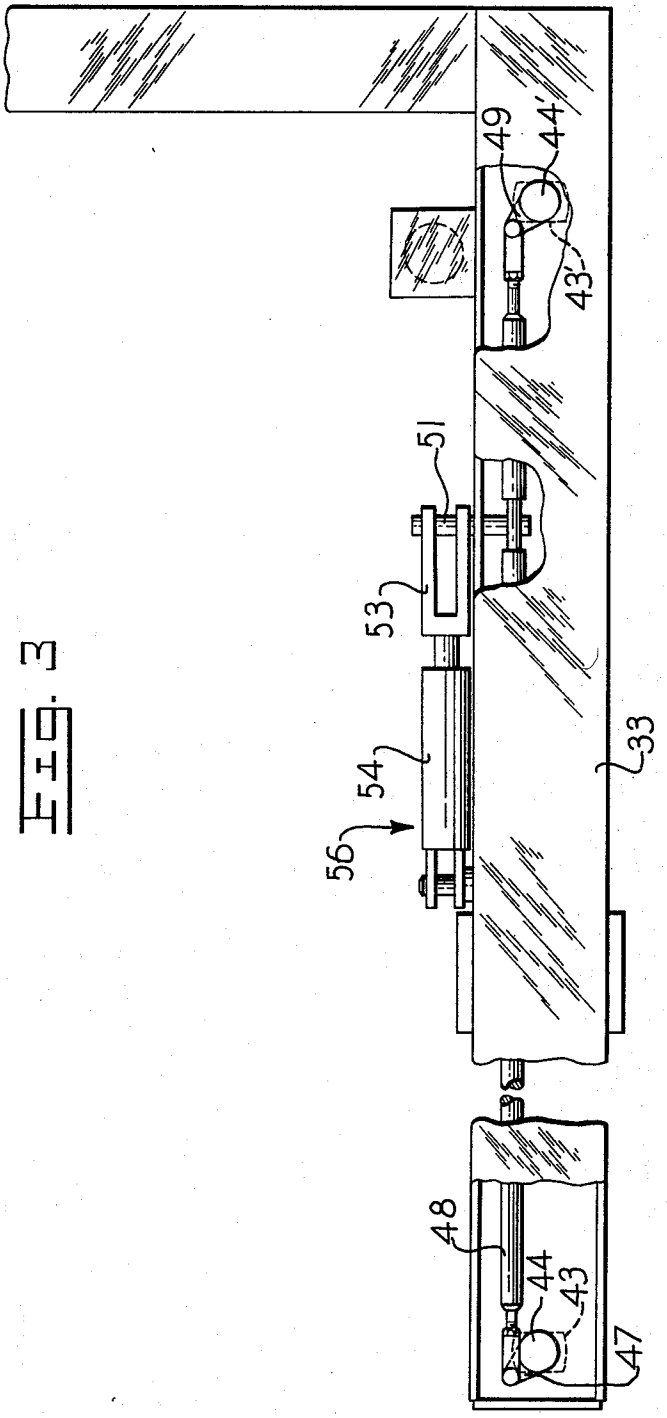
BY
Fryer, Tjensvold, Feix, Phillips & Lempio
ATTORNEYS

March 10, 1970 J. E. FORRY ET AL 3,499,563

CONTAINER LIFT FRAME

Filed Dec. 21, 1967 4 Sheets-Sheet 3

FIG. 3



INVENTORS
JAMES E. FORRY
CYRIL J. NISBETT
NORMAN D. THOMPSON

BY
Fryer, Tjensvold, Fix, Phillips & Lempio
ATTORNEYS

March 10, 1970 J. E. FORRY ET AL 3,499,563

CONTAINER LIFT FRAME

Filed Dec. 21, 1967 4 Sheets-Sheet 4

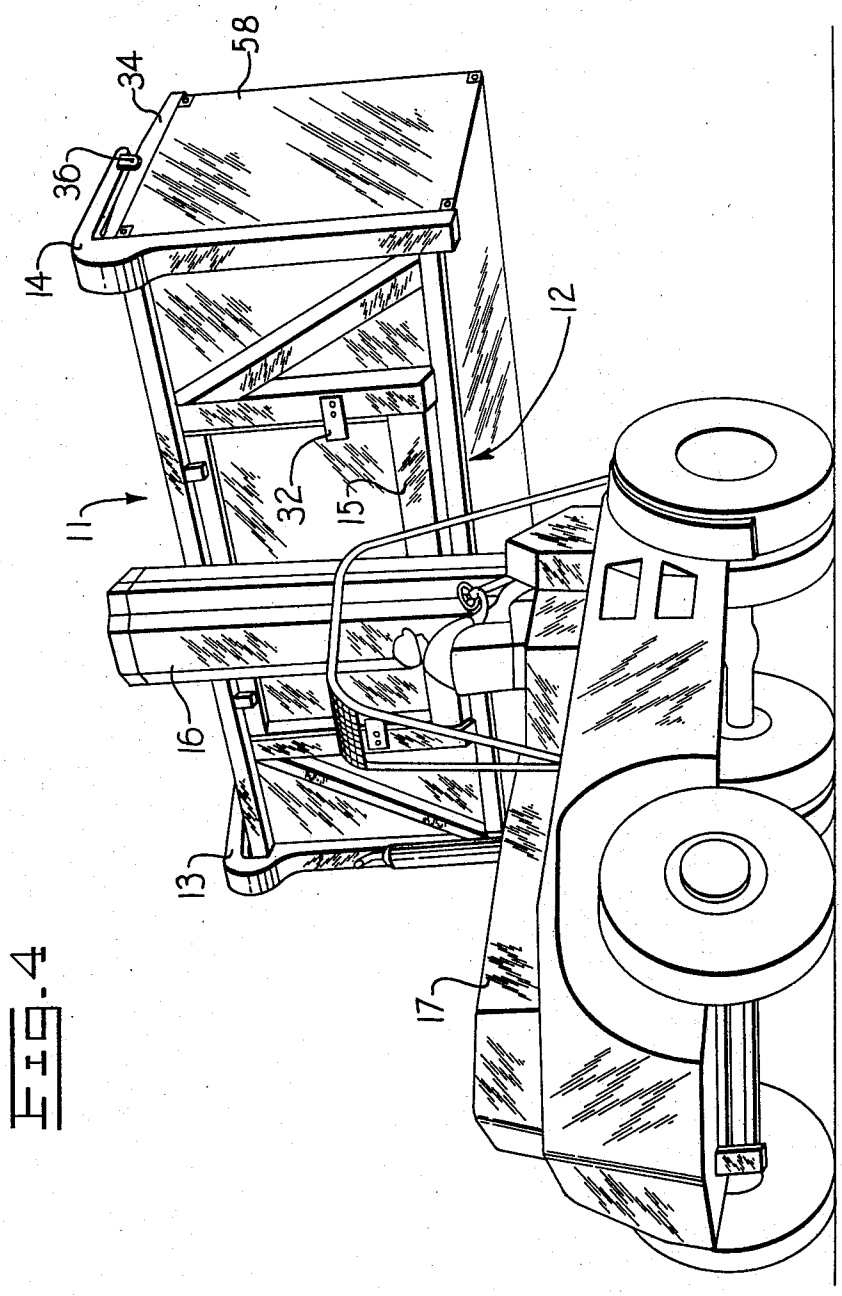


Fig. 4

INVENTORS
JAMES E. FORRY
CYRIL J. NISBETT
NORMAN D. THOMPSON

BY
Fryer, Tjensvold, Feix, Phillips & Lampio
ATTORNEYS

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Patented Mar. 10, 1970

3,499,563

CONTAINER LIFT FRAME

James E. Forry, Monmouth, Cyril J. Nisbett, Salem South, and Norman D. Thompson, Dallas, Oreg., assignors to Towmotor Corporation, Cleveland, Ohio, a corporation of Ohio

Filed Dec. 21, 1967, Ser. No. 692,478
Int. Cl. B66f 9/18; B66c 1/42
U.S. Cl. 214—621 9 Claims

ABSTRACT OF THE DISCLOSURE

A frame for lifting and moving large transportation containers is provided. The lift frame is adapted for easy attachment and detachment to large size fork trucks. A vertical frame is provided for attachment to the lift carriage on a mast of a fork lift truck. Transversely extending arms form an extension on the upper corners of the frame. These transverse supporting arms pivotally support transverse clamping beams, which beams are provided with container lastching means at the extremities thereof. When properly positioned the lift frame of the invention engages the upper corner fittings of a cargo container whereby said container may be lifted and moved by said truck.

CROSS-REFERENCE TO RELATED APPLICATION

The present invention describes a container lift frame which is related in purpose and operation to the lift frames disclosed and described in copending application Ser. No. 675,635, filed Oct. 16, 1967 for "Anti-Racking Container Lift Frame" by Theodore H. Allegri, Robert G. Neer and Norman D. Thompson.

BACKGROUND OF THE INVENTION

The present invention relates to lift frames for cargo containers and more specifically to lift frames suitable for attaching to a fork lift truck.

Large fully enclosed cargo containers in lengths of twenty to thirty, and even forty feet, have been finding increasing favor with the transportation industry. Such containers constructed completely of metal, metal and wood or of metal and fiberglass form cargo units susceptible to efficient cargo handling in that they may be rather easily transferred from truck to train and from train to ship and vice versa. Such containers also protect the cargo from theft and also present units which may be stacked and stored in outdoors locations while fully protecting the cargo therein from weather. Thus requirement for warehouse space is reduced during transshipment.

Further, although the cargo containers are of relatively large size, their regular shape and unifom size eases the problem of calculating correct cargo space for a given amount of cargo. Also the fully enclosed containers when lashed down on flatbed trailers or rail cars, may be readily transported from place to place.

Due to their standard size, i.e., nominally 8 ft. by 8 ft. by multiples of 10 ft., for instance 10, 20, 30 and 40 ft., such containers have been found to be extremely valuable for cargo shipments necessitating transportation by different means during their journey from shipping point to destination. Thus, in any one trip, a cargo container might travel first by truck, then by rail and then by truck to its ultimate destination. Or, for instance, it might travel by truck, by ship and thence by rail to its final destination. It will be realized that when shipment involves passage on various types of transporting means, transfer and transshipment of the containers is necessitated.

The transfer of such cargo containers from one means of transportation to another obviously necessitates the unloading of the containers from one means of transportation, then transporting and reloading of the container on another means of transportation. The transshipment of the cargo containers obviously requires some means of movement. Since the containers when loaded with cargo may reach weights up to 50,000 pounds in the case of 20 ft. containers, and even up to 75,000 pounds in the case of 40 ft. containers, it will be realized that the transshipment thereof presents quite a problem. Prior art devices for lifting and loading such cargo containers includes cranes and derricks of various forms, straddle lift carriers and lift trucks of one sort or another.

Most prior art devices, whether working from a crane, straddle carrier or truck, utilize a generally rectangular frame having side dimensions equal to the top dimensions of the cargo container, which frame incorporates standardized twist lock fittings (such as discussed in greater detail hereinafter) depending from each corner thereof. The frame and associated twist locks is generally suspended from some overhead device by means of cable or chain to lift the cargo containers.

As stated before, the dimensions of such cargo containers have been standardized. In addition the corner fittings on such containers have also been standardized whereby hooks and shackles of specified dimensions will suitably engage said containers. A twist lock of a safety type has been designed and standardized for use on the corner fittings of such containers. The standard corner fittings, twist lock latching means and the container dimensions are set forth in a publication of the United States of America Standards Institute. The Institute is located at 10 E. 40th Street, New York. The publication is entitled "Specifications for Freight Containers," and is designated MH 5.1–1962. The publication may be secured from the above noted organization, which publication completely describes the standardized cargo containers, standardized corner fittings, and the standardized twist lock latch means for use therewith.

In any event, prior art cargo container lifting devices have proven to be rather cumbersome and inefficient. For instance the crane devices suffer from the defect that they are restricted in their area of operation, since they work either from fixed towers or on rails. The straddle carrier type of container lift devices, while having more freedom of movement than the crane devices, must straddle the cargo container completely before it can lift and move it.

To date the most efficient means for loading and unloading cargo containers resides in the use of wheeled lift trucks adapted to move up to the side of a cargo container which is then lifted and transported utilizing the mast common to such vehicles. Cargo container transshipment by means of lift trucks is potentially the most efficient in point of time and in freedom of movement of all prior art devices utilized for such purposes.

The principal drawback in the use of lift trucks for transshipment of cargo containers resides in the fact that the lift truck must operate from one side of the cargo container. If the lift truck utilizes the four corners of the cargo container facing it along one vertical side, the problems of twisting and racking of the cargo container become of great concern. It will be appreciated that if the cargo container is picked up from one side thereof, the great weights involved, as noted above, place great loading forces upon the cargo container frame whereby severe twisting and racking thereof may occur. In overhead type of lift devices, i.e., cranes and straddle carriers, the upper four corners of the cargo container are generally utilized as the lift point whereby the entire container is suspended directly below the lift mechanism.

Racking and twisting problems are therefore greatly reduced by these transshipping devices.

SUMMARY OF THE INVENTION

The present invention provides a lift frame for cargo containers which is adapted for use on fork lift trucks, but in addition provides the advantages of overhead suspension discussed above. The lift frame of the present invention, when fitted to a fork lift truck, lifts the cargo container at the four upper corners thereof. By lifting, supporting and stabilizing the cargo container at the noted four positions, the entire weight of the container is suspended directly from the overhead portion of the lift frame whereby any racking and twisting thereof is virtually eliminated. In addition, since the frame is adapted for use on a fork lift vehicle, the cargo container may be lifted and carried from place to place in the shortest possible time and in the most efficient manner.

It is therefore an object of the invention to provide a device whereby cargo containers may be lifted and transported by fork lift truck means.

It is a further object of the invention to provide a container lift frame that supports the cargo container from the upper four corners thereof while thereby permitting lifting and transporting of a cargo container by a fork lift truck.

It is yet another object of the invention to provide a container lift frame that reduces racking and twisting of the cargo container.

It is still another object of the invention to provide a cargo container lift frame that may be quickly and simply placed on or removed from a standard fork lift vehicle.

It is still another object of the invention to provide a cargo container lift frame including the advantages of lifting the cargo container from the top four corners in the manner of a crane or straddle device, but also including the ease and efficiency of fork lift vehicle transportation.

Further objects and advantages of the invention will be apparent from a review of the following specification and claims along with the accompanying drawing which comprises:

FIG. 1, an isometric view of the container lift frame of the invention shown in position on a fork carriage (in phantom), mast (in phantom), and lift truck (in phantom);

FIG. 2, an isometric view of one of the transverse arms with the lift beam pivoted thereto and also showing a portion of the vertical upright frame;

FIG. 3 is a plan view of the transverse arm and pivoted lift beam with portions cut away to show the locking rod and locking pin levers contained within the lift beam; and

FIG. 4, an isometric view of the lift frame of the invention in position on a lift truck and showing a container clamped thereon and raised off the ground.

DESCRIPTION OF THE INVENTION

As is most clearly shown in FIG. 1 of the drawing, the lift frame **11** of the invention comprises a vertical frame portion **12** having two outwardly extending transverse arms **13** and **14** that comprise extensions to the upper corners of the vertical frame. The entire lift frame **11** is removably mounted on the fork carriage **15** which is conventionally attached to the mast structure **16** mounted on a lift truck **17**.

The vertical frame **12** is of a generally rectangular configuration and is fabricated from heavy steel box beams. Two box beams **18** and **19** form the upright outer members thereof, while similar beams **21** and **22** form the lower and upper cross members of the frame respectively. Inward of end beams **18** and **19** and placed sufficiently far apart to just straddle lift carriage **15**, are two additional vertical reinforcing beams **23** and **24** which are

welded at their respective ends to cross beams **21** and **22**, as are the end beams **18** and **19**.

Diagonal bracing members **26** and **27** are further welded to the lower corners of the frame **12** and to the junctions where vertical beams **23** and **24** meet upper cross beam **22**.

Depending C-shaped brackets **28** and **29** are welded to the underside of upper cross beam **22**, which brackets are adapted to fit over the upper cross beam of the common fork carriage **15**. Pivoting keeper lugs **31** and **32** are bolted to the back side of vertical beams **23** and **24** at a point approximately midway between cross beams **21** and **22**. Pivoted lugs **31** and **32** may be swiveled to the horizontal position (as shown in FIG. 1) whereby they fit behind the vertical side beams of fork carriage **15**. The removable pins (not shown) pass through lugs **31** and **32** into vertical beams **23** and **24** to retain the lugs in the horizontal position. An additional two lugs **25** and **30** are welded to bottom beam **21** and extend upwardly in front of carriage **15**, whereby the bottom portion of upright frame **12** is stabilized. Thus the entire lift frame **11** is securely mounted on the fork carriage **15** by means of brackets **28** and **29**, keeper lugs **31** and **32**, and lugs **25** and **30**.

If it is desired to remove lift frame **11** from the lift truck, the pins are simply removed from lugs **31** and **32** whereby they may be swiveled into the vertical position in back of vertical beams **23** and **24**. The entire lift frame **11** may then be easily removed from the fork carriage of lift truck **17** by suitably lowering carriage **15** to disengage brackets **28** and **29**. Similarly lift frame **11** may be remounted on the fork lift carriage of lift truck **17** by simply engaging the fork carriage **15** with brackets **28** and **29**, and thereafter resecuring lugs **31** and **32** behind the vertical end beams of the fork lift carriage.

As noted previously, transverse arms **13** and **14** form an extension of the upper outer corners of vertical frame **12**. These arms **13** and **14** extend horizontally outwardly away from lift truck **17** for a distance of somewhat more than half the width, i.e., four feet, of a standard cargo container. Depending from each transverse arm **13** and **14** and pivoted thereto, are transversely extending support and lift beams **33** and **34**. Arm **14**, and depending beam **34**, is a mirror image of transverse arm **13** and its depending beam **33**. Similarly, the apparatus which will be more fully described hereinafter, associated with each of the arms is identical in construction. For purposes of simplicity and construction of arms **13** and **14**, beams **33** and **34** and their associated apparatus will be discussed in relation to arm **13** and beam **33** only. However it should be understood that the mechanism associated therewith and therein is identical with that associated with arm **14** and beam **34**.

As is more clearly illustrated in FIG. 2, transverse arm **13** has two downwardly extending lugs (one of which is not shown) welded thereto a short distance inwardly of the outer end thereof. Support and lift beam **33** is pivoted to transverse arm **13** by a pin **36** that passes through the midpoint of support and lift beam **33** and is retained within bearing holes drilled into the lower portion of the depending lugs. Thus, support and lift beam **33** is free to rotate in the vertical plane about the point fixed by pin **36**. However support and lift beam **33** is limited in its extent of rotation by resilient load stops **37** and **38** mounted on the underside of transverse arm **13**, one on either side of the depending lugs.

It should be further noted that support and lift beam **33** cannot swing freely about the pivot point formed by pin **36**, but is further restricted in its movement by a load swing damper **39** which is affixed at one of its ends to brackets rigidly mounted on transverse arm **13** and at its other end to brackets rigidly mounted on support and lift beam **33**. As illustrated in the drawing, load swing damper **39** takes the form of a conventional shock absorber mechanism whereby lift and support arm **33** is permitted

to rotate about the pivot point, but wherein such rotation is controlled and damped by the shock absorber mechanism.

If more positive control of the movement and position of support and lift beam **33** is desired, a conventional double acting hydraulic jack with associated hydraulic lines and control valves may be substituted for the simple shock absorber mechanism illustrated in the drawing. In such event the relative angle between support and lift beam **33** and transverse arm **13** can be positively controlled by the vehicle operator utilizing conventional hydraulic controls and mechanisms.

As most clearly illustrated in FIG. 2, a pair of standard twist locks **41** and **42** depend from support and lift beam **33**, one at either end thereof. Details of construction of such twist locks (safety type) may be found in United States of America Standards Institute Document MH 5.1–1962 "Specifications for Freight Containers" previously referred to above.

These standardized twist locks **41** and **42** comprise a rotatable elliptical head portion **43** and **43'** which is secured to a shaft **44** and **44'** (see FIG. 3) which shaft passes through a fitting **46** and **46'** into the interior of hollow beam **33**. Fitting **46** and **46'** is welded to the under portion of beam **33** and in turn retains the locking mechanism thereon. Within the interior of beam **33** an actuating lever **47** is rigidly secured to shaft **44**. An actuating rod **48** is in turn pivotally secured to the other end of lever **47** and in turn passes along the entire interior length of beam **33** to the other end thereof at which point it is pivotally secured to an identical actuating lever **49** on corresponding shaft **44'**. At a suitable point between the ends thereof rod **48** has a horizontal hole drilled therethrough. A pin **51** passes through said hole and horizontally out through a slot **52** formed in one side wall of beam **33**. Slot **52** extends for some distance along the length of the side wall of beam **33** whereby pin **51** may be translated back or forth along the slot by means thereinafter described.

The end of pin **51** remote from rod **48** is fixedly retained in the end of hydraulic jack rod **53** which extends from hydraulic jack cylinder **54** that is in turn retained by suitable brackets on the side wall of beam **33**. Hydraulic cylinder **54** and associated rod **53** together comprise a double-acting hydraulic jack **56**, which is in turn supplied with hydraulic fluid through suitable hose connections (see FIG. 2) leading from the necessary control valves (not shown) at the vehicle operator's station.

When desired the vehicle operator may direct hydraulic fluid to one end or the other of cylinder **54** whereby pin **51** is moved in one direction or the other along beam **33**. Such movement in turn forces rod **48** to actuate the rotatable heads on twist locks **41** and **42**. By such means the heads of twist locks **41** and **42** may be rotated either into the locked or unlocked position. When dropped through the slotted top opening of a standard corner fitting (the cargo container standardized corner fittings are shown and described in the above referred to U.S.A. Standards Institute publication) of the cargo container and rotated 90° into the locking position, heads of twist locks **41** and **42** will be locked into such corner fittings of the cargo container. When rotated 90° back from the locking position, twist locks **41** and **42** may be removed through the slotted opening in the corner fittings of a standardized cargo container.

Since twist locks **41** and **42** are connected by actuating rod **48**, it is apparent that both twist locks will be rotated either into the locking or unlocking position at the same time.

If desired, suitable mechanisms may be attached to beam **33** to indicate whether or not twist locks **41** and **42** are positioned within the corner fittings of a cargo container and also to indicate whether or not such twist locks are in the locked or unlocked positions. Suitable types of such mechanisms are described and shown in copending application Ser. No. 675,635 referred to above.

In operation, with the lift frame **11** secured to the lift carriage **15** as previously described, and with the twist locks at either end of the lift beams **33** and **34** in the unlocked position, the vehicle operator approaches a cargo container **58** along one of its long sides. It should be noted that upright frame **12** and associated transverse arms **13** and **14** is of a length equal to the length of the container **58** which is to be lifted and transported. Further, depending beams **33** and **34** are of a length equal to the width of container **58**. The pair of twist locks associated with each lift beam **33** and **34** are set apart by a distance exactly equal to the distance between the upper corner fittings on either end of container **58**.

Thus the operator approaches container **58** with frame **11** lifted high enough to provide clearance between the top of the container and the bottom of the twist locks depending from beams **33** and **34**. The operator maneuvers the vehicle to a position alongside container **58** whereby the twist locks are brought to a position immediately above the corner fittings of the container **58**.

When in a suitable position, the operator then lowers lift carriage **15** and the attached container lift frame **11** until the four twist lock heads are engaged within the upper four corner fittings of container **58**. It should be noted that since beams **33** and **34** are pivoted on their respective transverse arms **13** and **14**, each arm will be free to rotate if necessary in order to completely engage the twist lock heads within the upper corner fittings of container **58** even if the container has been twisted or racked out of the horizontal plane.

In any event, once the twist locks are engaged in the upper corner fittings of the container **58**, the operator actuates hydraulic jacks **56** to lock the twist lock heads within the corner fittings. Once locked within the upper corner fittings of container **58**, the operator then raises lift carriage **15** on mast **16** whereby the container **58** is lifted by its upper four corners. If desired, the operator may tilt mast **16** slightly backward in order to bring the side of container **58** to rest against the adjacent portions of upright frame **12**.

Load swing dampers **39** also serve to snub any swinging tendency of the container. In the event positive control hydraulic jacks are utilized instead of dampers **39**, the operator may visually align beams **33** and **34** with the top of the container and any warping of the container out of the horizontal plane is then accommodated for and the twist locks will suitably engage the container corner fittings.

In any event, lifting container **58** by its upper four corners, the operator may then transport it to any desired location. The container may be stacked on the top of other containers, it may be loaded on a truck bed for highway transportation, it may be loaded onto a rail flat car for railway transportation, or it may be deposited at dock side for hoisting onto a cargo vessel.

Once deposited in the desired position, the operator simply actuates hydraulic cylinder **56** to unlock the twist locks depending from lift beams **33** and **34**. He then raises lift carriage **15** to disengage the locks from the top corner fittings of container **58**. The lift vehicle **17** is then backed away from the container and driven to the next container for a succeeding sequence of operations.

Utilizing the lift frame **11** as described above, cargo containers may be quickly and efficiently picked up and moved from place to place even when fully loaded. The locking and unlocking operations are conducted in a minimum amount of time. Further, since the cargo container is supported and held at the upper four corner positions as indicated, additional racking or twisting of even fully loaded containers is virtually eliminated, since the entire weight of the container hangs directly below the lifting points.

While a preferred embodiment of the invention has been shown and described, those skilled in the art may

make minor variations without departing from the spirit of the invention.

What is claimed is:

1. A cargo container lift frame comprising an upright frame, first and second outwardly extending arms rigidly secured to the upper portion of said upright frame, first and second lift beams pivoted to said first and second arms respectively and depending therefrom so that the beams may pivot independently of each other, container engaging means secured to said beams at positions for mating with corner fittings formed into the upper corners of said cargo container, and means for locking to and unlocking said engaging means from said container corner fittings.

2. The lift frame of claim 1 wherein said first and second lift beams are pivoted to the first and second arms by pins having their axis in a horizontal plane whereby each said beam is free to move relative to the other beam and in a vertical plane.

3. A cargo container lift frame comprising an upright frame, first and second outwardly extending arms rigidly secured to the upper portion of said upright frame, first and second lift beams pivoted to said first and second arms respectively, by pins having their axis in a horizontal plane whereby each said beam moves relative to the other beam and in a vertical plane, container engaging means secured to said beams at positions for mating with corner fittings formed into the upper corners of said cargo container, means for locking to and unlocking said engaging means from said container corner fittings, and damper means connected between said beams and said arms respectively to control the freedom of movement of said lift beams.

4. The lift frame of claim 3 wherein said damper means are hydraulically actuated shock absorbers.

5. The lift frame of claim 3 wherein said damper means are double-acting hydraulic jacks.

6. The container lift frame of claim 2 wherein the extent of movement of said lift beams in the vertical plane is restricted by resilient stops affixed to and depending from said arms.

7. The container lift frame of claim 1 wherein bracket means and lug means are affixed to said upright frame for attaching said lift frame to the fork carriage of a fork lift truck.

8. The container lift frame of claim 1 wherein said means for locking and unlocking the container engaging means comprises hydraulic jack means mounted on said first and second beams respectively.

9. The container lift frame of claim 2 wherein said arms extend away from said upright frame for a distance at least one-half the width of a standard cargo container, said lift beams are of a length at least equal to the full width of a standard cargo container and wherein said lift beams are pivoted at their approximate midpoints to said arms.

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ROBERT G. SHERIDAN, Primary Examiner

ROBERT J. SPAR, Assistant Examiner

U.S. Cl. X.R.

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