# United States Patent [19]

**Allegri et al.**

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[54] **EXPANDABLE TOP-HANDLING CONTAINER ATTACHMENT**


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[51] **Int. Cl.** ..... **B66f 9/18**

[58] **Field of Search** ..... 214/620, 621, 730; 294/67 D, 67 DA, 81 SF



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[57] **ABSTRACT**

An expandable, top-handling container, lift frame attachment for lifting and moving large cargo containers of varying lengths is provided. The lift frame attachment is adapted for easy attachment to, or detachment from a carriage of a large-size fork-lift truck, and includes telescoping, transverse beam members that can be extended or retracted in length to fit intermixed containers of various lengths.


**12 Claims, 6 Drawing Figures**

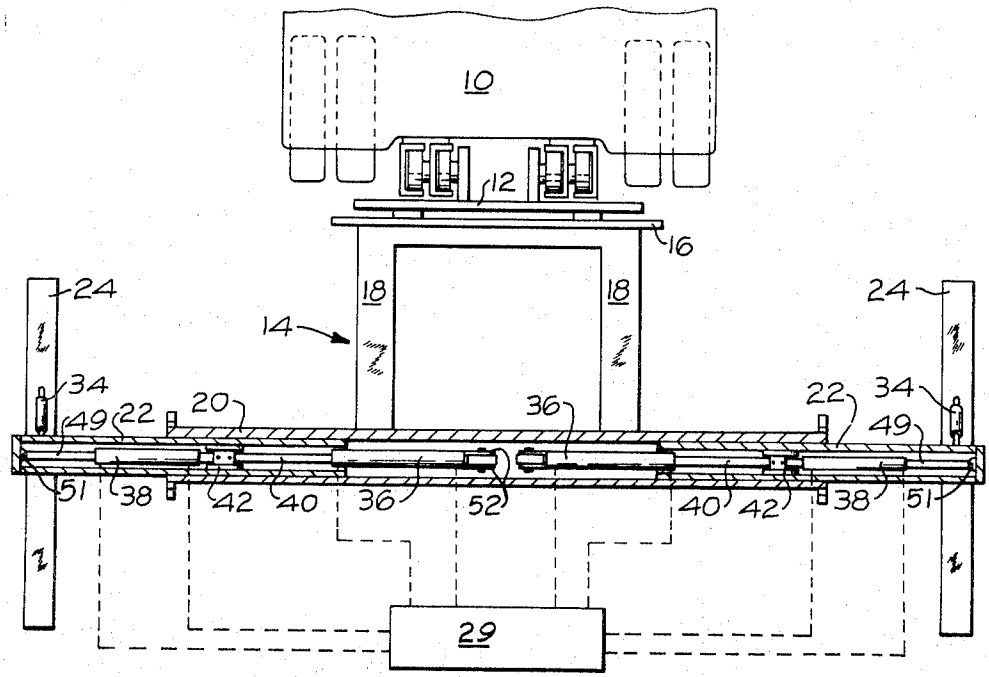

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Fig. 1

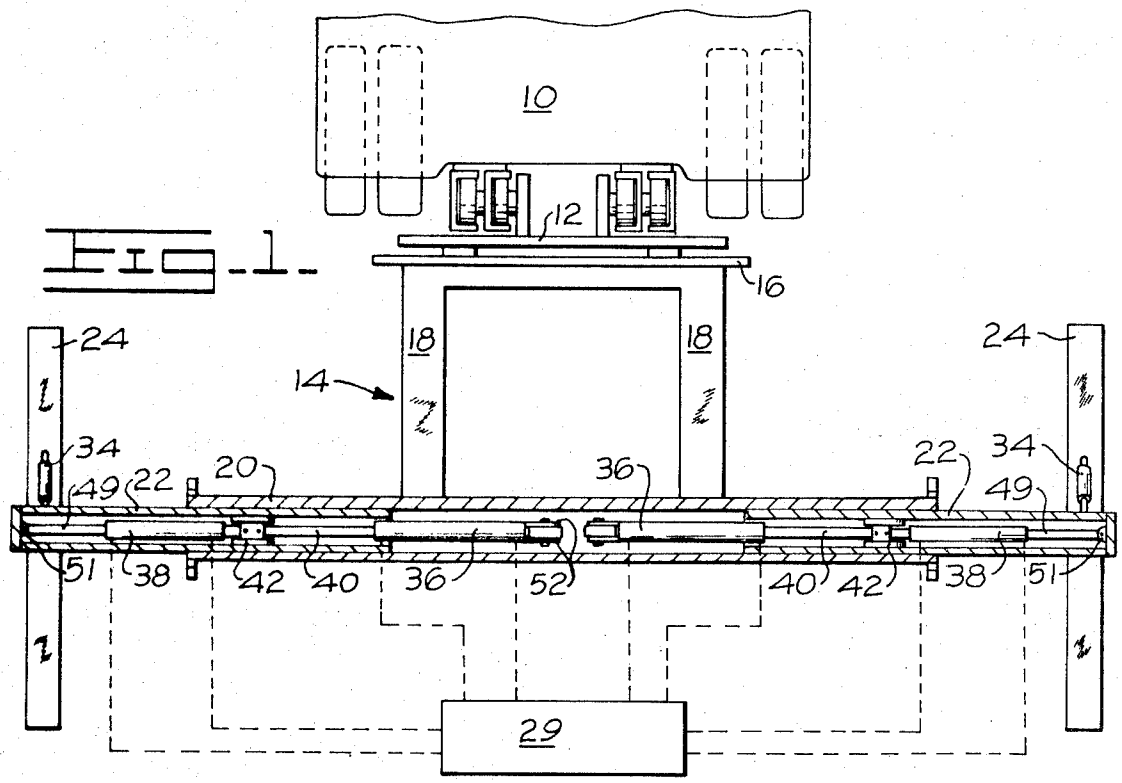
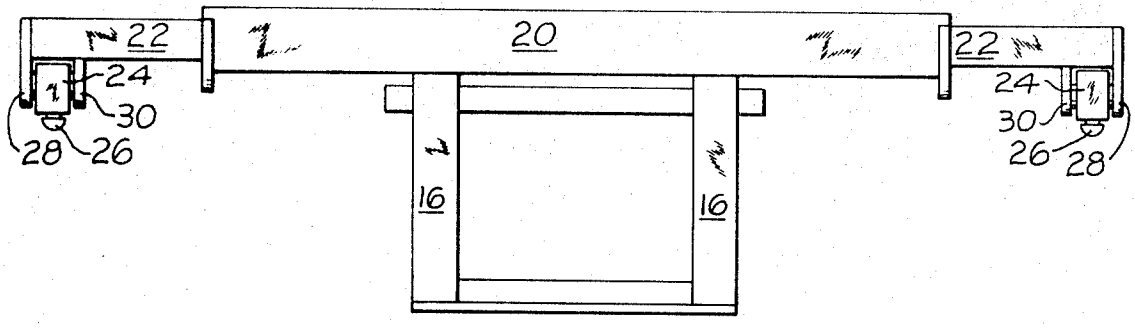



Fig. 2

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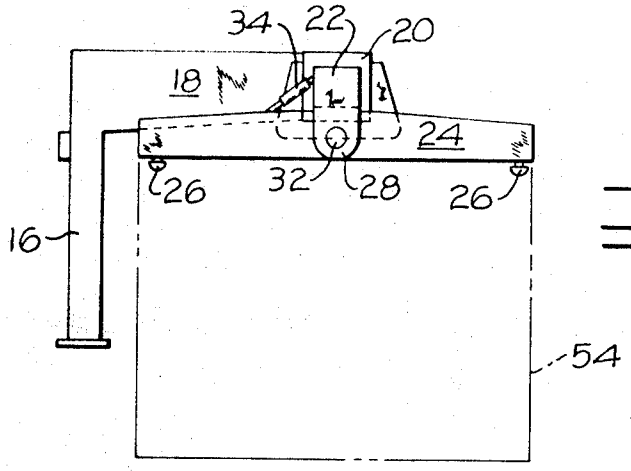


Fig-3-

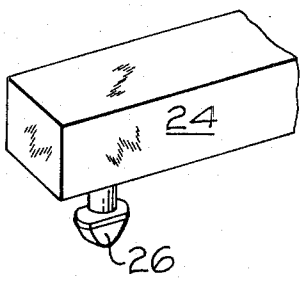


Fig-4-

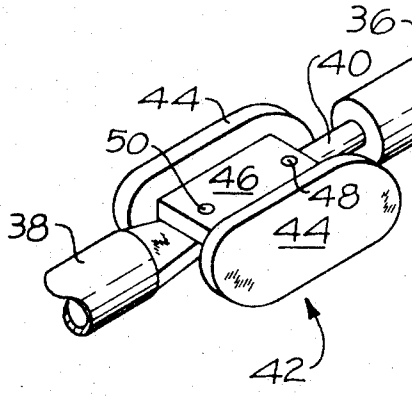


Fig-5-

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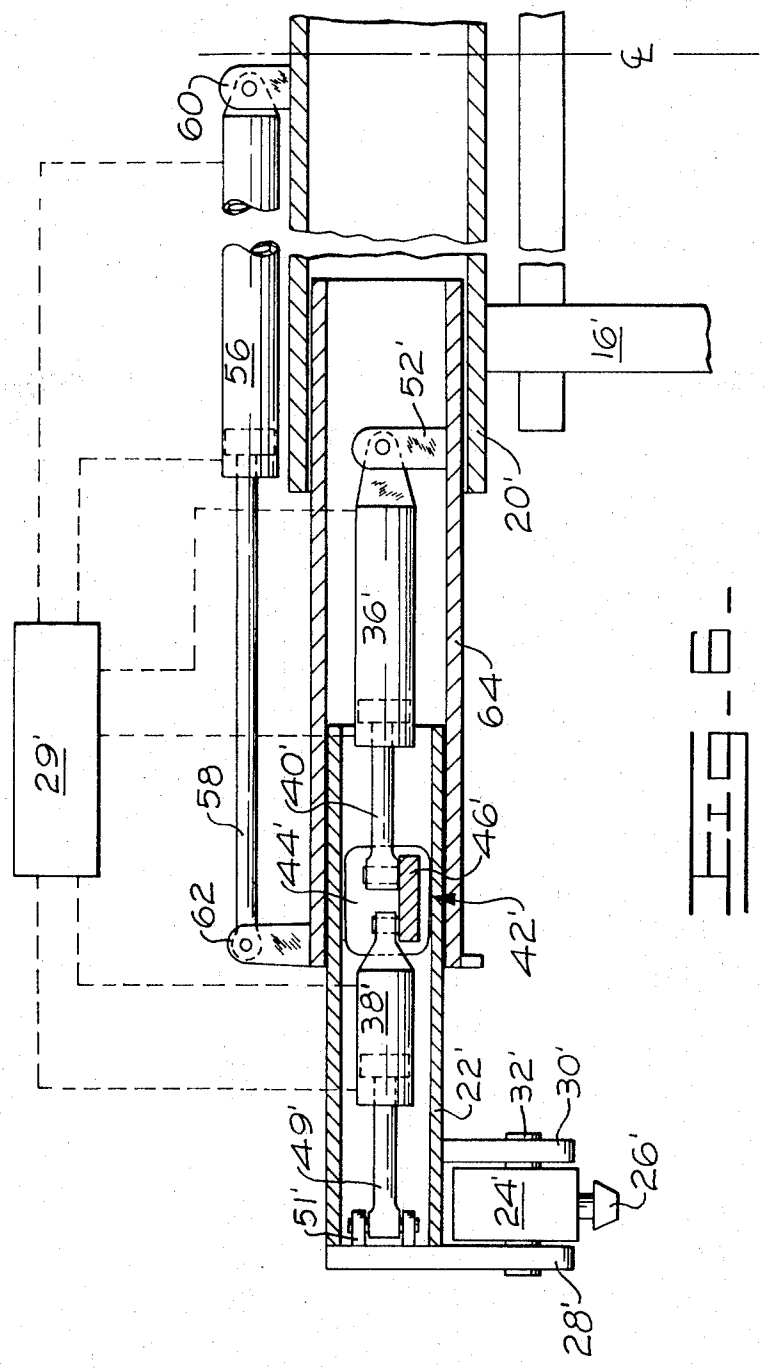


FIG. 6

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# EXPANDABLE TOP-HANDLING CONTAINER ATTACHMENT

## CROSS REFERENCE TO RELATED APPLICATION

Reference is made to related copending application Ser. No. 185,699, filed Oct. 1, 1971, which discloses an expandable, side-handling, as opposed to top-handling, lift frame for containers.

## BACKGROUND OF THE INVENTION

At the present time, large cargo containers are handled by various means including: lift cranes; fork-lift trucks when the containers are equipped with fork-lift pockets; straddle carriers; straddle cranes; and, a proliferation of U-frame or sliding-bed devices, all of which do not permit the most efficient handling of containers to be achieved.

Attachments that are adaptable to fork-lift truck carriages are also being used, but lack versatility in handling containers of intermixed sizes without removing one attachment and replacing it with another one of a size suitable for the container to be handled. This has posed serious limitations on their acceptance by industry. It can be understood that the need to change attachments to accommodate different length containers is expensive from the standpoint of equipment investment, the cost of labor to accomplish the changeover, and the loss of production that is caused by having the vehicle idle during the changeover of attachments.

## SUMMARY OF THE INVENTION

The present invention provides a top-handling container attachment for a fork-lift truck that is operator-controlled to adjust itself to fit intermixed cargo containers of varying lengths with little or no loss of vehicle operation time. The subject lift frame is easily attached to or detached from a standard fork-lift carriage. This has the benefit of having economic advantages of a truly versatile lift truck that can function either as a fork-lift truck or as a container carrier machine.

By the use of a hydraulic control means and hydraulic lines connected to hydraulic cylinder means, located either outside or inside of the telescoping transverse beam member, the adjustment of the load-supporting beams and associated container twist locks to handle various length containers is achieved.

## OBJECTS OF THE INVENTION

Accordingly, it is a primary object of this invention to provide a top-handling container attachment for industrial fork-lift trucks.

It is another object to provide an attachment for fork-lift trucks that will handle cargo containers of various lengths.

Also, it is an object of this invention to provide an attachment for fork-lift trucks that will handle intermixed cargo containers of various lengths.

It is a further object to provide a fork-lift truck, lift-frame attachment having means adjustable by the vehicle operator to fit cargo containers of various lengths.

A further object is to provide a lift-frame which is adjustable as to length by means of an operator-controlled adjustment system that requires no removal or addition of parts **30** accommodate itself to different length containers.

Another object of this invention is to provide a lift-frame which is adjustable as to length to accommodate various length containers and having container-gripping means for engaging and top-handling containers.



Another object of this invention is to provide a lift-frame attachment that can be easily mounted to or removed from a fork truck carriage.

Additional advantages and features of the present invention are made apparent in the following description and the accompanying drawings.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a plan view of the container lift-frame according to the present invention mounted on a suitable fork-lift truck;

FIG. **2** is a front elevation of the container lift-frame of FIG. **1**;

FIG. **3** is an end view of the container lift-frame of FIG. **1**;

FIG. **4** is an illustration of one of the means on the device for coupling and locking to a container;

FIG. **5** is an enlarged view of the slide member located between each pair of inner and outer cylinders; and

FIG. **6** is an enlarged, partial, front sectional view of a second embodiment of the instant invention.

## DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the primary embodiment of the invention shown in FIGS. **1 – 5**, there is illustrated a partial view of a lift truck **10** which includes a standard fork-lift truck mast and a fork carriage **12** (with forks removed) upon which is mounted the container lift-frame attachment **14.** A suitable attaching and retaining means, such as described in U. S. Pat. No. 3,499,563 to J. E. Forry et al., and assigned to the assignee hereof, may be used to attach the frame to the carriage. The lift-frame of this invention comprises a vertical frame **16** having two outwardly extending, horizontal support arms **18** that are attached to the transverse box-beam member **20.** The entire lift-frame attachment **14** is removably mounted on fork carriage **12** which is conventionally attached to the mast structure of a lift truck **10.** In the preferred embodiment shown, the lift forks are removed from the fork carriage **12** before mounting the attachment **14** thereon. Alternatively, lift-frame attachment **14** could be directly mounted on the lift forks (not shown) of the carriage **12.**

The transverse beam **20** is of a hollow box beam shape, within which telescope the extensible transverse beam members **22** of a similar shape. These beam members are adapted to slidably travel outwardly and inwardly. The load support beam members **24** can thus be positioned to connect with cargo containers **54** of varying lengths. Appended to the outer ends of each transverse beam member **22** are downwardly extending lugs **28** and **30,** fixed thereto to pivotally support the extending load support and lift beams **24.**

The load support and lift beams **24** are pivoted to the lugs **28** and **30** by pin **32,** that passes through the longitudinal mid-point of beam **24** and is retained within bearing holes in the lower portion of the depending lugs. Thus, support and lift beams **24** are free to rotate in the vertical plane about the point fixed by pin **32.** However, the support and lift beams **24** are limited in their extent of rotation by resilient load stops (not

shown) and by a load damper means **34**, it being rotatably attached by known means to load support and lift beam **24** and the cross beam member **22**.

As most clearly illustrated in FIGS. **3 – 4**, a pair of standard twist locks **26** depends from support and lift beam **24**, one at either end thereof.

If a more complete description of the structure and operation of the load support lift beam is desired, reference may be had to aforementioned U.S. Pat. No. 3,499,563 to J. E. Forry et al. The disclosure of that patent is expressly incorporated by reference herein.

The transverse movement of the extensible cross beam member **22** within beam member **20** is best shown in FIGS. **1** and **5**. The head end of hydraulic cylinder means **36** is pivotally attached to brackets **52**, with said brackets being fixed within the box beam member **20**. The rod-end **40** of the cylinder means **36** is pivotally attached by means of pin **48** to the sliding link assembly **42**.

As seen in FIG. **5**, pin **48** thus acts to secure the rod **40** to the slider assembly plate **46**, which in turn is welded to two slider plates **44**. Pin **50** is located in the opposite end of plate **46** from pin **48**, with the pin **50** rotatably securing the head end of hydraulic cylinder means **38** to the slider assembly **42**. The rod end **49** of cylinder means **38** is pivotally secured to a plurality of brackets **51** which are secured to the outer end of the box beam member **22**.

Typically, the beams are dimensioned so that when transverse beam members **22** are fully retracted to provide a minimum length transverse beam, a standard **20** foot long minimum length cargo container can be accommodated. When a container of greater length is to be lifted and moved, the lift truck operator can actuate a plurality of hydraulic control valve means **29** of known construction to introduce hydraulic fluid under pressure to a plurality of hydraulic cylinder means **36, 38**, which will, in turn, cause beam members **22** to slidably travel in a transverse, outward direction.

The operation of adjusting the instant invention transverse beam member from its minimum length to a length that will accommodate longer cargo containers, such as those having lengths of 24 or 27 feet, will be further described.

With the attachment **14** transverse beam assembly at its basic minimum length, the operator can actuate a hydraulic control valve means **29** of known construction that will, in turn, provide hydraulic fluid under pressure to the two hydraulic cylinders **36**. This action will extend cylinder rods **40**, the two slide assemblies **42**, and cylinders **38**, thus positioning the adjustable transverse members **22** and the associated support and lift beams **24** for attachment to the next longer size cargo container, e.g., 24 feet. If a still longer cargo container is to be lifted, e.g., 27 feet, the operator can actuate a hydraulic control valve of known construction, to provide hydraulic fluid pressure to the two hydraulic cylinders **38**, thus further extending transverse beam members **22** and their associated support and lift beams **24**. The control valve means **29** previously mentioned is understood to be such that either one valve control lever or pedal actuates cylinders **36** and a similar lever or pedal actuates cylinders **38**, or a single valve and control means actuates both cylinders **36** and **38**.

An alternate means is presented in which the hydraulic control valve means initially actuates the hydraulic cylinders **36** and when greater extension of the transverse beam is desired, it then actuates the hydraulic cylinders **38**.

An alternative embodiment is shown in FIG. **6** which would accommodate very long containers of 30 or 40 feet. It may be parenthetically noted that primes are used throughout the following discussion to denote structure having its analogous numerical counterpart in the primary embodiment.

In this embodiment, additional telescoping beams **64** are provided intermediate beams **20'** and **22'**. Hydraulic cylinders **36'** are fixed to these slidable beams **64** by means of brackets **52'**. In addition, a plurality of hydraulic cylinders **56** having their head ends pivotally secured to beam **20'** and their rod ends **58** to beam **64** by means of brackets **60** and **62**, respectively, are provided. Hydraulic control means **29'** is used to provide hydraulic fluid under pressure for actuating these hydraulic cylinders. While only one-half of the entire structure is shown in FIG. **6**, it is to be understood that the other half is identical with the first half.

While a preferred embodiment and an alternate embodiment of the invention have been shown and described, it is apparent to any one skilled in the art that various other forms would be possible without departing from the spirit of the invention or the scope of the following claims. It is further understood that the scope of the invention is not to be limited to the thus illustrated embodiments, but is to be determined by the scope of the appended claims.

What is claimed is:

**1.** A cargo container lift frame comprising

an upright frame,

extensible transverse beam means mounted on said upright frame,

first and second lift beams pivotally secured to said transverse beam means, wherein said transverse beam means comprise,

a plurality of extensible beams wherein said plurality of extensible beams comprise,

a first transverse beam member having means associated therewith slidably securing

a second transverse beam member, and

a third transverse beam member to opposite ends of said first transverse beam member, wherein said means slidably securing said beam members comprise,

means defining a transverse opening in each end of said first beam member slidably receiving said second and said third beam member in opposite ends of said first beam member,

container engaging means mounted on said lift beams at locations for mating with top corner fittings on a cargo container,

power means for extending and retracting said transverse beam means whereby said lift frame may accommodate containers of various lengths, wherein said power means comprise,

hydraulic cylinder means associated with said beams for extending and retracting said beams, and

control valve means for controlling said hydraulic cylinder means, wherein said hydraulic cylinder means comprise,

a first hydraulic cylinder means operatively connected between said first and second transverse beam members, and

a second hydraulic cylinder means operatively connected between said first and third transverse beam members, and

wherein said first hydraulic cylinder means comprises,

first and second hydraulic cylinder, said first and second cylinders being operatively connected by

first slidable link means, and wherein said second hydraulic cylinder means comprise,

third and fourth hydraulic cylinders, said third and fourth cylinders being operatively connected by

second slidable link means.

**2.** A cargo container lift frame comprising

an upright frame,

extensible transverse beam means mounted on said upright frame,

first and second lift beams pivotally secured to said transverse beam means, wherein said transverse beam means comprise,

a plurality of extensible beams, and

wherein said plurality of beams comprise,

a first Transverse beam member mounted on said upright frame member,

means defining an opening in opposite ends of said first transverse beam member,

second and third transverse beam members, each being slidably received in one of said means defining an opening whereby said second and third beam members extend outwardly from said first transverse beam member,

means defining a transverse opening through each of said second and third beam members, and

fourth and fifth transverse beam members being slidably received in said second and third beam members, respectively, and extending outwardly therefrom,

container engaging means mounted on said lift beams at locations for mating with top corner fittings on a cargo container, and

power means for extending and retracting said transverse beam means whereby said lift frame may accommodate containers of various lengths, and wherein said power means comprise,

hydraulic cylinder means associated with said beams for extending and retracting said beams, and

control valve means for controlling said hydraulic cylinder means.

**3.** The lift frame of claim **2** wherein said hydraulic cylinder means comprise,



a first and a second hydraulic cylinder operatively connected between said first and second and said first and third transverse beams, respectively.

**4.** The lift frame of claim **3** wherein said hydraulic cylinder means further comprise,

a first hydraulic cylinder means operatively connected between said second and fourth beams, and

a second hydraulic cylinder means operatively connected between said third and fifth beams.

**5.** The lift frame of claim **4** wherein said first hydraulic cylinder means comprises,

third and fourth hydraulic cylinder, said first and second cylinders being operatively connected by

first slidable link means, and wherein said second hydraulic cylinder means comprise,

fifth and sixth hydraulic cylinders, said fifth and sixth cylinders being operatively connected by

second slidable link means, and wherein said first and second hydraulic cylinder means are located internally of said transverse beams.

**6.** The lift frame of claim **4** wherein said container engaging means comprises twist locks adapted for engagement into container corner castings and means for locking and unlocking said twist locks from container corner castings.

**7.** The lift frame of claim **5** wherein said control valve means comprise, a plurality of control valves for selectively actuating said first and second, said third and fourth, and said fifth and sixth hydraulic cylinders, respectively.

**8.** The lift frame of claim **1** wherein said control valve means comprise, control valves for selectively actuating said first and second, and said third and fourth hydraulic cylinders, respectively.

**9.** The lift frame of claim **1** further including a cushioning member on said upright frame.

**10.** The lift frame of claim **9** wherein said cushioning member is mounted in a transverse direction on the lower portion of said upright frame.

**11.** The lift frame of claim **1** wherein said container engaging means comprises twist locks adapted for engagement into container corner castngs and means for locking and unlocking said twist locks from container corner castings.

**12.** The lift frame of claim **1** further including load damper means for damping motion of said first and second lift beams.

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