Feb. 5, 1957 W. S. GLENN, JR., ET AL 2,780,377

ARTICLE GRAPPLING AND STACKING ATTACHMENT FOR LIFT TRUCKS

Filed March 16, 1954 5 Sheets-Sheet 1

Fig-1-A

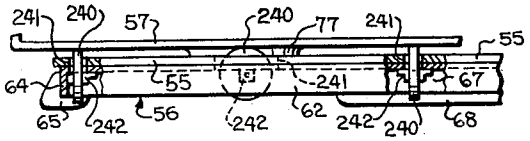


Fig-1

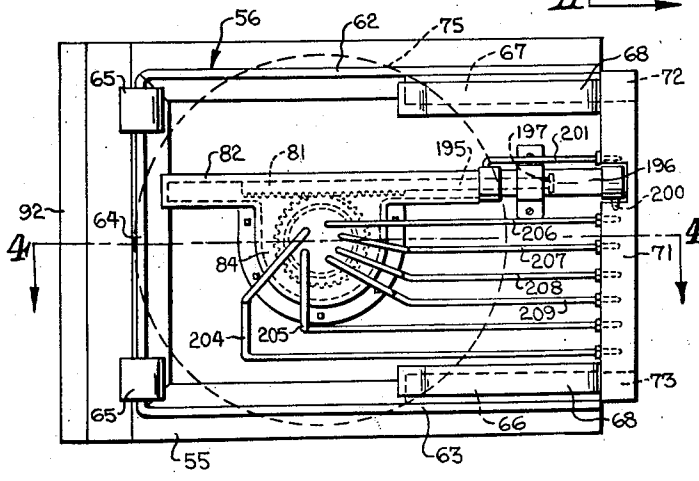


Fig-2

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ARTICLE GRAPPLING AND STACKING ATTACHMENT FOR LIFT TRUCKS

Filed March 16, 1954 5 Sheets-Sheet 2

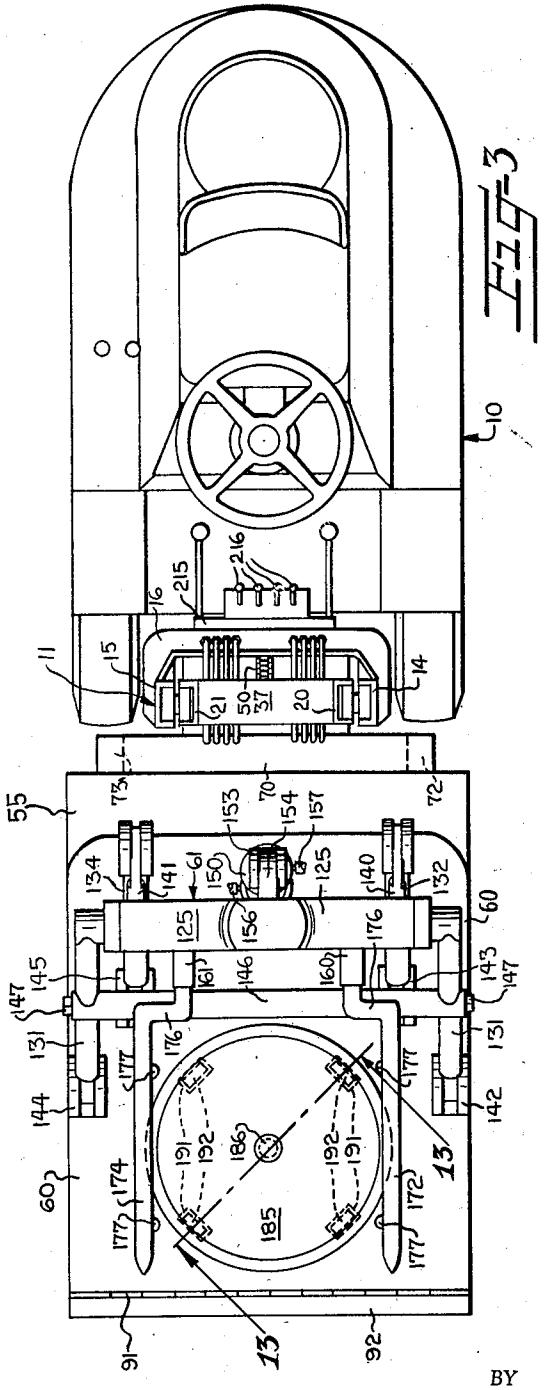


FIG-3

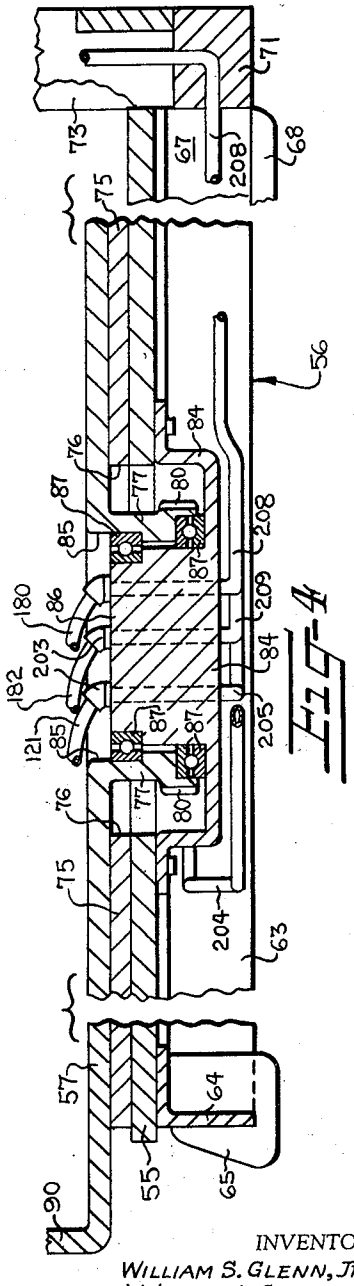


FIG-4

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ARTICLE GRAPPLING AND STACKING ATTACHMENT FOR LIFT TRUCKS

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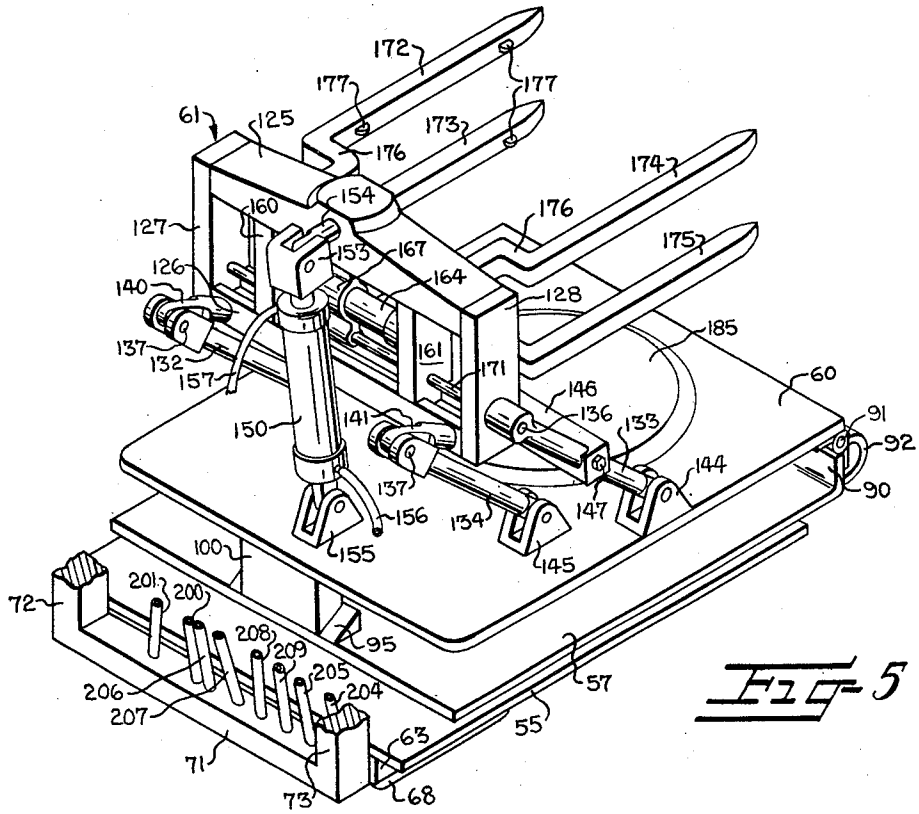


Fig-5

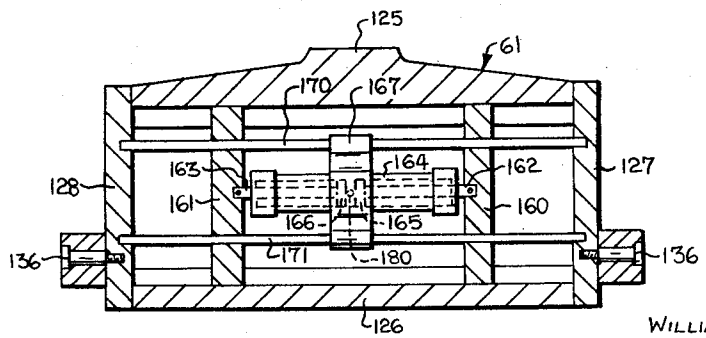


Fig-6

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ARTICLE GRAPPLING AND STACKING ATTACHMENT FOR LIFT TRUCKS

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Fig-7

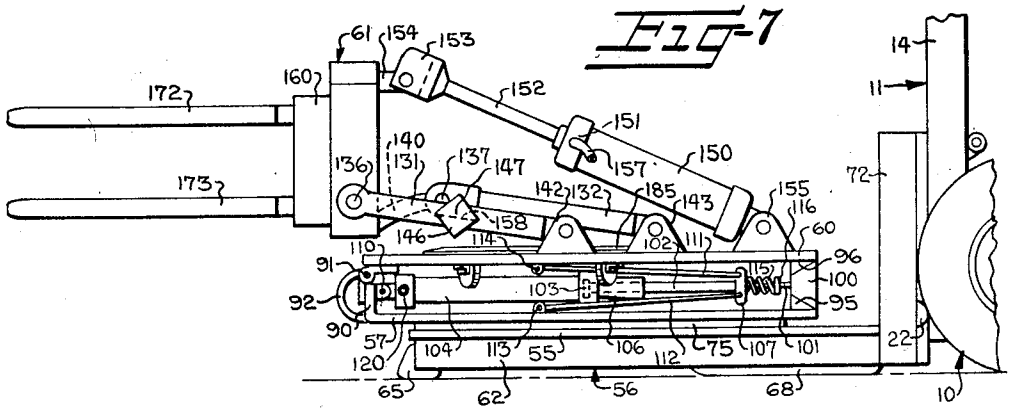


Fig-8

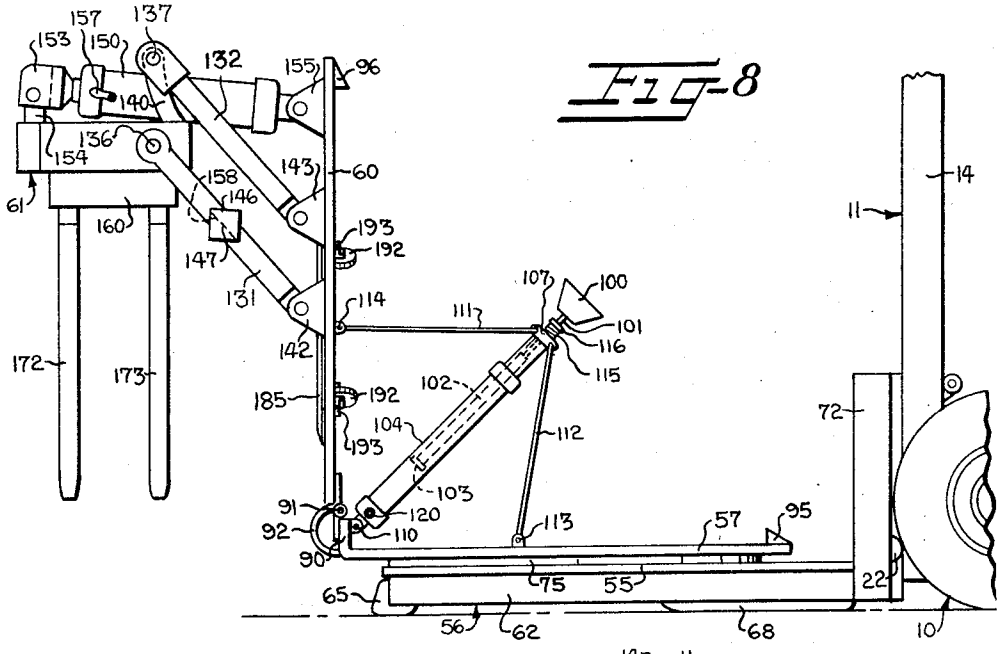
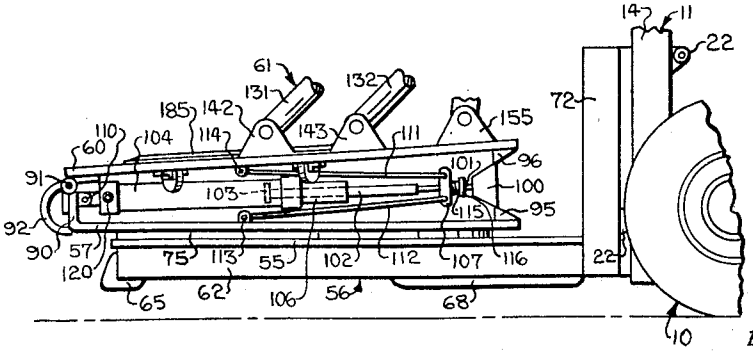


Fig-9



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ARTICLE GRAPPLING AND STACKING ATTACHMENT FOR LIFT TRUCKS

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Fig-10

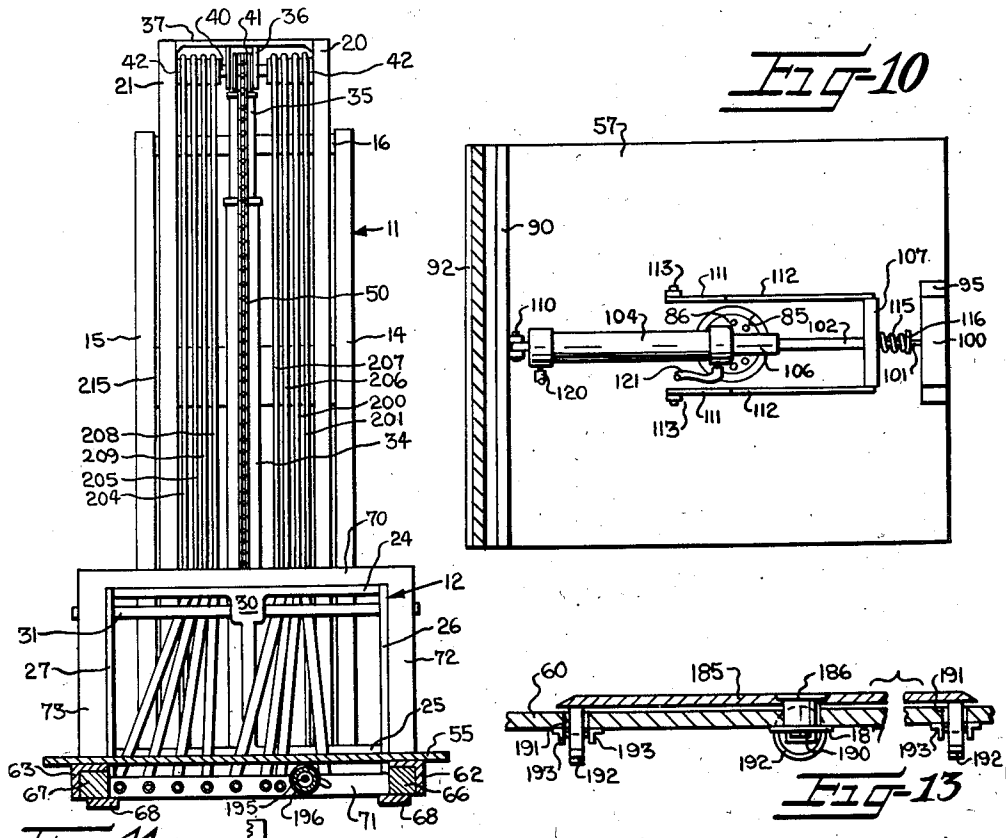
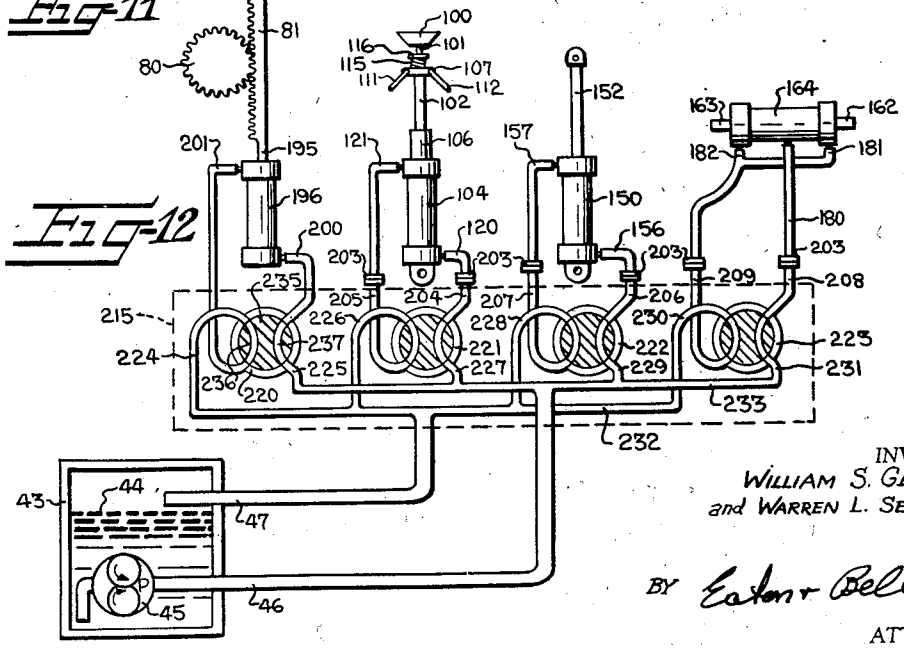

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Fig-11

Fig-13

Fig-12



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United States Patent Office 2,780,377 Patented Feb. 5, 1957

2,780,377

ARTICLE GRAPPLING AND STACKING ATTACHMENT FOR LIFT TRUCKS

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Application March 16, 1954, Serial No. 416,578

11 Claims. (Cl. 214—652)

This invention relates to apparatus of the type associated with industrial trucks for handling heavy articles such as large boxes or other containers, cotton bales and the like.

It is the primary object of this invention to provide an improved article handling and stacking apparatus adapted to be mounted on the usual raising and lowering means of an industrial truck, which apparatus is of simple, compact construction to enable the truck to freely pass through relatively narrow aisles between adjacent rows of stacked articles and wherein the apparatus is provided with a tiltable platform having a grappling means thereon which is shiftable out of the vertical plane of the platform for gripping the article and lifting the same onto the platform and, also, wherein the platform may be elevated to the desired level and tilted in any desired direction, except toward the truck itself, for depositing the article on its side upon other articles, or the grappling means may be moved outwardly in any desired direction relative to the truck, with the exception of being moved toward the truck itself, for depositing the article upon other articles in the same upright position in which the article was originally disposed when it was initially grasped by the grappling means.

It is another object of this invention to provide an apparatus of the type described which is provided with fluid pressure operated means for imparting movement to the tiltable platform and the grappling means relative to the platform and also wherein the grappling means comprises spaced members which are movable toward and away from each other by fluid pressure operated means, for gripping articles therebetween.

Briefly, the invention comprises a base adapted to be mounted on the usual lift element of an industrial truck and on which base a lower or primary platform is mounted with fluid pressure operated means for rotating the primary platform about a substantially vertical axis. The primary platform has a secondary platform hingedly connected thereto at one edge thereof and fluid pressure operated means are also provided for tilting the secondary or hinged platform relative to the primary platform. The secondary platform has a turntable thereon which may be manually rotated by rotating the article positioned thereupon so the article may be turned to any desired position after being positioned upon the secondary platform.

Also, mounted on the secondary, hinged or tiltable platform, adjacent the free end thereof, is a grappling device having arms extending therefrom whose free ends normally terminate adjacent the hinged edge of the secondary platform and means are provided for swinging or moving the grappling device outwardly and downwardly with respect to the secondary platform.

Fluid pressure operated means are also provided for moving the grappling arms toward and away from each other so that, when the grappling device is swung outwardly and downwardly relative to the secondary platform, the article may be grasped therebetween and then raised as the grappling device is returned to its original position so the article is then positioned upon the secondary platform, although the secondary platform is spaced substantially above the floor upon which the truck is positioned.

It is apparent that the usual lifting means of the truck may then be operated to raise and lower the improved apparatus as desired and, when raised, the grappling means may be operated to shift the article from the second platform while maintaining the same in its original attitude and to thus position the article upon other stacked articles, if desired. On the other hand, the grappling device may be maintained in its position above the platform and the secondary platform may then be tilted after which the article is released from the grappling device so the article is then positioned on its side upon other articles as desired.

Since the primary platform is mounted for movement about a vertical axis, it follows that the articles handled by the improved apparatus may be positioned forwardly of, or to either side of, the truck as desired.

Some of the objects of the invention having been stated, other objects will appear as the description proceeds, when taken in connection with the accompanying drawings, in which—

Figure 1 is a side elevation of the improved apparatus showing the same in association with a portion of an industrial lift truck;

Figure 1–A is a fragmentary view similar to the lower left-hand portion of Figure 1, with parts broken away and in section, but showing a modified form of bearing means between the base and the primary or rotatable platform;

Figure 2 is an inverted plan view of the improved article handling apparatus removed from the truck and showing, in particular, the means for imparting rotative movement to the platforms and the grappling device;

Figure 3 is a top plan view of the improved apparatus mounted on the front end of an industrial lift truck;

Figure 4 is an enlarged fragmentary vertical sectional view taken substantially along line 4—4 in Figure 2 showing the rotary connection between the primary platform and the base of the apparatus;

Figure 5 is an isometric viewe of the improved apparatus removed from the truck, showing a portion of the same broken away with the grappling device in retracted position;

Figure 6 is an enlarged fragmentary vertical sectional view taken substantially along line 6—6 in Figure 1;

Figure 7 is a view similar to the lower left-hand portion of Figure 1, but showing the grappling device in extended position;

Figure 8 is a view similar to Figure 7, but showing the grappling device in retracted position relative to the tiltable or secondary platform and showing the tiltable platform tilted in substantially right angular relationship to the primary or rotatable platform;

Figure 9 is a fragmentary vertical sectional view similar to Figure 7, but showing a substantial portion of the grappling device broken away and showing, in particular, how initial impetus or upward movement is imparted to the secondary platform relative to the primary platform;

Figure 10 is a fragmentary sectional plan view, mostly in elevation, taken substantially along line 10—10 in Figure 1 and showing the means for imparting initial upward movement to the secondary platform relative to the primary platform;

Figure 11 is a view, partially in section, taken substantially along line 11—11 in Figure 1 and showing how the hydraulic or fluid pressure lines or conduits are caused to be raised and lowered with the improved apparatus

upon actuation of the conventional lifting apparatus of the truck;

Figure 12 is a schematic view of the fluid pressure circuit for the particular rams employed in operating the various parts of the improved apparatus;

Figure 13 is an enlarged fragmentary vertical sectional view showing how the turntable is mounted and being taken substantially along line 13—13 in Figure 3.

Referring more specifically to the drawings, the numeral 10 broadly designates an industrial truck of the usual type driven with an internal combustion and having at its forward end a pivotally mounted upright telescopic frame 11 acting as a guide and a support for a carriage broadly designated at 12 and which truck 10 is provided with conventional fluid operating mechanisms, not shown in detail, but portions of which are shown schematically in Figure 12.

The lift truck or industrial truck 10 may be of any desired or conventional construction and constitutes a part of the present invention only to the extent that the improved apparatus is particularly adapted to be mounted on and raised and lowered by the carriage 12 and controlled by the conventional fluid pressure mechanisms of the truck. The particular truck illustrated in the drawings is of a type shown in the patent to George B. Johnson, No. 2,428,223, issued September 30, 1947. Accordingly, a detailed illustration and description thereof is deemed unnecessary.

In order that a clear understanding may be had of the improved article handling apparatus, a further description will now be given of the pivotally mounted substantially upright telescopic frame 11. The frame 11 comprises outer upright frame members 14, 15 (Figure 3) which are joined at the top by a transverse frame member 16 and between which frame members 14, 15 an extensible frame including spaced uprights 20, 21 is mounted for vertical movement relative to the frame members 14, 15.

The carriage 12 is guided on the upper movable or extensible frame formed of frame members 14, 15 by a plurality of rollers 22 and preferably comprises a substantially rectangular frame which may consist of horizontal frame members 24, 25 and substantially vertical frame members 26, 27 (Figure 11) secured together at their corners to provide a rectangular frame. The horizontal frame members 24, 25 are shown as being longer than the width of the upright pivoted frame assembly 11 so that they project beyond each side of said pivoted upright frame assembly and these frame members may be joined at the middle by an intermediate vertical frame member 30.

The substantially rectangular frame of the carriage 12 has a horizontally disposed rod or shaft 31 mounted in the vertical frame members 26, 27, 30 and whose opposite ends extend outwardly beyond the frame members 26, 27 for supporting the improved article handling apparatus to be later described. The truck 10 is also provided with a conventional cylinder 34 supported by the lower upright frame section in the usual manner, as shown in said patent, and which operates to impart vertical movement to a piston 35.

The upper end of piston 35 is connected to the lower portion of a U-shaped bracket or yoke 36 whose upper end is connected to an upper cross frame member 37. The opposite ends of the upper cross frame member 37 are connected to the upper ends of the upright members 20, 21 forming the extensible portion of the upright framework 11.

A pulley shaft 40 (Figures 1 and 11) is mounted in the upper portion of the upright frame members 20, 21 and has a grooved pulley 41 mounted on the central portion thereof between the upright legs of the U-shaped bracket 36. The shaft 40 also has a pair of multi-grooved pulleys, rollers or drums 42 mounted thereon adjacent opposite sides of the yoke 36. The purposes of the multi-grooved pulleys or drums 42 will be later described.

The truck 10 may be provided with the usual means for transmitting fluid under pressure to the upper and lower ends of the upright cylinder 34 from a suitable reservoir 43 shown schematically in Figure 12 and which reservoir contains fluid 44 and a pump 45 for directing the fluid 44 outwardly under pressure through a pipe or conduit 46. A return pipe or conduit is also connected to the reservoir 43 and is indicated at 47. The connections between the pipes 46, 47 and the lift cylinder 34 are not shown in the present drawings, since they are well known in the art and are clearly illustrated in said Patent No. 2,428,223.

The pulley 41 is engaged by a lift chain 50, one end of which is connected to the carriage 12 and the other end of which is connected to the cross or transverse frame member 16. It is apparent that, when the piston 35 is driven upwardly by fluid under pressure in the cylinder 34, it engages the movable frame section comprising members 20, 21, 37 through the intermediary of the yoke 36 and lifts the upper frame section as well as the pulley 41.

Since the rear end of the chain 50 is anchored to the transverse frame member 16 of the lower or outer frame section of the upright frame 11, the raising of the pulley 41 simultaneously extends both the forward and rearward bights of the chain 50 and the carriage 12 is raised twice as fast as the upper frame 20, 21, 37.

The parts heretofore described, with the exception of the multi-grooved pulleys or rollers 42 (Figure 11), are conventional and well known in the art and it is with such parts that the present invention is particularly adapted to be associated. However, it is to be distinctly understood that the present invention may be used in association with many different types of trucks wherein the organization of parts thereof may be somewhat different from that heretofore described.

The improved article handling apparatus generally comprises a base 55 fixedly mounted on a horizontal portion of a substantially L-shaped framework broadly designated at 56 and on which base a rotatable or swivel element or primary platform 57 is mounted for rotative movement about a substantially vertical axis. A secondary or tiltable platform 60 is hingedly connected to one upturned edge of the primary platform 57 and supports a radially shiftable or outwardly and inwardly shiftable grappling device broadly designated at 61. The base 55 is shown as being in the form of a substantially rectangular plate in Figures 2 and 4.

The substantially L-shaped framework 56 comprises parallel spaced substantially horizontally disposed side frame members 62, 63 in the form of angle bars whose front ends are connected to opposite ends of a transverse frame member 64 to which a pair of toe skids 65 are suitably secured. The rear portions of the angle bars 62, 63 are suitably secured to the upper surfaces of forwardly projecting arms 66, 67 (Figures 1, 2 and 11). Suitable heel skids 68 may be fixed to the lower surfaces of arms 66, 67. The rear ends of the arms 66, 67 are suitably secured to, or integral with, the lower portion of a substantially rectangular frame forming the vertical leg of the framework 56 and comprising upper and lower horizontal frame members 70, 71 and vertically disposed side frame members 72, 73. This rectangular frame is adapted to snugly fit about the carriage frame comprising frame members 24 through 27.

The substantially rectangular frame forming the vertical leg of the L-shaped framework 56 is held in engagement with the rectangular frame of the carriage 12 by means of the rod 31, said rod being slidably mounted in the rectangular frame of the carriage 12. The upright frame members 72, 73 of the vertical leg of the substantially L-shaped framework 56 are suitably apertured for slidably receiving the rod 31. As heretofore stated, the swivel platform or primary platform 57 is supported for rotative movement on the base 55 and it is preferable

that a suitable thrust bearing element or plate **75** of low friction material is disposed between the proximal surfaces of the base plate **55** and the primary platform or swivel platform **57** as shown in Figures 1, 4, 7, 8 and 9. Another form of bearing means between the base plate **55** and the primary platform **57** is shown in Figure 1–A, which will be later described.

As best shown in Figure 4, the substantially central portions of the thrust bearing element or plate **75** and the base plate **55** are provided with an opening **76** through which an annular throat portion **77**, integal with or suitably secured to the lower substantially central portion of the primary or swivel platform **57**, loosely extends. The lower end of the throat portion **77** has a gear **80** thereon which is disposed beneath the level of the base plate **55** and is engaged by a rack **81** mounted for horizontal movement in an elongated guide portion **82** of a gear housing **84**.

The gear housing **84** is suitably secured to the lower surface of the base plate **55** and also serves as a rotary connection between the proximal ends of a plurality of fluid pressure lines or conduits which are instrumental in directing fluid under pressure to and from the various hydraulic or pneumatic rams of the improved article handling apparatus as will be later described. The hub or throat portion **77** of the swivel platform or primary platform **57** has a bore **85** therethrough in which a hub portion or upwardly projecting portion **86**, integral with the housing **84**, is positioned. Suitable low friction or anti-friction bearing means **87** are provided between the wall of the bore **85** and the periphery of the upwardly projecting hub portion **86** of the housing **84**. The front or outer end of the primary or swivel platform **57** has an upturned portion **90** thereon to which the corresponding edge of the upper, tiltable or secondary platform **60** is hingedly connected, as at **91**.

A suitable bumper or guard **92** is suitably secured to the front end of the primary or lower platform **57** for protecting the upturned portion **90** and the adjacent portion of the hinge **91**. Suitably secured to the proximal surfaces of the platforms **57**, **60**, adjacent the free ends thereof, are tapered blocks or bars **95**, **96** whose proximal surfaces converge inwardly or forwardly and engage the opposite surfaces of a cam block **100**.

It should be noted that, when the tiltable or secondary platform **60** is in closed position, as shown in Figures 1, 5 and 8, the diverging surfaces of cam block **100** mate with the inclined proximal surfaces of the bars or blocks **95**, **96**. The cam block **100** is fixed on the free end of a plunger **101** and is suitably restrained from rotative movement thereon. The other end of the plunger **101** is fixed in the outer end of a piston rod **102** which is a part of a hydraulic or fluid pressure operated ram and whose inner end has a piston **103** fixed thereon and mounted for longitudinal sliding movement in a cylinder **104**. The head of the cylinder **104** has an elongated tubular portion **106** thereon which forms an abutment which is engageable, at times, by a trunnion or cuff member **107** mounted for longitudinal sliding movement on the plunger **101**. The base of the cylinder **104** is pivotally connected, as at **110**, to the upturned portion **90** of the rotatable or primary platform **57**.

It will be observed in Figure 10 that the trunnion or cuff member **107** is elongated and has corresponding ends of lower and upper pairs of links **111**, **112**, respectively, pivotally connected to opposite ends thereof and which extend rearwardly in diverging relationship and normally straddle the cylinder **104**.

The other ends of the links **111**, **112** are pivotally connected, as at **113**, **114**, to the medial portions of the respective lower and upper platforms **57**, **60**. The surface of the trunnion or cuff member **107** adjacent the cam block **101** is engaged by one end of a compression spring **115** which surrounds the plunger **101** and whose other end engages an abutment or nut **116** adjustably mounted on the plunger **101**.

The cylinder **104** is a double-acting cylinder and has corresponding ends of fluid pressure pipes, lines or conduits **120**, **121** connected thereto, as best shown in Figure 12. Means are provided for alternately directing fluid under pressure into opposite ends of the cylinder **104** through the respective pipes **120**, **121** and, when the parts are in the positions shown in Figures 1, 3, 5, 7 and 10, and fluid pressure is admitted to the right-hand or rear end of the cylinder **104**, the piston rod **102**, plunger **101** and cam block **100** commence movement from right to left to initially move the cam block **100** from the position shown in Figure 7 to that shown in Figure 9.

The links **111**, **112** may remain stationary during this initial movement of the cam block **100**, during which the cam block moves relative to the blocks **95**, **96** to initially effect upward movement of the free edge of the secondary platform **60**. This may be necessary because of the pivot points of the links **111**, **112** being disposed relatively close to dead-center relative to the longitudinal axis of the piston rod **102** and cylinder **104**.

After the spring **115** has been compressed sufficiently against the trunnion or cuff member **107** by inward movement of the piston rod **102**, the pivoted ends **113**, **114** of the links **111**, **112** will have moved sufficiently away from dead-center so that continued inward movement of the piston rod **102** will cause the trunnion or cuff member **107** to move therewith and impart further separating movement to the pivoted ends **113**, **114** of the links **111**, **112**. Thus, the tiltable or secondary platform **60** may be tilted to substantially any desired angle or between the position shown in Figure 7 and that shown in Figure 8.

It will be noted that, when the secondary platform **60** is disposed in substantially vertical position or in substantially right angular relation to the primary platform **57**, the cuff member or trunnion **107** then engages the end of the tubular abutment **106** on the head of the cylinder **104**. In order to lower the tiltable platform **60**, fluid pressure is admitted to the lower end of the cylinder **104**, causing the piston rod **102** to move outwardly until it engages and imparts movement to the trunnion or cuff member **107**. In so doing, the links **111**, **112** move outwardly with the piston rod **102** to return the parts to the position shown in Figures 9 and 7, successively.

The frame of the grappling device **61** comprises upper and lower cross bars **125**, **126** whose opposite ends are connected to corresponding ends of frame members **127**, **128**. The cross bars **125** and **126** are termed as upper and lower cross bars, respectively, because of the position normally occupied thereby, although the cross bars **125**, **126** may be spaced horizontally from each other when the secondary or tiltable platform **60** is in the upright position shown in Figure 8.

In order to maintain the grappling device **61** in substantially parallel relation to the secondary platform **60** when it is shifted between the position shown in Figure 1 and that shown in Figure 7, for example, opposite sides of the frame of the grappling device **61** have respective pairs of parallel links **131**, **132** and **133**, **134** pivotally connected thereto. To this end, it will be observed in Figures 1, 3 and 5 that corresponding ends of the links **131**, **133** are pivotally connected, as at **136**, to the respective side frame members **127**, **128** and the bifurcated corresponding ends of the links **132**, **134** are pivotally connected, as at **137**, to the free ends of arms **140**, **141** which extend forwardly in Figures 1 and 5 and are fixed to the lower cross bar **126**.

The lower ends of the parallel links **131**, **132**, **133**, **134** are pivotally mounted in respective bifurcated blocks **142** to **145**, inclusive, suitably secured to, or integral with, the upper surface of the secondary or tiltable platform **60**. It will be observed in Figures 1, 5, 7 and 9 that the blocks **142**, **144** are spaced toward the pivoted edge of

the secondary platform 60 relative to the blocks 143, 145 and are also spaced further apart from each other than the blocks 143, 145. The medial portions of the links 131, 133 penetrate opposite end portions of a stabilizing bar 146 which is suitably secured to the links 131, 133, as by screws 147.

In order to extend and retract the grappling device 61 relative to the secondary platform 60 between the positions shown in Figures 1 and 7, a double-acting ram is employed which comprises a cylinder 150 in which a piston 151 is mounted for longitudinal sliding movement and to which piston a piston rod 152 is secured. The piston rod 152 slidably penetrates the head of the cylinder 150 and has a clevis 153 fixed to its free or upper end which is pivotally connected to the cross bar 125 of the frame of the grappling device 61 by means of a rod 154. The lower end or base of the cylinder 150 is pivotally mounted in a bifurcated block 155 suitably secured to the upper surface of the secondary platform 60 adjacent the free edge thereof.

As best shown in Figure 12, opposite ends of the cylinder 150 have respective fluid pressure lines, pipes or conduits 156, 157 communicatively connected thereto and it is apparent that, upon introduction of fluid under pressure to the lower end of the cylinder 150, the grappling device 61 may be moved outwardly and downwardly in a substantially arcuate path while remaining in substantially the same attitude throughout its movement from substantially the position shown in Figure 1 to substantially the position shown in Figure 7. Conversely, upon introducing fluid under pressure to the upper end of the cylinder 150, the grappling device 61 is caused to move upwardly and rearwardly from substantially the position shown in Figure 7 to return to substantially the position shown in Figures 1 and 5.

The means for alternately directing fluid under pressure through the pipes 156, 157 into the respective lower and upper ends of the cylinder 150 will be later described. The stabilizing bar 146 has recesses 158 therein to accommodate the corresponding ends of links 132, 134 when the grappling device is fully extended as shown in Figure 7.

Mounted for lateral movement between the upper and lower cross bars 125, 126 is a pair of normally upright grappling arm supports or grasping arm supports 160, 161 which are spaced from each other (Figures 5 and 6), and to which the distal ends of respective piston rods 162, 163 are suitably secured. The piston rods 162, 163 slidably penetrate opposite ends of a double-acting cylinder 164 in which a pair of pistons 165, 166 are mounted for longitudinal movement. The proximal ends of the piston rods 162, 163 are fixed to the respective pistons 165, 166. The elements 162 to 166, inclusive, collectively form ram means for moving the grasping bar supports 160, 161 toward and away from each other.

The medial portion of the cylinder 164 is mounted in a bracket 167 which extends radially from opposite sides of the cylinder 164 and is preferably fixedly mounted on a pair of guide rods 170, 171. Opposite ends of the guide rods 170, 171 are fixed in the side frame members 127, 128 (Figure 6).

The supports 160, 161 extend outwardly or forwardly beyond the frame formed of elements 125, 126, 127, 128 and have respective pairs of upper and lower grappling arms or grasping arms 172, 173 and 174, 175 suitably secured thereto, as by being threaded thereinto. The grasping arms 172 to 175, inclusive, may be straight, if desired, but due to space limitations, it may be desirable to bend the grasping arms adjacent the corresponding supports 160, 161, as at 176, so the outer or free end portions of the grasping arms 172 to 175, inclusive, are spaced further apart from each other than the supports 160, 161. It is preferable that the inner surface of each of the grasping arms 172 to 175, inclusive, has two or more relatively thin or sharp projections 177 thereon which may be removably attached to the grasping arms or formed integral therewith, as desired. These projections 177 are particularly useful in handling resilient or pliable articles or objects, such as bales of cotton and the like.

As best shown in Figure 12, the medial portion of the cylinder 164 has one end of a pipe, conduit or fluid pressure line 180 connected thereto and opposite ends of the cylinder 164 have respective pipes, conduits or fluid pressure lines 181, 182 connected thereto. The means for directing fluid pressure either into the central portion of the cylinder 164 or into opposite ends thereof will be later described.

It is apparent that, prior to admitting fluid pressure to the lower end of the cylinder 150, the grappling arms 172, 173 and 174, 175 may be moved apart from each other by admitting fluid under pressure to the central portion of the cylinder 164. After the grappling device 61 has been swung outwardly to the desired position, such as that shown in Figure 7, the grappling arms 172, 173 and 174, 175 may then be moved inwardly toward each other by the admission of fluid pressure to opposite ends of the cylinder 164. Thus, the grasping arms 172, 173 and 174, 175 will tightly engage opposite sides of the article to be handled and, as the grappling device 61 is swung inwardly from the position shown in Figure 7 to substantially the position shown in Figure 1, the upward arcuate movement thereof will raise the article supported between the grasping or grappling arms 172 to 175, inclusive, so that its lower surface will clear the platform 60 in the course of inward movement or retracting movement of the grappling device 61. As the parallel links 131 to 134, inclusive, reach a substantially vertical position, that is, a position in substantially right angular relation to the secondary platform 60, further inward movement of the grappling device 61 will lower the article supported between the grappling arms 172 to 175, inclusive, so that it will then rest in upright position against the upper surface of the secondary platform 60.

It is preferable that the upper surface of the secondary platform 60 is provided with a disk-like turntable 185 which may be manually rotated relative to the secondary platform 60 to thereby facilitate rotation of an article positioned thereon in the manner heretofore described. A turntable of this character is particularly useful in handling bales of cotton in a cotton warehouse, because it is quite often necessary to rotate a bale of cotton to successively expose all four sides thereof so a swatch of cotton may be removed from each side of a bale, if desired, for grading the cotton as to staple length, cleanliness, etc.

The turntable 185 may be supported for rotation on the secondary platform 60 in any desired manner and, in this instance, it will be observed in Figure 13 that the turntable 185 is fixed on a stub shaft 186 which is shown in the form of a shoulder screw in Figure 13 and is rotatably mounted in the secondary platform 60. The reduced lower end of the shaft 186 has a thrust washer 187 mounted thereon which is retained thereon by means of a nut 190 threadably mounted on the reduced lower end of the shaft 186. The secondary platform 60 is provided with a plurality of circularly spaced openings 191 therein through which the upper portions of rollers 192 project, and the turntable 185 rests upon the rollers 192. Each of the rollers 192 is journaled in a pair of brackets 193, shown in the form of angle clips, suitably secured to the lower surface of the secondary platform 60.

Referring to Figure 1–A, there will be observed a modified form of bearing means which may be provided between the primary platform and the base plate 55 in lieu of the low friction bearing plate 75 heretofore described. The bearing means shown in Figure 1–A is similar to the bearing means between the turntable 185 and the secondary platform 60 shown in Figure 13. In both forms of bearing means between the base plate 55 and the primary platform 57, the central portion of the

primary platform is supported in substantially the manner shown in Figure 4. However, in Figure 1–A, in lieu of the low friction plate **75**, a plurality of circularly spaced rollers **240** are provided whose upper portions project through corresponding openings **241** provided in the base **55** and whose uper surfaces are engtaged by the lower surface of the primary platform **57**. Each of the rollers **240** is journalled in a pair of brackets **242**, shown in the form of angle clips, suitably secured to the lower surface of the base plate **55** or to the horizontal portion of the L-shaped framework **56**, as the case may be.

It is thus seen that, by using the modified form of bearing means between the base plate **55** and the primary platform **57**, the central portion of the primary platform is rotatably supported and held in proper central position relative to the base plate **55** by means of the bearings **87** shown in the central portion of Figure 4 and the lower surface of the primary platform **57** may move in engagement with the rollers **240**. Now, in order to rotate automatically the platforms **57**, **60** and the grappling device **61** relative to the base **55**, the rack **81** (Figure 2) is fixed to, or formed integral with, a piston rod **195** which penetrates one end of a cylinder **196** and is fixed to a piston **197** mounted for longitudinal sliding movement in the cylinder **196**. The elements **195**, **196**, **197** form a ram for imparting movement to the rack **81** in opposite directions. Pipes, conduits or fluid pressure lines **200**, **201** are connected to opposite ends of the cylinder **196** for alternately directing fluid pressure to opposite ends of the cylinder **196**.

In order to avoid confusion, only portions of the pipes or conduits **120**, **121**, **156**, **157**, **180**, **181** and **182** are shown in Figures 1 and 3 to 11, inclusive, since the manner in which fluid pressure is directed thereto and therefrom is shown schematically in Figure 12. All of these conduits, pipes of fluid lines are necessarily of a resilient, flexible or pliable nature since they must move relative to the base **55** when the platform **60** is tilted or when the grappling device **61** is extended.

The conduit **181** is communicatively connected to the conduit **182**, intermediate the ends thereof (Figure 12), and the conduits **156**, **157**, **180** and **182** may extend from the respective cylinders **150**, **164** past the free edge of the secondary platform **60** and between the primary and secondary platforms **57**, **60**.

The ends of the pipes or conduits **120**, **121**, **156**, **157**, **180** and **182** remote from the respective cylinders **104**, **150** and **164** are coupled, by means of suitable rotary pipe connections **203**, to corresponding ends of respective conduits **204** to **209**, inclusive. The pipes or conduits **204** to **209**, inclusive, extend through the hub **86** of the gear housing **84** and then extend rearwardly along with pipes **200**, **201** and penetrate the transverse frame member **71** at the juncture of the horizontal and vertical legs of the L-shaped framework **56**. Although the pipes **200**, **201** and **204** through **209** are each described as a single pipe, it should be understood that each of these pipes may be formed of suitably coupled pipe sections. These pipes or conduits **204** to **209**, inclusive, then extend upwardly successively through the upper frame member **24** of the carriage **12** and the upper frame member **70** of the vertical leg of the framework **56** and then extend upwardly and pass partially around the corresponding rollers **42**.

The pipes or conduits **204** to **209**, inclusive, then extend downwardly rearwardly of the rollers **42** and are fixed to the upper transverse frame member **16** of the telescoping frame **11**, from whence they extend downwardly and are connected to respective four-way valves disposed within a suitable housing **215** suitably secured to the frame members **14**, **15** which form the outer portion of the extensible or telescoping frame **11**.

The valve casing **215** has a plurality of valve control levers or knobs **216** mounted therein and is preferably mounted as described so the control levers or knobs **216** are disposed within reach of the operator of the truck **10**, there being one of the levers **216** for operating each of the valves disposed within the casing **215**. The upper end of a conduit **217** is connected to the lower wall of the casing **215** and extends downwardly and has the pipes or conduits **46** and **47** mounted therein (Figures 1 and 12).

The valves disposed within the casing **215** are indicated at **220** to **223**, inclusive, for controlling the flow of fluid under pressure to and from the respective cylinders **196**, **104**, **150** and **164**. It follows, therefore, that the ends of the pipes or conduits **200**, **201** remote from cylinder **196** are connected to the valve **220**, the ends of pipes or conduits **204**, **205** remote from the pipes **120**, **121** are connected to the valve **221**, the ends of pipes **206**, **207** remote from the respective pipes **156**, **157** are connected to the valve **222**, and the ends of pipes **208**, **209** remote from the pipes **180**, **182** are connected to the valve **223**.

The valves **220** to **223**, inclusive, also have respective pairs of pipes **224** to **231**, inclusive, connected thereto. The ends of pipes **224**, **226**, **228**, **230** remote from the valves **220**, **221**, **222**, **223** are connected to a common pipe **232** and the ends of pipes **225**, **227**, **229** and **231** are connected to a common pipe **233**.

The ends of the pipes or conduits **46**, **47** remote from the reservoir **43** are connected to the respective pipes **233**, **232**. The valves **220** to **223**, inclusive, may be of any desired construction and each is shown as being provided with a rotatable core **235** having a pair of passageways **236**, **237** therein for controlling the direction of flow of the fluid under pressure through the respective valves.

It is apparent that, when the valve cores **235** occupy the positions shown in Figure 12, fluid pressure is directed from the reservoir **43** to the lower or base ends of the cylinders **104**, **150**, **164**, **196** and is returned to the reservoir **43** from the head ends of said cylinders. By rotating the cores **235**, fluid pressure is then directed from the reservoir to the head ends of the cylinders **104**, **150**, **164** and **196** and returned to the reservoir **43** from the base ends of said cylinders.

It is thus seen that I have provided an improved apparatus adapted to be mounted on the usual lift carriage of an industrial truck and including a pair of normally superposed platforms, namely, a primary or lower platform and a secondary or tiltable platform and on which tiltable platform a grappling device is mounted. Fluid pressure operated means are provided for rotating the primary and secondary platforms with the grappling device about a substantially vertical axis, for tilting the upper or secondary platform at any desired angle and for extending and retracting the grappling device.

Also, the grappling device is so mounted that it will move in an arcuate path as it is extended relative to the secondary platform so that the grappling arms thereon, which are also moved inwardly and outwardly relative to each other by fluid pressure operated means, may grasp an article positioned on a lower level than the upper surface of the secondary platform and, when retracted, will raise the article and position the same upon the secondary platform.

The secondary platform is also provided with the turntable **185** thereon so that any article positioned thereupon by the grappling device may be rotated relative to the secondary platform **60** with a minimum of effort on the part of the operator. It is apparent that the improved apparatus enables an operator to pick up an article forwardly of the platform **60** and then position the same upon the platform whereupon the platforms **57**, **60** and the grappling device **61** may be elevated to the desired level and then the article may be removed from the platform **60** and positioned forwardly of or to either side of the longitudinal axis of the truck **10** while the article is maintained in the same attitude in which it was disposed when it was initially picked up and placed upon the secondary platform **60**. Also, after the article has

been elevated to the desired level, the tiltable platform 60 may be tilted at any desired angle so the article, when released from the grappling arms 172 to 175, inclusive, may be positioned upon other articles at a different attitude than that occupied thereby when it was initially picked up and placed upon the secondary platform 60.

It is apparent that the platforms 57, 60 and the grappling device 61 may be operated in a manner opposite from that last described for picking up an article from a level substantially higher than the level on which the truck 10 is disposed and for depositing the article upon the floor in the desired attitude.

In the drawings and specification there has been set forth a preferred embodiment of the invention and although specific terms are employed, they are used in a generic and descriptive sense only, and not for purposes of limitation, the scope of the invention being defined in the claims.

We claim:

1. In a lift truck having a vertically movable frame thereon; the combination of a support adapted to be mounted on said vertically movable frame, a grappling device movably mounted on said support and having laterally spaced substantially parallel grappling arms thereon, means for rotating the grappling device about a substantially vertical axis relative to said support substantially a quarter revolution either side of the longitudinal axis of the truck, means for tilting said grappling device and means for extending and retracting said grappling device relative to said support in opposite directions substantially parallel with said grappling arms.

2. An attachment for lift trucks and the like, said lift truck having a vertically movable frame thereon; a substantially horizontal primary platform mounted for rotative movement about a substantially vertical axis and through an arc of substantially one hundred eighty degrees on said vertically movable frame, a secondary platform pivotally connected to said primary platform, a grappling device pivotally mounted on said secondary platform and having spaced substantially parallel grappling arms thereon, fluid pressure operated means for rotating the primary platform about said vertical axis, fluid pressure operated means for tilting said secondary platform, and fluid pressure operated means for extending and retracting said grappling device.

3. In a lift truck having a vertical extending load supporting frame at its front end and having a carriage guided for movement longitudinally of said frame; the combination of a platform, means supporting said platform for rotation about a substantially vertical axis and adapted to be mounted on said carriage, means for rotating said platform substantially one-fourth revolution either side of the longitudinal axis of the truck, means for tilting said platform relative to said supporting means, a grappling device mounted on said platform, said grappling device including at least two spaced substantially parallel grappling arms, means for moving said arms relative to each other for grasping and releasing an article therebetween, and means for moving said grappling device inwardly and outwardly relative to the platform.

4. In a lift truck having a substantially upright frame and a lift element movable along said upright frame, the combination of a substantially horizontally disposed platform adapted to be carried by said lift element, means for rotating said platform about a substantially vertical axis relative to said lift element, a grappling device movably mounted on said platform, means for moving said grappling device in opposite directions substantially radially of the axis of said platform and also for moving said grappling device in a substantially arcuate path, said grappling device having clamping members thereon, means for moving said clamping members relative to each other for clamping an article therebetween, and a relatively thin turntable rotatably mounted on said platform on an axis substantially parallel to the axis of said platform.

5. In a lift truck having a vertical extending load supporting frame at its front end and having a carriage guided for movement longitudinally of said frame; the combination of a tiltable platform adapted to be supported by said carriage, means for rotating said tiltable platform about a substantially vertical axis, a grappling device mounted on said tiltable platform, said grappling device including at least two spaced substantially parallel grappling arms, means for moving said arms toward and away from each other for grasping and releasing an article therebetween, means for moving said grappling device inwardly and outwardly relative to and in substantially parallel relation to the tiltable platform, and a turntable mounted on said platform for rotative movement about an axis substantially perpendicular to the plane of said platform.

6. In a lift truck having a substantially vertical frame, a lift element mounted for substantially vertical movement on said vertical frame and a source of fluid under pressure; the combination of a substantially L-shaped framework adapted to be mounted on said lift element, a base mounted on the horizontal leg of said L-shaped framework, a platform mounted on said base, means for shifting said platform about a substantially vertical axis on said base, means for tilting said platform between substantially horizontal and substantially vertical positions, a grappling device carried by said platform, fluid pressure operated means for moving said grappling device in an arcuate path substantially parallel to the platform, fluid pressure operated means on the grappling device for clamping an article therebetween, first fluid pressure conduits connected to said fluid pressure operated means, a plurality of second fluid pressure conduits extending from said source to the base, and rotary connections between the first and second conduits.

7. In a lift truck having an open substantially vertical telescopic frame and a substantially rectangular carriage frame mounted for substantially vertical movement on said vertical frame; the combination of a substantially L-shaped framework having a substantially rectangular vertical leg adapted to be mounted on said carriage frame, a base mounted on the horizontal leg of said L-shaped framework, a first platform rotatably mounted on said base, means for shifting said first platform about a substantially vertical axis on said base comprising a rack, said base having an opening therethrough, a hollow throat portion on said first platform loosely penetrating said opening and having a gear on its lower end engaging said rack, a housing for said gear fixed to said base and having a hub thereon extending into said throat portion, first fluid pressure operated means for moving said rack in opposite directions, a second platform hingedly connected to said first platform, second fluid pressure operated means for tilting said second platform between substantially horizontal and substantially vertical positions, a grappling device carried by said second platform, third fluid pressure operated means for moving said grappling device in an arcuate path substantially parallel to the second platform, fourth fluid pressure operated means on the grappling device for clamping an article therebetween, first conduits extending from the second, third and fourth means, valve means carried by said truck, rollers carried by the upper portion of said telescopic frame, pliable second conduits each having one end connected to said hub, rotary connections between the proximal ends of the first and second conduits, third conduits connected to said first fluid pressure operated means, and said second and third conduits extending through said vertical leg of the L-shaped framework, through said carriage frame and over said rollers to said valve means.

8. In a lift truck of the type having an upright frame and a lift element movable in opposite directions along said upright frame; the combination of a primary platform, means for rotating said primary platform about a

substantially vertical axis, a secondary platform normally disposed in spaced substantially parallel relationship above said primary platform, means pivotally connecting one edge of said secondary platform to the primary platform, spaced pairs of parallel links pivotally connected to the outer surface of said secondary platform, a grappling device comprising a frame pivotally connected to the other ends of said parallel links, said frame of the grappling device normally being disposed adjacent the edge of said secondary platform opposite from that edge which is pivotally connected to the primary platform, at least two grappling arms extending outwardly from said frame of the grappling device substantially toward the pivoted edge of said secondary platform and in substantially parallel relation to said secondary platform, means for moving the grappling device inwardly and outwardly relative to the plane of the secondary platform, means for tilting the secondary platform between substantially vertical and substantially horizontal positions, and said parallel links being so arranged as to maintain the grappling arms in substantially horizontal position during the course of inward and outward movement thereof when the secondary platform is in a substantially horizontal position while causing said grappling device to move in a substantially arcuate path whereby, when the grappling device is extended, it will be disposed on a lower level than that occupied thereby when it is retracted.

9. In a lift truck of the type having an upright frame and a lift element movable in opposite directions along said upright frame; the combination of a primary element, means for rotating said primary element about a substantially vertical axis, a platform normally disposed above said primary element, means pivotally connecting one edge of said platform to the primary element, parallel links having one end pivotally connected to the outer surface of said platform, a grappling device comprising a second frame pivotally connected to the other ends of said parallel links, said second frame normally being disposed adjacent the edge of said platform opposite from that edge which is pivotally connected to the primary element, at least two grappling arms extending outwardly from said second frame toward the pivoted edge of said platform and in substantially parallel relationship to said platform, means for moving the grappling device inwardly and outwardly relative to the plane of the platform, means for tilting the platform, and said parallel links being so arranged as to maintain the grappling arms in

substantially horizontal position during the course of inward and outward movement thereof when the platform is in a substantially horizontal position while causing said grappling device to move in a substantially arcuate path whereby, when the grappling device is extended, it will be disposed on a lower level than that occupied thereby when it is retracted.

10. In a lift truck having a first vertically movable frame thereon; the combination of a support adapted to be mounted on said frame, a second frame movably mounted on said support and having laterally spaced substantially parallel arms thereon, means to rotate the second frame about a substantially vertical axis relative to said support substantially a quarter revolution either side of the longitudinal axis of the truck, means to tilt said second frame relative to the support, and means to extend and retract said second frame relative to said support in opposite directions substantially parallel with said arms.

11. In a lift truck having a vertical extending load-supporting frame at its front end and having a carriage guided for movement longitudinally of said frame; the combination of a platform, means supporting said platform for rotation about a substantially vertical axis and adapted to be mounted on said carriage, means for rotating said platform substantially one fourth revolution either side of the longitudinal axis of the truck, means for tilting said platform relative to said supporting means, a second frame mounted on said platform, at least two spaced substantially parallel arms carried by said second frame and extending substantially parallel to said platform, and means for moving said second frame inwardly and outwardly relative to said platform.

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