United States Patent

Rumell

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[45] **Sept. 5, 1972**

[54] **LIFTING ATTACHMENT FOR FORK LIFT TRUCKS AND THE LIKE**

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[21] Appl. No.: **95,500**

[52] **U.S. Cl.**.....**214/621,** 294/67 D

[51] **Int. Cl.**.....**B66f 9/12**

[58] **Field of Search**.....214/620, 621; 294/67.4 R, 67.4 A

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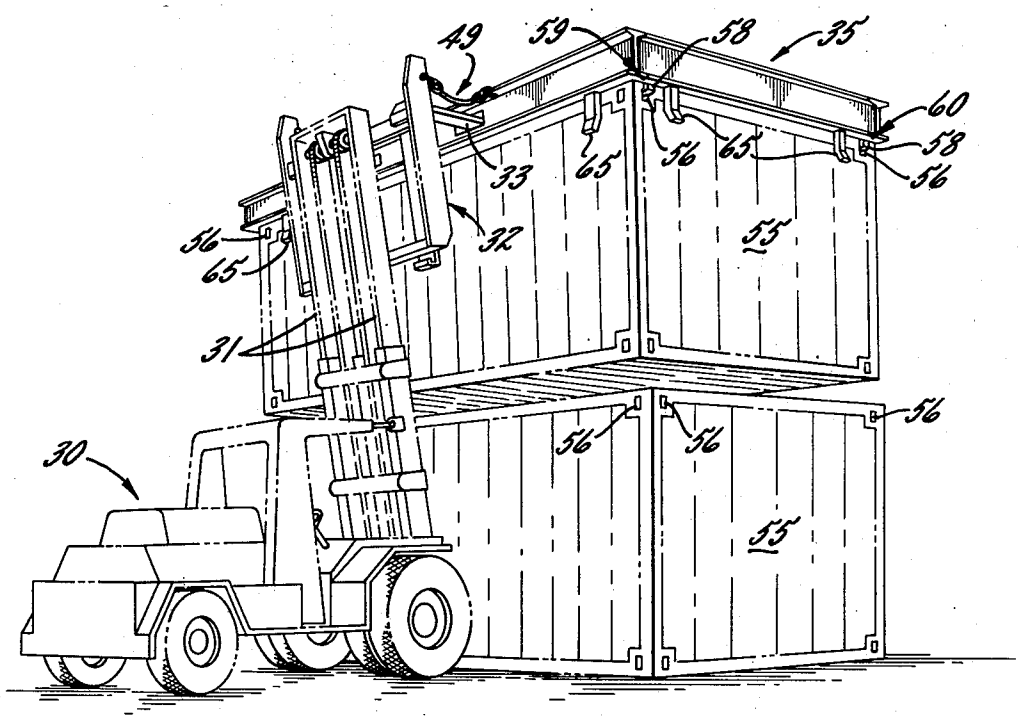
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[57] **ABSTRACT**

An article lifting attachment for a fork lift truck or similar hoisting system is provided. The attachment includes a frame equipped with oversize tine-engaging channels and tensible link members for allowing limited longitudinal and lateral movement of the frame upon the fork lift truck tines. Such longitudinal and lateral movement allows the lifting attachment to be centered over the load to be lifted and further allows the effective reach of the fork lift truck to be extended. Embodiments are described for use in lifting standardized load containers, loose elongated articles, or spooled articles having axial recesses.

5 Claims, 20 Drawing Figures



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6 Sheets-Sheet 1

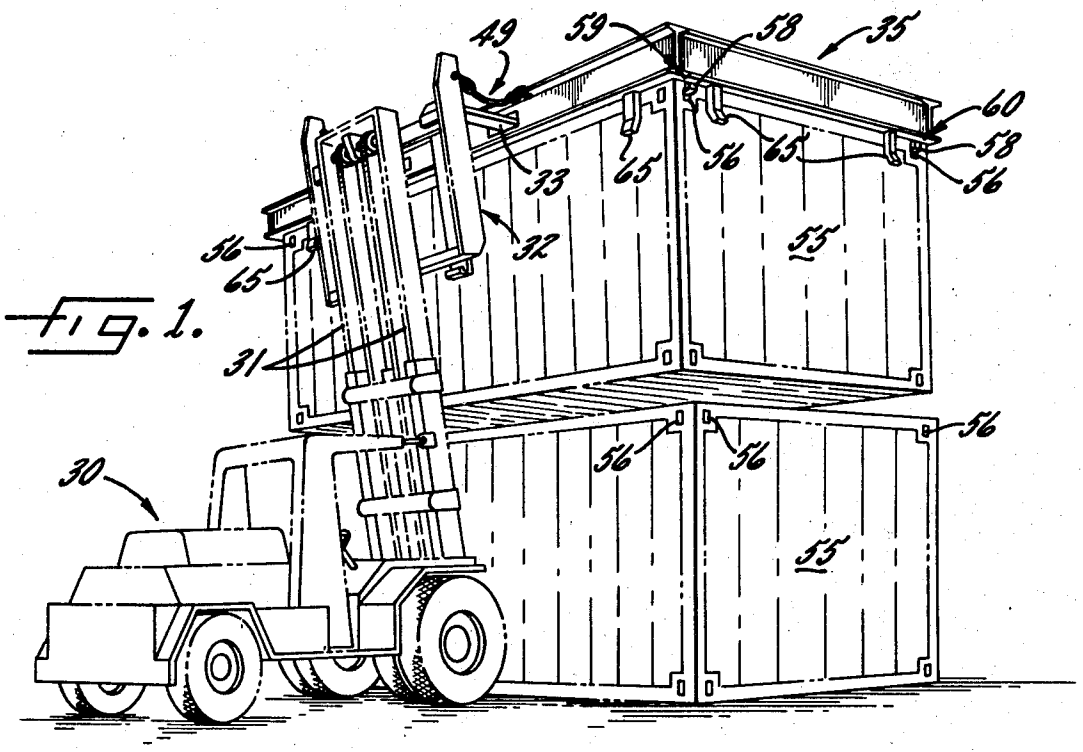


Fig. 1.

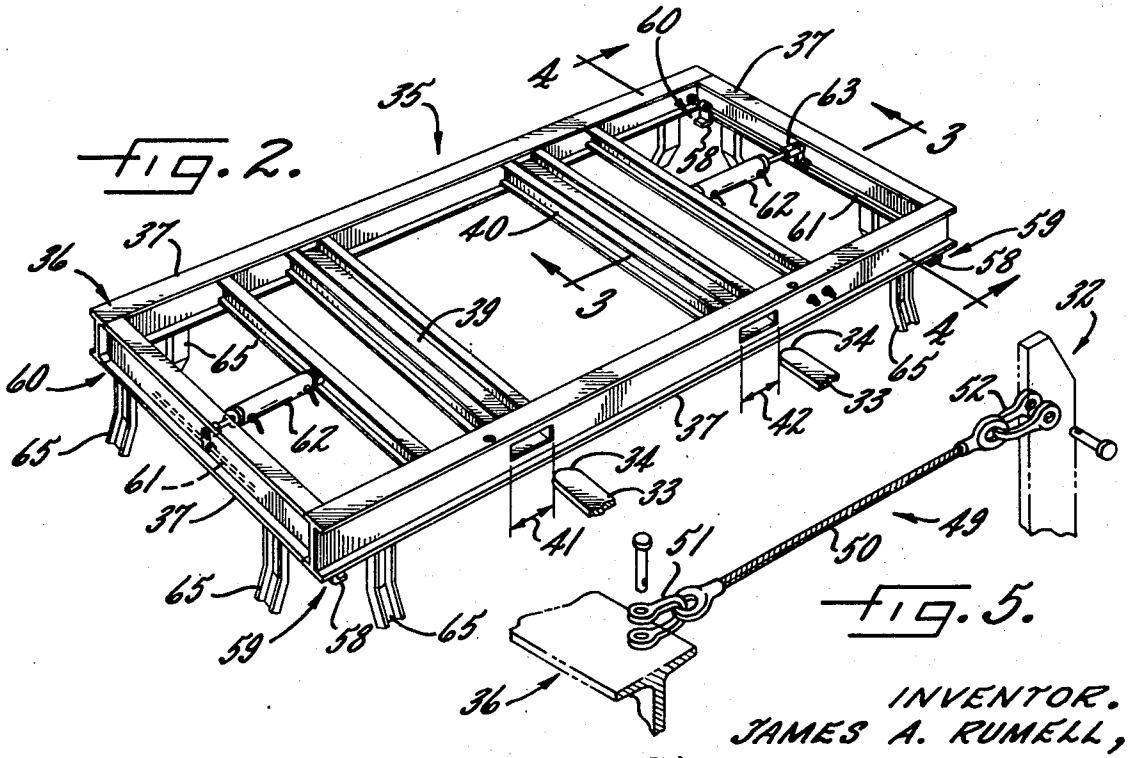


Fig. 2.

Fig. 5.

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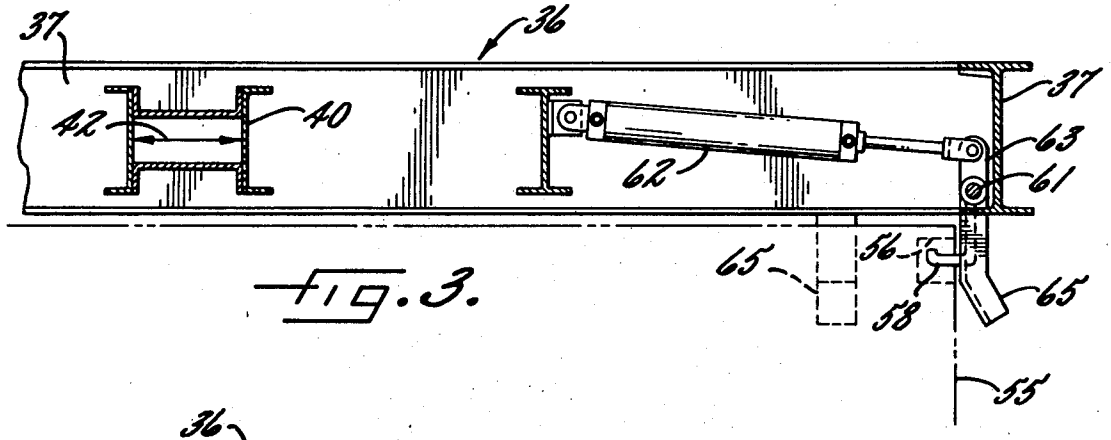


Fig. 3.

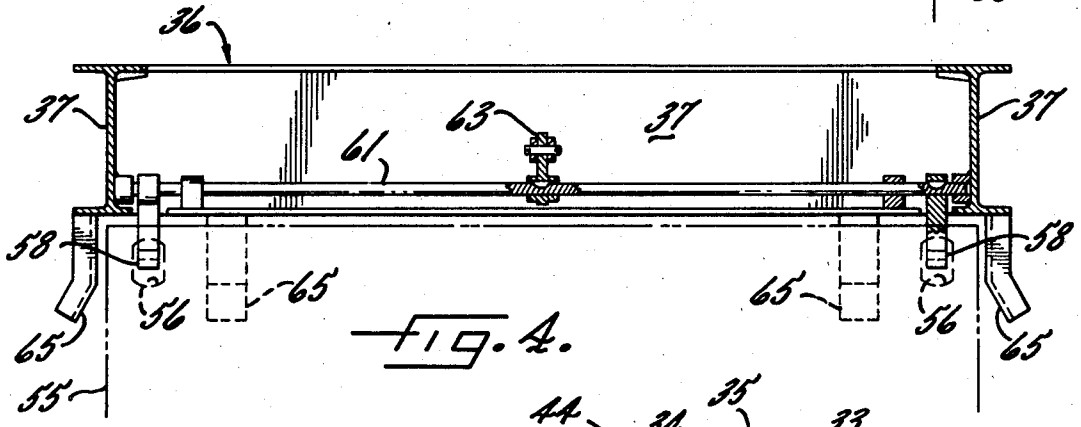


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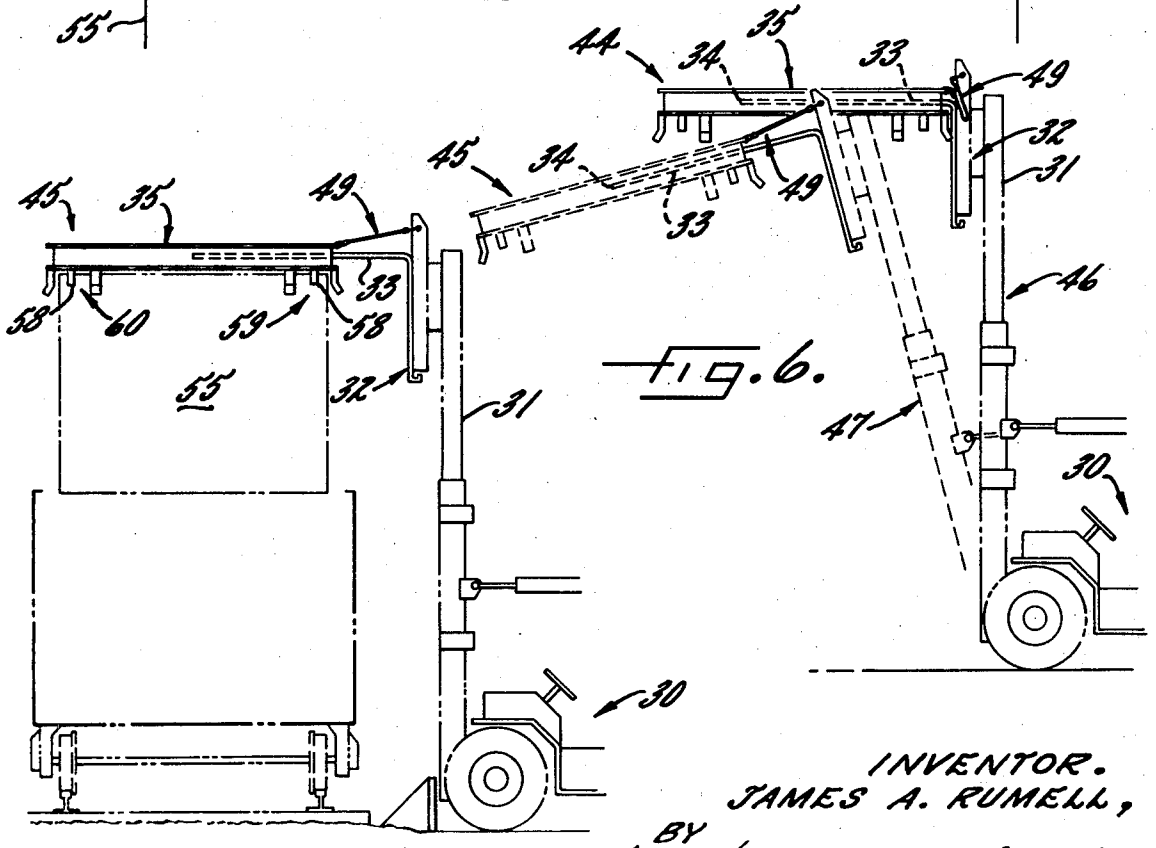
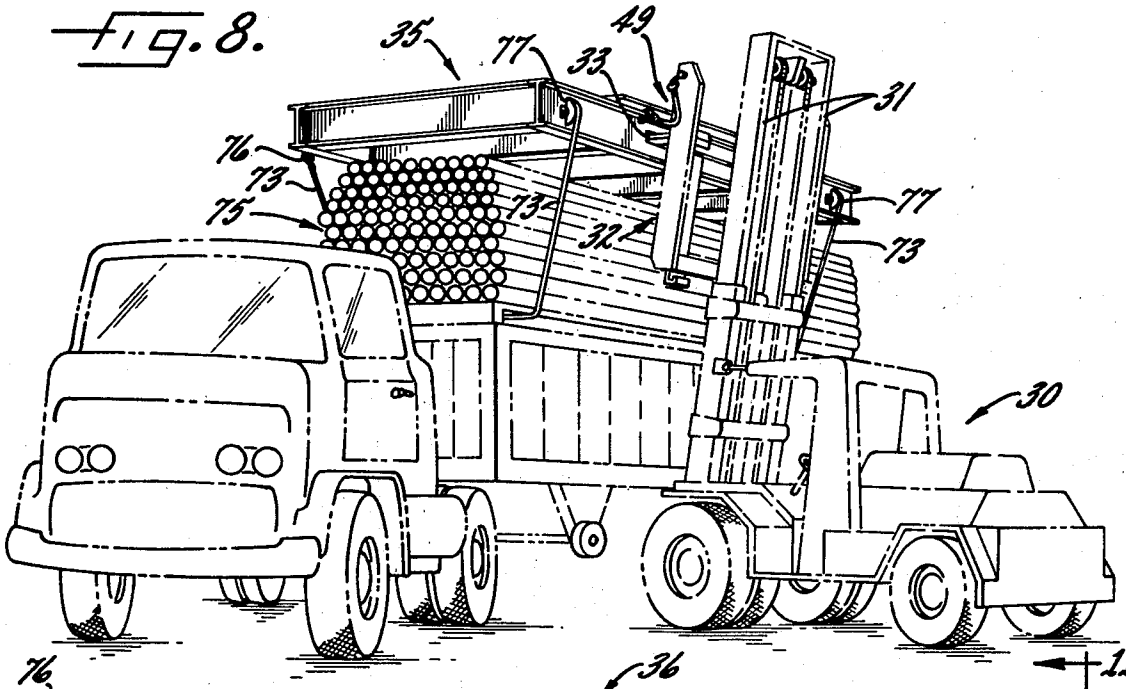


Fig. 6.

Fig. 7.

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Fig. 8.



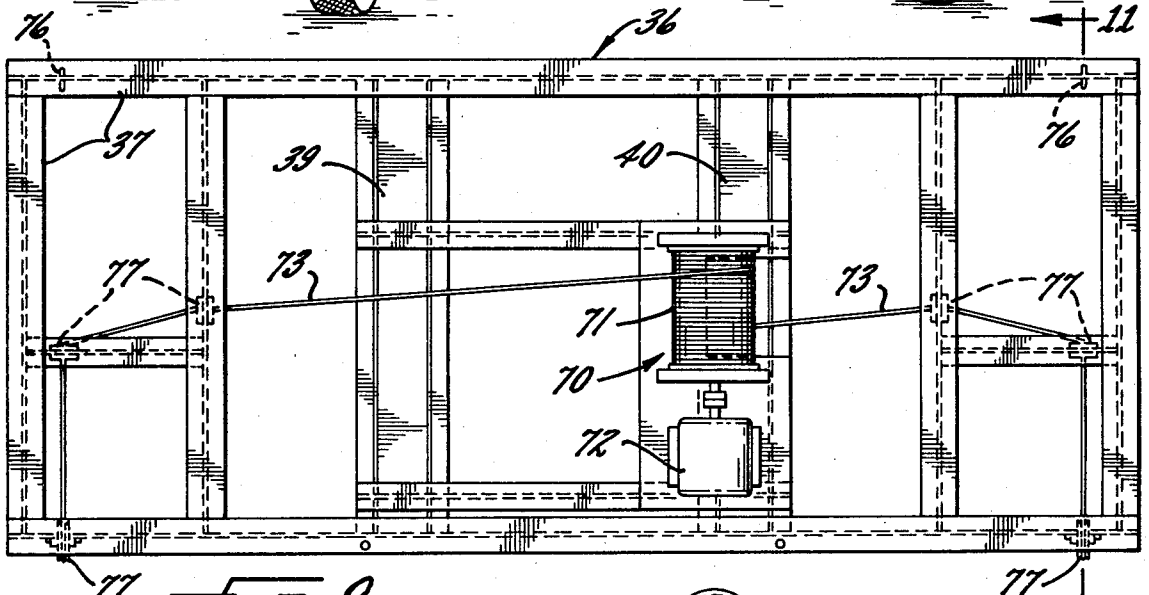


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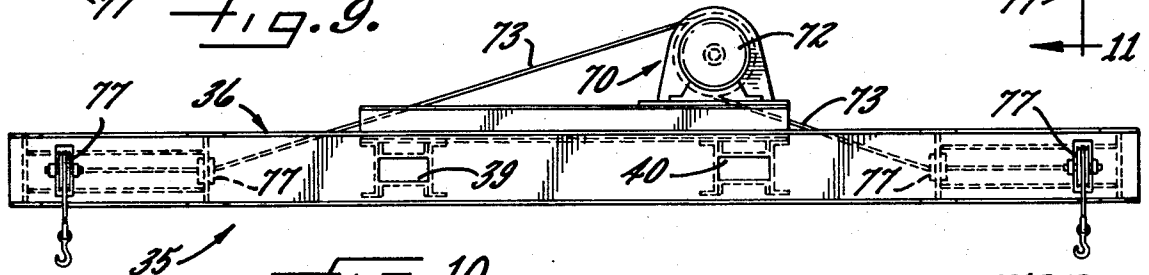


Fig. 10.

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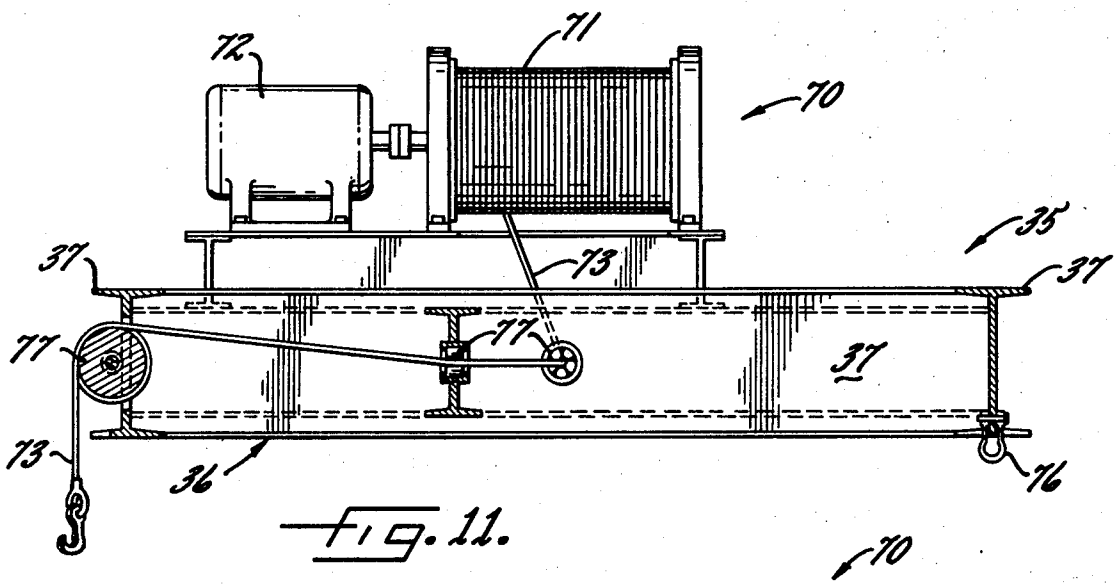


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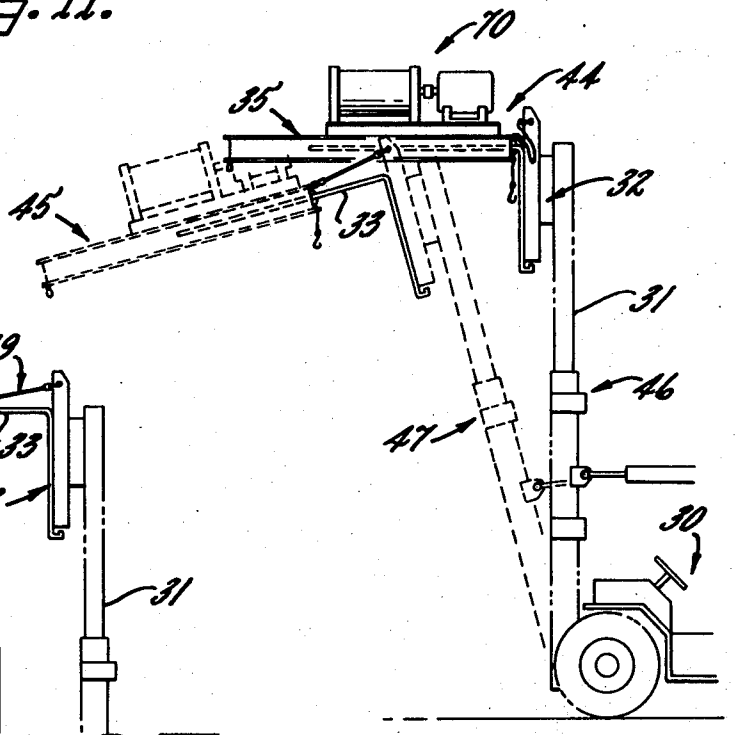


Fig. 12.

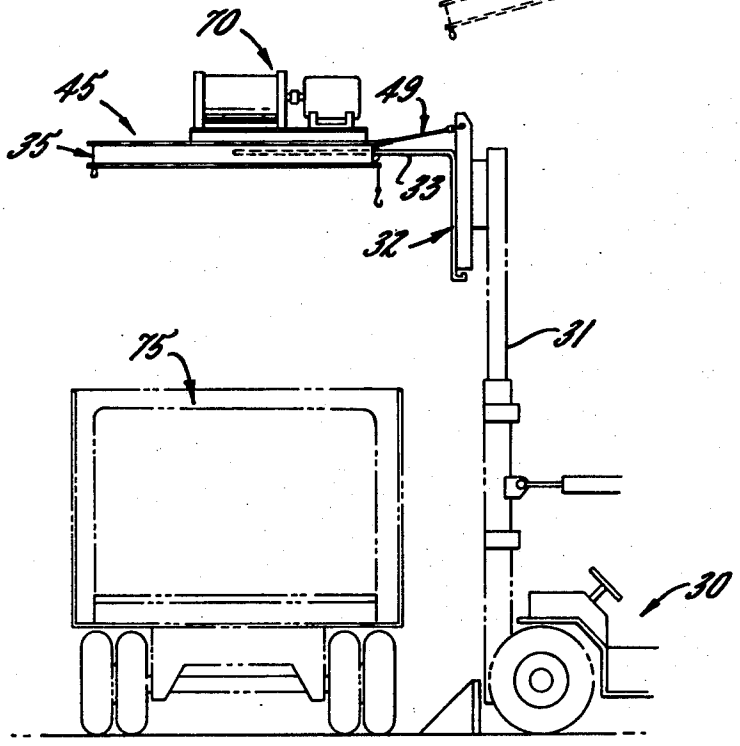


Fig. 13.

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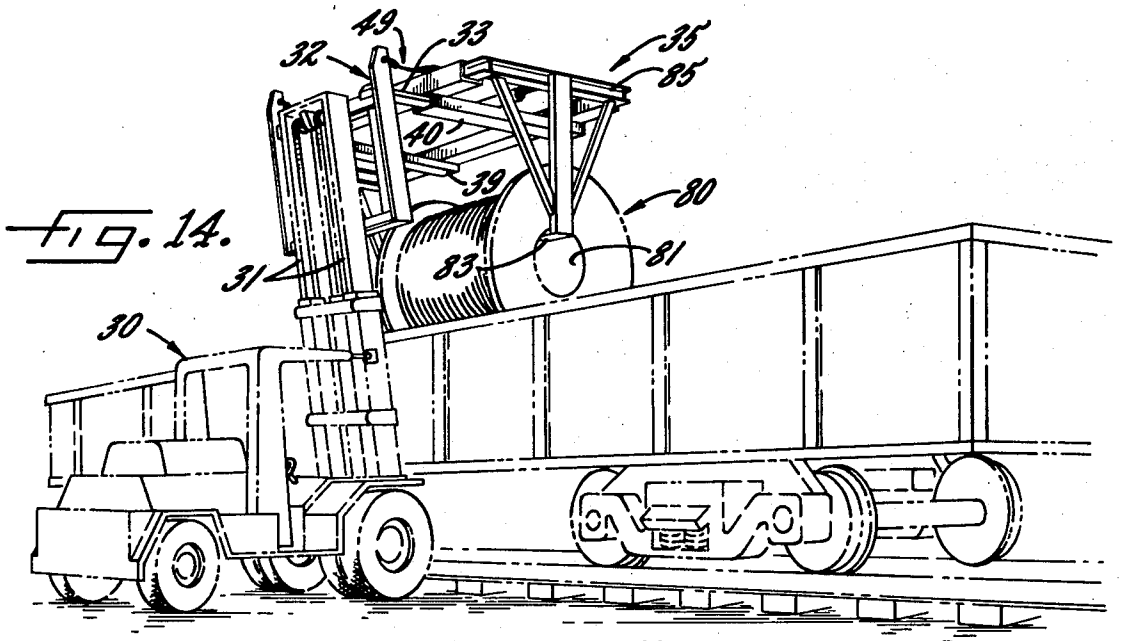


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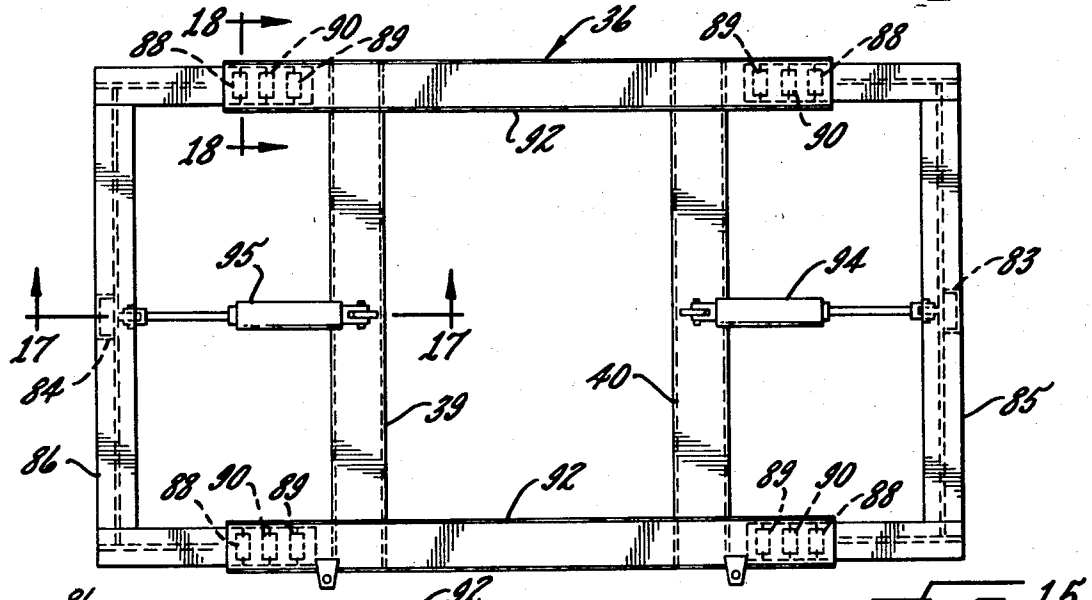


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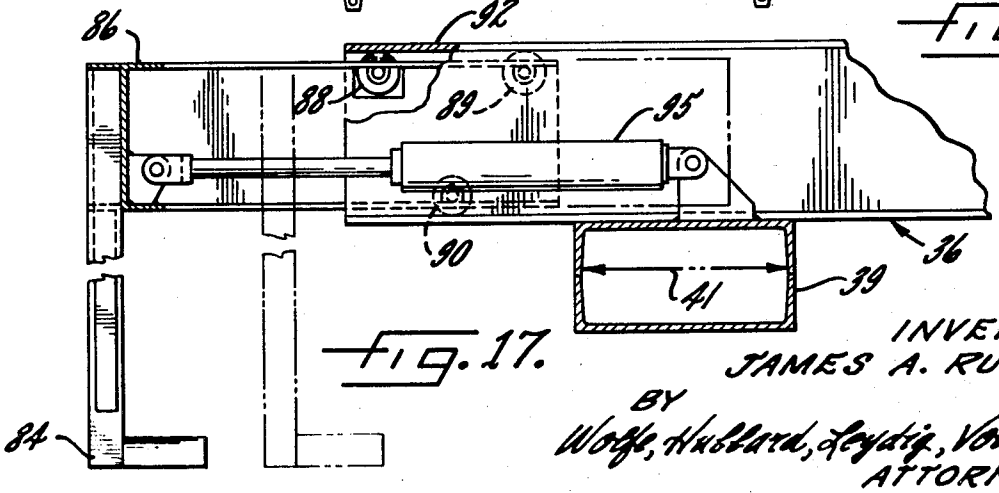


Fig. 17.

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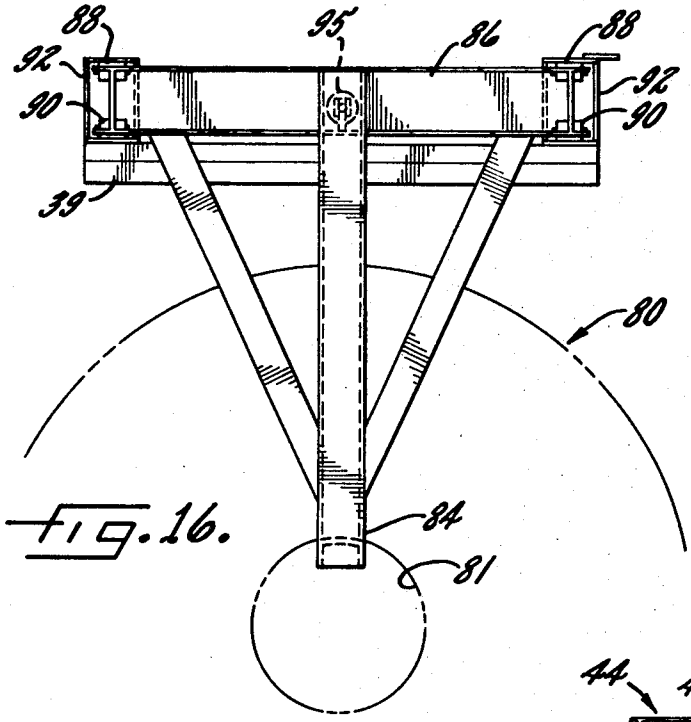


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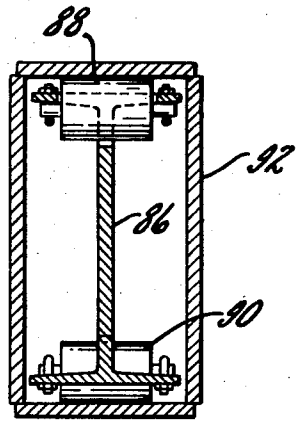


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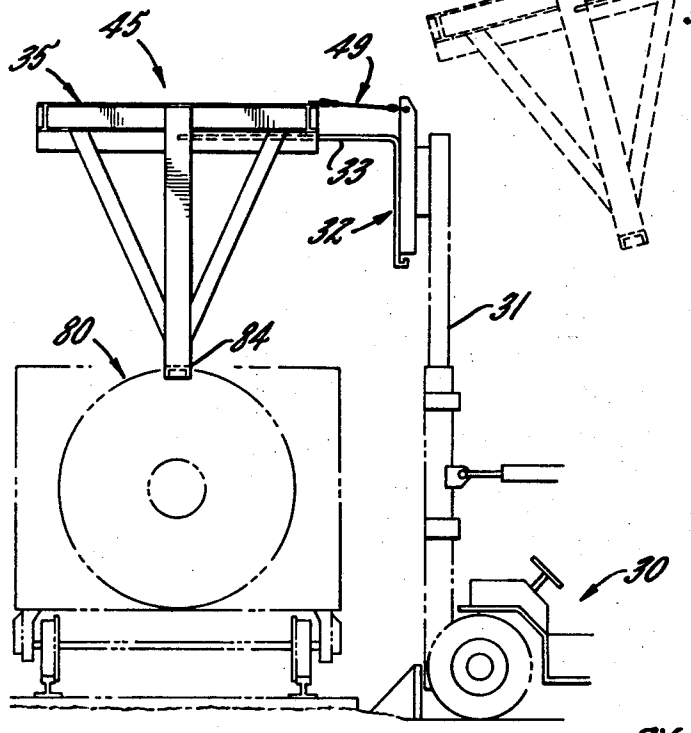


Fig. 20.

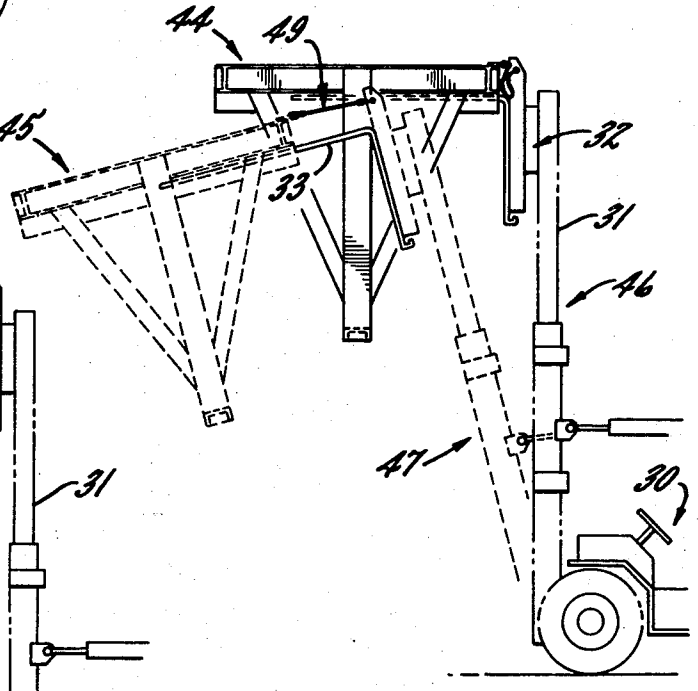


Fig. 19.

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LIFTING ATTACHMENT FOR FORK LIFT TRUCKS AND THE LIKE

DESCRIPTION OF THE INVENTION

This invention relates generally to material handling devices and more particularly to a load lifting attachment for use with fork lift trucks and similar hoisting systems.

The use of fork lift trucks and similar systems for engaging, transporting, and depositing loads in transportation facilities such as docks, warehouses, and railway terminals has become common in recent years. Use of these fork lift trucks has not proved as efficient or easy as might be desired in all cases, however. Bulky items, such as standardized load containers, large bundles of loose items such as pipe lengths, and large irregularly shaped items such as cable spools have sometimes proved difficult to handle. Moreover, such objects are often transported in or upon railway cars or other vehicles having a relatively depressed bottom and elevated sides. Standard fork lift trucks are not adapted to reach over the sides of such railway cars to engage and retrieve such loads, since such trucks can only support loads atop the truck tines.

Moreover, such loads are often located at a distance from the side of the transporter at a spot beyond the effective reach of the fork lift truck. Thus, even if the load bottom is accessible to the tips of the lift fork tines, the load is so located as to prevent its effective engagement by a sufficient length of the tine to safely support the load. In the past, such loads have been unloaded from railway cars or other vehicles by cranes or other special equipment. This equipment is expensive to acquire and to operate.

Several lifting attachments have been proposed for use with fork lift trucks in attempts to overcome the above-described inability of such trucks to initially engage loads carried upon transporters. However, the utility of such load-lifting attachments has, until now, proved limited. Some such load lifting attachments have been rigidly secured to the fork lift truck tines and thus have necessitated extremely accurate positioning of the fork lift truck with respect to the load which is to be engaged. The necessity for such accurate positioning requires, in turn, relatively great skill on the part of the fork lift truck operator in order to place the load lifting attachment precisely over the load to be lifted.

Moreover, some such attachments do not provide a clear indication to the fork lift truck operator that the load to be lifted has, in fact, been securely engaged by the lifting attachment. Improper or incomplete engagement of the load by the attachment has in the past led to accidents when the load has been dropped.

Further, such load lifting attachments have not been designed to extend the effective reach of the fork lift truck. Thus, if the load to be engaged is positioned upon the transporter or other location at a position slightly beyond the normal reach of the fork lift truck, a crane or other auxiliary lifting or hoisting system must be employed to deliver the load to the fork lift truck. Such occurences can lead rapidly to bottlenecks and delayed shipments within the transportation facility. At times, attempts by anxious workers to engage and lift the barely out-of-reach load with only the tips of the fork lift truck tines have led to dangerous working conditions.

It is therefore the primary object of this invention to provide an article lifting attachment of improved effectiveness for use with standard fork lift trucks and like hoisting systems.

It is a more specific object of the invention to provide an article lifting attachment for fork lift trucks and like hoisting and transporting systems which eliminates the necessity for precise positioning of the lifting attachment over the load to be lifted before engagement of the load by the attachment can be made.

It is another specific object to provide an article lifting attachment for use with standard fork lift trucks which is adapted to increase the effective loading reach of the truck.

It is yet another object of the invention to provide a common article lifting attachment platform or frame for use with fork lift trucks and like hoisting systems which may be readily provided with various load engaging apparatus configurations to operate upon a wide variety of load weight and shape configurations.

It is a further object to provide an article lifting attachment, which is simple and effective in design and reliable and rugged in operation.

Other objects and advantages of the invention will become apparent upon reading the following detailed description and upon reference to the drawings, in which:

FIG. 1 is an overall perspective view showing a fork lift truck equipped with the novel article lifting attachment as adapted for engaging and lifting a load container,

FIG. 2 is a perspective view showing in further detail the novel load lifting attachment as adapted for engaging and securing load containers,

FIG. 3 is a fragmentary sectional view taken substantially in the plane of line 3—3 in FIG. 2 showing in further detail the load engaging hooks and hook actuating mechanism provided in a first embodiment of the novel article lifting attachment,

FIG. 4 is a fragmentary sectional view taken substantially in the plane of line 4—4 of FIG. 2 showing in additional detail the load-engaging hook system utilized in the first embodiment of the novel article lifting attachment,

FIG. 5 is a fragmentary view showing in further detail the tensible link device connecting the article lifting attachment frame to the fork lift truck carriage for limited longitudinal motion of the frame upon the fork lift truck tines,

FIG. 6 is an elevational view showing the method by which the effective reach of the fork lift truck may be extended by positioning the novel article lifting attachment in a longitudinal direction along the fork lift truck tines,

FIG. 7 is an elevational view similar to FIG. 6 showing a fork lift truck having engaged and lifted a load container by means of the novel article lifting attachment positioned upon the truck and its extended location,

FIG. 8 is a perspective view similar to FIG. 1 showing a fork lift truck equipped with a second embodiment of the novel article lifting attachment having engaged and lifted a bundle of loose elongated objects such as pipe lengths.

FIG. 9 is a plan view showing in further detail the second embodiment of the novel article lifting attachment shown in FIG. 8,

FIG. 10 is an elevational view showing the second embodiment of the article lifting attachment shown in FIGS. 8 and 9,

FIG. 11 is an enlarged sectional view taken substantially in the plane of line 11—11 of FIG. 9 and showing in further detail the load-engaging cable and cable winch utilized in the second embodiment of the article lifting attachment,

FIG. 12 is an elevational view similar to FIG. 6 showing the method by which the article lifting attachment may be repositioned at its extended-reach location upon the fork lift truck,

FIG. 13 is an elevational view similar to FIG. 7 showing the novel article lifting attachment in its extended-reach position and ready for engagement with a load,

FIG. 14 is a perspective view similar to FIGS. 1 and 3 showing a third embodiment of the novel article lifting attachment,

FIG. 15 is a plan view similar to FIG. 9 showing in further detail the third embodiment of the novel article lifting attachment,

FIG. 16 is an elevational view showing in further detail the third embodiment of the article lifting attachment,

FIG. 17 is a fragmentary sectional view taken substantially in the plane of line 17—17 in FIG. 15 showing in further detail the power means for operating the telescopic hooks mounted upon the third embodiment of the novel lifting attachment,

FIG. 18 is a sectional view taken substantially in the plane of line 18—18 in FIG. 15 showing in further detail the bearings for the telescoping hook subframes utilized in the third embodiment of the novel article lifting attachment,

FIG. 19 is an elevational view similar to FIGS. 6 and 12 showing the method by which the article lifting attachment may be relocated in the extended-reach position, and

FIG. 20 is an elevational view similar to FIGS. 7 and 13 showing the article lifting attachment in its extended-reach position and ready for engagement with a load.

While the invention will be described in connection with several preferred embodiments, it will be understood that it is not intended to limit the invention to that embodiment. On the contrary, it is intended to cover all alternatives, modifications and equivalents as may be included within the spirit and scope of the invention.

Turning first to FIG. 1, there is shown a fork lift truck 30 which is provided with vertical ways 31 upon which is mounted for vertical movement a carriage 32. A plurality of horizontal tine members 33 terminating in tips 34 are mounted upon the carriage 32 for engaging various loads. It is contemplated by the invention that the fork lift truck 30 and tine members 33 will be of a standardized construction, and that the tine members 33 will have a predetermined or given width and length and will be disposed in a substantially horizontal plane.

For grasping and lifting loads in accordance with the invention, the novel article lifting attachment 35 is provided. It is a feature of the invention that the article lifting attachment 35 is not rigidly affixed to the carrying fork lift truck tines 33, but is rather mounted for limited longitudinal motion in a direction parallel to the depth of the tine member and for limited lateral motion in a direction perpendicular to the depth of the tine member. Such lateral and longitudinal motion allows the attachment 35 to be centered over the load to be engaged without extensively maneuvering the fork lift truck 30.

To carry out this feature of the invention, the article lifting attachment 35 includes a frame 36 which, in the embodiments illustrated comprises a generally rectangular assemblage of structural beams 37 of suitable strength. To receive the truck tines 33, a pair of channels 39 and 40 are formed upon the frame 36. These channels 39 and 40 are constructed so that their interior widths 41 and 42 are greater than the widths of the inserted tine member 33 by a predetermined amount, thereby allowing limited horizontal motion of the frame 36 in the described lateral direction. By way of example, if a tine to be inserted into the channel 40 is of an 8 inch width, the interior width 41 of the channel 40 may be of a 12 inch width, thereby allowing the frame 36 to shift up to 2 inches in a lateral direction from a centered condition.

In accordance with an associated aspect of the invention, means are provided for limiting the longitudinal motion of the attachment 35 in a direction parallel to the length of the tine members. As illustrated in FIGS. 6, 7 and elsewhere, the lifting attachment 35 may thus be slid in a longitudinal direction parallel to the length of the tine members between a first position 44 wherein the tine members 33 are relatively full inserted into the channel members, and a second position 45 wherein the tine members 33 are relatively withdrawn from the channel means to a predetermined extent. Movement between the first position 44 and second position 45 may be easily accomplished by actuating standard hydraulic circuitry in the truck 30 to tip or incline the vertical ways 31 between the illustrated vertical position 46 and an inclined position 47. In so doing, the tines 33 are correspondingly inclined so as to allow the lifting attachment 35 to slip toward the tine tips 34.

To insure that the lifting attachment 35 does not slip excessively far toward the tine tips 34 are tensible link means 49 are provided. As illustrated in FIG. 5 and elsewhere, these tensible link means may consist of a length of cable 50 attached by U-brackets 51 and 52 or other convenient means to the frame of the attachment 36 and to the carriage 32. Thus, the lift truck operator may extend the effective reach of his fork lift truck merely be dipping or inclining the vertical ways 31 sliding the article lifting attachment 35 out upon the lift truck tines 33 to the full extent of the tensible link 49, and re-leveling the tines 33 and attachment 35. In such position, a load not otherwise reachable, as seen in FIG. 7, may be engaged by the attachment 35.

If it is desired to transport such load over some distance, the load may be first engaged with the article lifting attachment 35 in its extended position 45, repositioned slightly closer to the edge of the transporter or other platform, and the truck nudged or urged closer to the load, thereby relatively moving the article lifting attachment 35 and engaged load closer to the first described position 44. With the article lifting

attachment 35 and engaged load so located in the first described position 44, the article may be safely moved by the fork lift truck 30 to any other desired location.

In accordance with a further aspect of the invention, pickup apparatus is provided on the article lifting attachment for grasping or engaging and securing the load. In the first illustrated embodiment, the pickup apparatus is provided to engage, secure and pick up load containers 55 of a standardized size and shape. Each container is provided with a plurality of hook-receiving recesses 56 situated at the top corners of the container 55.

To engage this container load 55 in accordance with the invention, the attachment 35 is provided with a number of container-engaging hooks 58 which may be pivoted into engagement with the recesses 56. Strain upon the hooks 58 is minimized by forming the hooks to a width substantially equal to the width of the receiving recesses 56.

As may be envisioned by reference to FIG. 1, it may be difficult for the vehicle operator to assure himself that the load container 55 is safely and fully engaged by the hooks 58 before actually attempting to pick up the container. It is a feature of this invention that one or more of the hooks 58 are located within the line of sight of the fork lift truck operator. These visible hooks, which may be termed guide hooks 59, are connected to the remaining or blind hooks 60 so that the guide hooks 59 will engage the load 55 only when all the hooks have completely engaged the container recesses 56. To this end, as seen in FIG. 2 and elsewhere, a hook rotating shaft 61 is located at each end of the frame 36. The guide hooks 59 are mounted upon each of the two hook-rotating shafts 61 for rotation in respective vertical planes upon the horizontal shaft 61 at locations adjacent the visible corners of the frame 36. Fluid cylinders 62 and crank arms 63 are provided to rotate as a unit each hook rotating shaft 61, and the guide hook 59 and blind hook 60 secured thereupon.

In operation, the fork lift truck operator generally positions the attachment 35 over the container 55 to be lifted, and lowers the lifting attachment 35 thereupon by lowering the fork lift truck tines 33. As the attachment 35 is lowered, guides 65 accurately cam the attachment 35 into its final engagement position on top of the container 55. These guides, here illustrated as angularly-positioned channels, are located adjacent each corner of the frame 36. The operator may then actuate the fluid cylinders 62 to pivot the hooks 58 into engagement with the hook-receiving recesses 56 upon container 55. If, for some reason, a blind hook 60 which the driver cannot see does not engage the corresponding recess 56, the guide hook 59, being affixed to the same shaft, will rotate no further toward its corresponding hook receiving recess 56, and will halt in a position out of engagement with the recess 56 so that the truck operator may determine at a glance that recess engagement has not been accomplished and that conditions are unsafe for lifting the container 55.

A second embodiment of the article lifting attachment 35, illustrated generally in FIGS. 8—13, may be provided for engaging loose bundles of elongated objects, such as pipe.

In accordance with the invention, the pickup means in this second embodiment includes winching means 70 comprising a cable drum 71, a suitable motor or other power means 72 for driving the drum, and a cable 73 wound upon the winch drum 71. As illustrated, the cable 73 may be let out by appropriate rotation of the drum 71, passed around the load 75 at each end of the frame 36 and hooked to an appropriate eye 76 affixed to the opposite side of the frame 36. The cable drum 71 may then be oppositely rotated to tighten the cable 73 into a sling about the load 75 for firmly securing the load 75 to the attachment 35. Appropriate bearings and pulleys 77 are provided to allow free movement of the cable 73.

As described in connection with the first embodiment of the invention, the article lifting attachment 35 may be moved from a first position 44 located closely adjacent to the carriage 32 of the fork lift 30 to an extended position 45 so as to extend the effective reach of the forklift truck 30, and thereby reach otherwise inaccessible loads. After the load is engaged, it may then be moved to a non-extended position 44 before being carried away.

Yet another type of load 80, such as large spools or other objects having an axial recess 81 therein, may be engaged by a third form of the article lifting attachment 35 as illustrated generally in FIGS. 14–20. Here, a pair of large opposed hook members 83 and 84 are mounted upon subframes 85 and 86, respectively. For moving the hooks 83 and 84 into and out of engagement with the load 80, the subframes are mounted for telescoping motion upon the main frame 36. In the illustrated embodiment, such mounts include three roller bearings 88, 89 and 90 which are journaled upon the subframes 85 and 86 for rolling engagement with the interior of box beams 92 forming part of the main frame 36.

For moving the subframes 85 and 86 and the load engaging hooks 83 and 84 carried thereupon into and out of engagement with the load, power cylinder means 94 and 95 are provided. By means of appropriate fluid circuitry controlled from the driving position of the fork lift truck 30, the operator may selectively extend the subframes 85 and 86, thus separating the load-engaging hooks 83 and 84. The article lifting attachment 35 may be extended, if necessary, as described above and then positioned over the load, and the article engaging hooks 83 and 84 drawn toward each other by reversely powering the cylinders 94 and 95.

The following is claimed as invention:

1. For use in lifting loads with a fork lift truck having at least one tine member of a given width and depth disposed in a substantially horizontal plane, and tine carriage means carrying the tine for vertical movement through a range of heights, a containerized cargo lifting attachment comprising the combination of frame means, channel means carried upon the frame means and slidably engageable with the truck tine member for allowing motion of the frame means in a longitudinal direction parallel to the length of the tine member, flexible link means connecting said attachment and said carriage means for limiting the motion of the attachment in said longitudinal direction between a first position wherein the tine member is relatively fully inserted into the channel means and a second position wherein the tine member is relatively withdrawn from the channel means to a pre-determined extent, said

channel means having an interior width substantially greater than the width of said tine member for allowing limited horizontal motion of the frame means on said tine in a direction transverse to the length of said tine, tapered cam members extending downwardly and outwardly from the outer periphery of said frame for camming the attachment into a predetermined location overlying the load to be lifted, and pickup means for selectively engaging and securing the load to the attachment.

2. An article lifting attachment according to claim 1 wherein said pickup means includes at least four hook members mounted upon horizontal pivots for rotation in vertical planes adjacent the corners of said frame means for selective engagement with any of a plurality of load containers, each load container being provided with at least a corresponding number of hook-receiving recesses of a width substantially the same as the hook width, and hook pivoting means for pivoting the hooks into engagement with the recesses.

3. An article lifting attachment according to claim 2 wherein said hook pivoting means includes fluid cylinder means and hook rotating means located at each end of said frame means, each hook rotating means operating at least one guide hook within the line of sight of the fork lift truck operator, other load-engaging hooks connected to the hook rotating means for operation in unison with the guide hook so that the guide hook will engage the load only when all hooks connected to the hook rotating means will engage the load.

4. An article lifting attachment according to claim 1 wherein said pickup means includes winching means, and a flexible cable member wound upon the winching means, the ends of the cable means being disposed at each end of said frame means for engaging and securing a load to the attachment in a sling.

5. An article lifting attachment according to claim 1 wherein said pickup means includes a subframe mounted for telescoping motion upon the main frame, a pair of opposed hook members each mounted upon the subframe, and power means for telescopicly moving the subframe and the hooks carried thereupon into and out of engagement with a load.

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