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[54] **LIFTING APPARATUS**

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[51] **Int. Cl.**.....**B66f 9/14**

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

[56] **References Cited**

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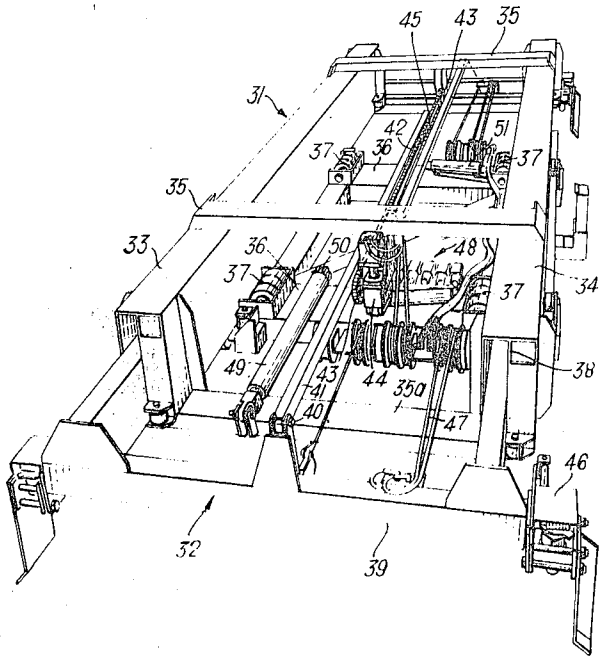
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[57] **ABSTRACT**

A load lifting attachment for use with a fork lift truck for lifting container loads from above, comprising a horizontal main frame having at one or both ends an extension slidable longitudinally with respect to the frame, locking means for retaining the extensions in the frame, power operated means for moving the extension into and out of the frame, load engaging means at the corners of the extensions, a pair of translatable fork elements on the main frame and engageable by the forks, power operated means for moving the frame with respect to said forks.

3 Claims, 4 Drawing Figures



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SHEET 1 OF 3

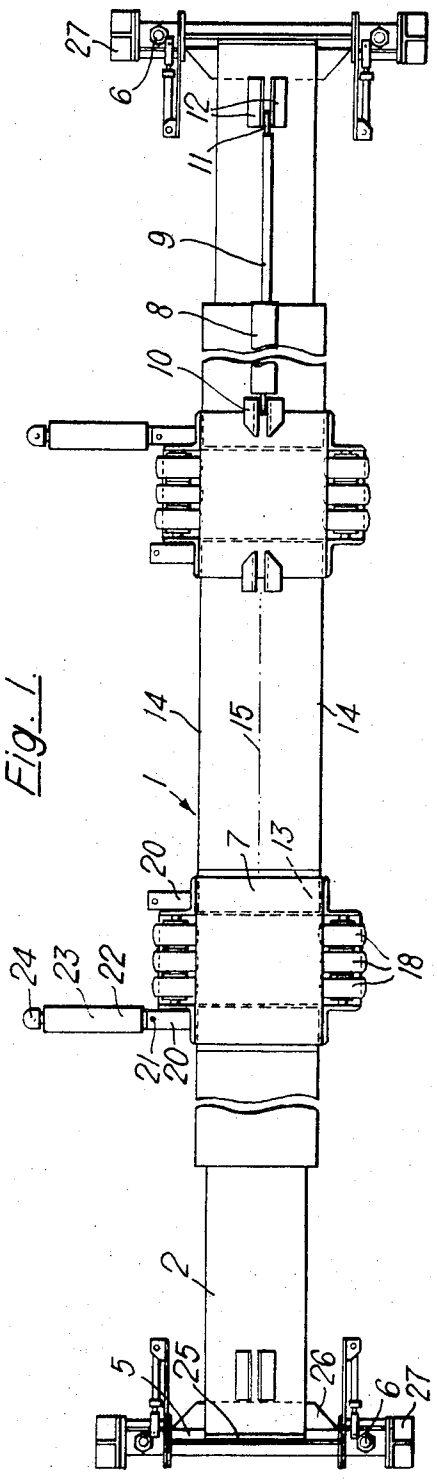


Fig. 1.

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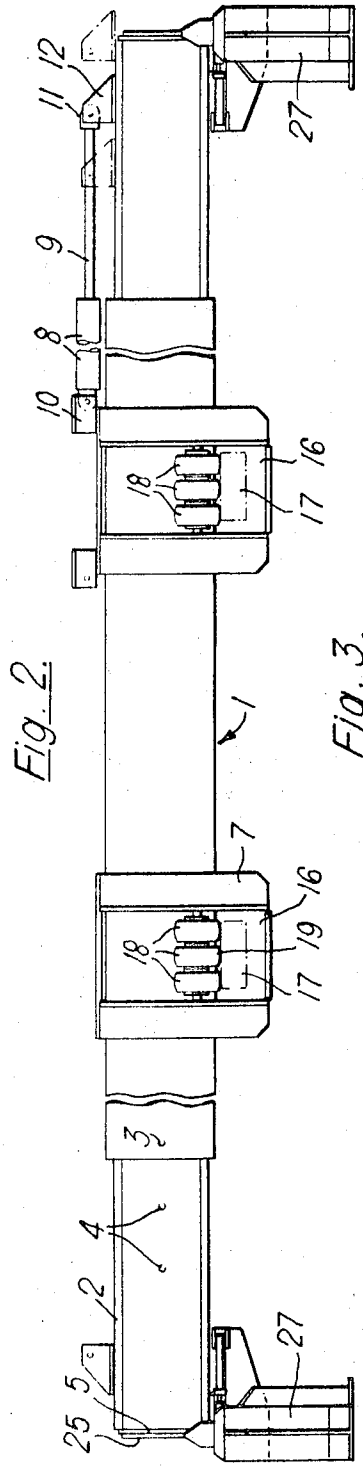


Fig. 2.

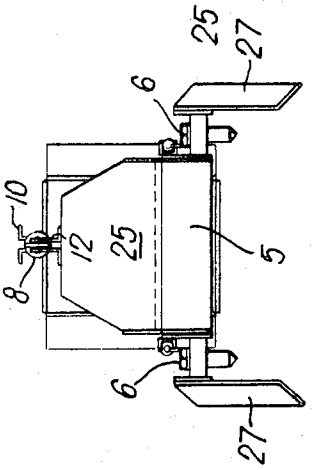


Fig. 3.

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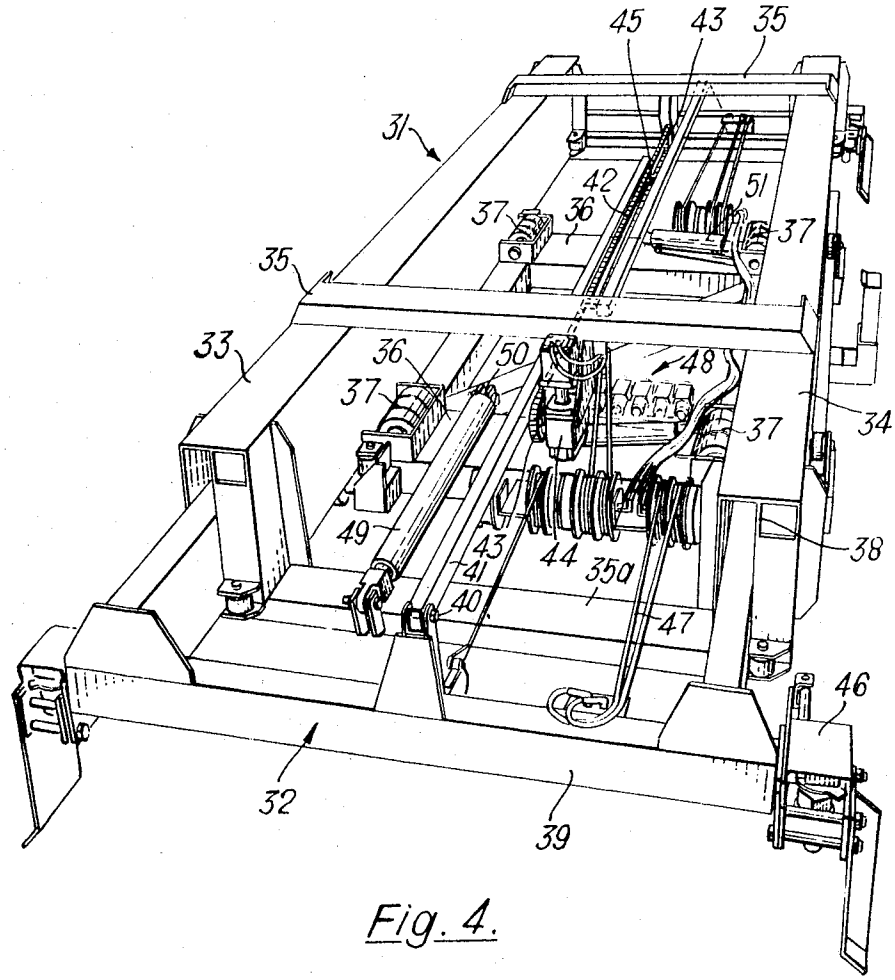


Fig. 4.

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LIFTING APPARATUS

BACKGROUND OF THE INVENTION

Field of the Invention

This invention relates to load lifting apparatus and more particularly to an improvement in or modification of a load lifting attachment.

The attachment of the present invention is particularly suitable for use in mechanically handling containers used in the modern method of containerization for transporting loads packed in box-like closed containers in which the goods can be transported without disturbance in land, sea or air vehicles and/or craft and may be mechanically moved from one transport vehicle to another. Such containers are now of standard length, width and height, and are generally rectangular in form with apertures in reinforced corner units at their four upper corners into which lifting means such as twist locks with downwardly projecting bayonet type locking elements can be engaged; the locks are mounted on the lifting means and rotated to lock them in the apertures or to unlock them by suitable means such as hydraulic rams on or operatively connected to the forks or members associated therewith.

The main object of the present invention is to provide an improved lifting attachment which is simple to manufacture and operate.

SUMMARY

According to the present invention an improvement in or modification of a load lifting attachment comprises a substantially horizontal main frame having at one or both of its end portions an extension element slidable longitudinally of the main frame, means for retaining the extension element at a selected position with respect to the main frame, a transverse element secured to the end portions of the extension elements, or the element and the frame, with a load engaging device at each end portion of each transverse element, a pair of fork receiving elements translatable longitudinally of the main frame and having fork receiving portions transversely of the main frame, and a power operated device connected to each fork receiving element and connectable to the fork received thereby, the attachment including a power operated device connected between at least one end of the main frame or the extension element or elements and at least one of the fork receiving elements for effecting relative movement between the fork engaging elements and the main frame.

The main frame preferably comprises a unitary frame element and the transverse elements are each in the form of a double cantilever arm extending to each side of the main frame.

The main frame may comprise a pair of spaced substantially horizontal frame elements and the end portions of the transverse elements have substantially horizontal extension elements perpendicular thereto slidable with respect to the main frame elements to form a rectangular frame extensible in length at one or both ends or it may be extensible also in width.

The fork receiving elements preferably each comprise a box-like unit having an upper transverse aperture through which the beam passes and a lower transverse aperture transversely of the beam through which the arm of a fork passes.

The fork receiving element may carry on each side one or more freely journalled rollers disposed to ride on the upper surface of the forks when received in the elements. Each fork receiving element may also have rollers freely journalled therein disposed to roll along a horizontal surface or surfaces extending along the frame element.

Preferably an hydraulic ram is provided with its cylinder or piston connected to the frame element and its piston or cylinder respectively connected to one or both of the frame elements. The fork receiving elements may be interconnected and the interconnection may be rigid or capable of adjustment in length and fixable in one of several different lengths in order to vary the space between the forks so that the attachment can be used with fork lift truck vehicles of different sizes.

Each or one of the fork receiving elements preferably has connected to it the piston rod of an hydraulic ram the cylinder of which is pivotally connected to the fork when it is received in the elements. By this means the fork receiving elements can be moved longitudinally along the arms of the forks within the tolerance allowed between the forks and the sides of the apertures in the fork receiving elements through which they pass. This slewing of the attachment can therefore be arranged by operating one of the rams, or by operating both of the rams at the same time the whole attachment can be slid or moved along the arms of the forks to increase or reduce the distance of the center of the attachment from the truck.

BRIEF DESCRIPTION OF THE DRAWINGS

In order that the invention may be more fully understood embodiments in accordance therewith will now be described by way of Example with reference to the accompanying drawings, in which:

FIG. 1 is a plan view of the attachment;

FIG. 2 is a side elevation of the FIG. 1;

FIG. 3 is an end elevation of the attachment in FIG. 1; and

FIG. 4 is a perspective view of an alternative construction.

In the drawings the same references have been used to designate the same parts.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIGS. 1 to 3, the attachment shows a substantially horizontal main frame 1 having at one or both ends, both ends being shown in the drawings, an extension element 2 slidable longitudinally of the main frame 1. Means such as a pin 3 passing through an aperture in the main frame and through one of selected apertures 4 in the extension element may be provided to fix the extension element longitudinally with respect to the main frame. A transverse element 5 is secured to the end portions of each extension element, or where only one element on one end of the frame is provided then at the other end the transverse element will be fixed to the end of the main frame.

Each transverse element at its outer end portion has a load engaging device.

A pair of fork receiving elements 7 are mounted on the main frame so as to be translatable longitudinally thereof.

A power operated device in the form of a ram **8** with a piston rod **9** is connected between a bracket **10** on one fork receiving element and at the other end the piston rod is connected at **11** to a bracket **12** on the extension element. If there is no extension element at that end of the attachment then the bracket **12** will of course be mounted on the end portion of the main frame.

If desired both the fork receiving elements may be provided with the hydraulic ram **8,9** that on the left of FIGS. **1** and **2** being similar to that described herein. Alternatively the two elements **7** may be interconnected by a rigid bar so that operation of the ram **8,9** will cause both the elements **7** to be translated on the main frame but maintained at a constant distance apart. This rigid bar could be telescopic and capable of adjustment in length so that the distance between the two elements **7** can be adjusted to suit trucks having forks which are spaced different distances apart.

Each element **7** is arranged to embrace the main frame at its upper portion so as to slide therealong and may be provided with rollers **13** which ride along surfaces of the main frame.

The main frame preferably comprises a pair of longitudinal I-beams **14** having their flanges horizontal and their webs vertical, the juxtaposed edges of the flanges being welded along the center line **15** or otherwise secured together.

The elements **7** extend below the main frame **1** and in their lower portions have apertures **16** therethrough transversely thereof to receive the forks **17** of the fork lift truck. The apertures **16** are of larger cross sectional area than the forks **17** so that the forks can move freely therein and can be moved sideways for slewing the frame to be described.

The elements **7** have journalled thereto a number of rollers **18**, or a single roller may be used, three being shown in the drawings, and these ride on the upper surface **19** of the forks thereby facilitating longitudinal movement of the attachment with respect to the arms of the forks.

Each element **7** or at least one of them has a bracket **20** to which is pivoted at **21** the piston rod of an hydraulic ram **22** the cylinder **23** of which is connected at **24** by a pivot pin which is temporarily engaged into the arm of the fork of the truck. A number of apertures may be provided along the fork to enable the pin to be inserted at different points as desired.

In fact as shown in the drawings it is preferred to have a ram **23** for each of the elements **7** and in addition each of the elements **7** may be provided as shown with two brackets **20** one on either side so that the rams can be connected at one or the other side of the elements **7**.

The extension element **2** is preferably of a box like construction or beam construction shaped to slide or move within the main frame **1** without fouling the webs or flanges thereof.

The transverse elements **5** may also be telescopic or constructed of I-beams reinforced by plates **25** and connected to the extension elements **2** by welding and strengthening plate **26**.

The end of the extension element can have the guide members **27** pivoted thereto which can be raised or lowered so that when the vehicle having the attachment mounted on its forks is driven alongside the load the attachment can be moved over the load and the guides **27** as the attachment is pushed out over the load will engage the corners of the load and center the attachment over the load so that the attachment can be lowered onto the load to enable the means **6** to be operated to engage the load for lifting it.

The ends of the extension elements **2** of the main frame **1** may be adjustable in length, i.e., width of the attachment for example telescopic, and hydraulic rams may be provided for adjusting their width.

Referring to FIG. **4**, this shows an alternative construction of lifting attachment in accordance with the present invention. This attachment comprises the main frame **31** having, in the drawing at both ends but it may be at one end only, an extension **32** slidable horizontally of the main frame **31**. The frame **31** is formed of two parallel hollow members **33,34** fixed in spaced relationship with transoms **35** shown in their preferred position on the tops of the members **33,34**. The members **33,34** are also interconnected by two transverse hollow members **36**, secured to their undersides and forming channels in which the forks of a fork lift truck can pass. Attached to these members **36** are freely journalled rollers **37** which ride on the top surfaces of the forks when they pass through the channels in the members **36**. The manner of mounting these channels on the forks and for adjusting their position along the forks and securing them in the adjusted position, are the same as described with reference to FIGS. **1** to **3**.

The members **33,34** have longitudinal parallel vertical channels divided by internal walls **38**; one of the extensions **32** shown at the left hand side of FIG. **4** is of U-shaped construction, that is to say it has two horizontal elongated members joined by transoms **39** and the free ends of the longitudinal members are inserted into the channels in the members **33,34** shown at the left hand side in FIG. **4**. The extensions **32** at the other end of the frame **31** is similarly constructed to the one just described, but the free ends of its elongated members pass through the channels in the members **33,34** on the right hand side shown in FIG. **4**. Thus since the elongated members of the two extensions are longer than half the length of the frame, these two extensions can be moved right into the frame **31** so that the members **39** are against the transoms **35***a*, and thus the elongated members of the two extensions can lie side by side within their respective channels in the members **33,34**.

Each extension has pivoted at **40** to it, a rod **41** extending inwardly of the frame and across the members **36**. Between the overlapping portions of these two rods **41** is mounted on the frame a chain **42** which runs over sprocket wheels **43** at each end at least one of which is driven from a prime mover **44** such as an hydraulic motor. Both of these sprockets **43** may be driven by hydraulic motors if desired. The rods **41** have members **45** connecting them to the upper and the lower runs of the chain respectively so that when the chain is moved by rotation of the sprocket **43**, the rods can force the extensions **32** into and out of the members **33,34**.

The attachment is constructed for use with a container used in containerization and at its corners **46**, it has the twist lock unit described with reference to FIGS. **1** to **3** of a bayonet type, which can be inserted into holes in the top corners of the containers and then

rotated to engage under lips thereon for lifting the containers by means of the attachment. These locking units are operated by hydraulic rams, (not shown) but in the conventional manner, and the leads **47** of which one is shown in FIG. **4** carrying the hydraulic fluid, are connected to a junction box **48** fixed to the frame **31**.

An hydraulic ram **49** is connected to one of the transoms **35***a* and its piston rod **50** is connected at its outer end to the member **36** so that the frame **31** can be moved transversely of the members **36** to balance the load with respect to the forks, the members **36** preferably having rollers (not shown) which ride on horizontal flanges on the members **33,34** to facilitate this translational movement.

Also hydraulic rams **51** may be provided between the frame **31** and the members **36** whereby the frame may be slewed with respect ro the members **36** for aligning the frame onto the load when the fork lift truck is not absolutely correctly positioned with respect to the load.

Rams **49** and **51** are provided with hydraulic fluid through flexible lines which pass to the junction box **48** whence leads go to the driver's cab of the fork lift truck for controlling operation of the attachment.

The leads **47** for all the said hydraulic rams may be wound on cables or cable drums on the frame **31** so that during movement of the extensions **32** with respect to the frame **31** the cables do not hang down and interfere with the load, or a tray or plate may be provided across the frame **31** under these flexible pipes so that when they do hang down, they are prevented from falling below the level of the frame **31**.

In both the constructions of the invention, when the frame is mounted on the forks of the fork lift truck, and the driver actuates his controls, he can accurately position his attachment over the container to be lifted before lowering the forks on the truck mast to engage the load and locking the members **46** into the holes in the load.

If desired, sensing devices may be provided which will influence indicators in the driver's cabin, so that he can detect the position of the attachment with respect to the load or the driver having set the control, the sensing devices will influence automatic devices which cause the attachment to be centered by automatic operation of the various rams aforesaid in register with the load.

I claim:

1. A load lifting attachment for use with a fork lift truck for lifting container loads from above, comprising in combination:

a substantially horizontal main frame having longitudinally extending channel means opening onto at least one end thereof;

extension means slidably received in said channel means;

a pair of transverse elements at the opposite ends of said main frame, one of which is fixed to said extension means whereby the transverse elements are relatively movable with respect to each other;

means for retaining said extension means in selected positions with respect to said main frame;

load engaging means at each end of each transverse element for selectively engaging the corners of a container;

a pair of fork receiving means for longitudinal movement along said main frame, said fork receiving means presenting tunnel portions receiving said main frame and each having opposite side portions having aligned openings below said main frame for receiving respective forks of a fork lift truck;

bearing means in said opposite side portions aligned below said main frame for engaging upper surfaces of the forks;

first power operated means connected between said main frame and at least one of said fork receiving means for effecting longitudinal movement thereof with respect to said main frame;

second power operated means for shifting said attachment along said forks;

said main frame comprising a rectangular frame formed of two horizontal elongated hollow elements separated and secured together by transoms and mounted on said fork receiving elements, said extension being U -shaped in form, the arms of which are movable within channels in said main frame elongated elements, power operated means being provided to telescope said extension arms into and out of said channels of said main frame, said power operated means comprising a rod connected to said extension element and extending along said main frame, an endless chain running round sprockets mounted on said main frame, a prime mover driving said sprocket, said chain being connected to said rod whereby on operation of said power operated means said extension is telescoped into or out of said main frame.

2. A load lifting attachment according to claim 1, wherein said main frame comprises a pair of spaced substantially horizontal frame elements and said end portions of said transverse elements have substantially horizontal extension elements perpendicular thereto slidable with respect to said main frame elements to form a rectangular frame extensible in length at least at one end.

3. A load lifting attachment according to claim 1, wherein each fork receiving means has rollers freely journalled therein disposed to roll along a horizontal surface extending along said main frame.

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