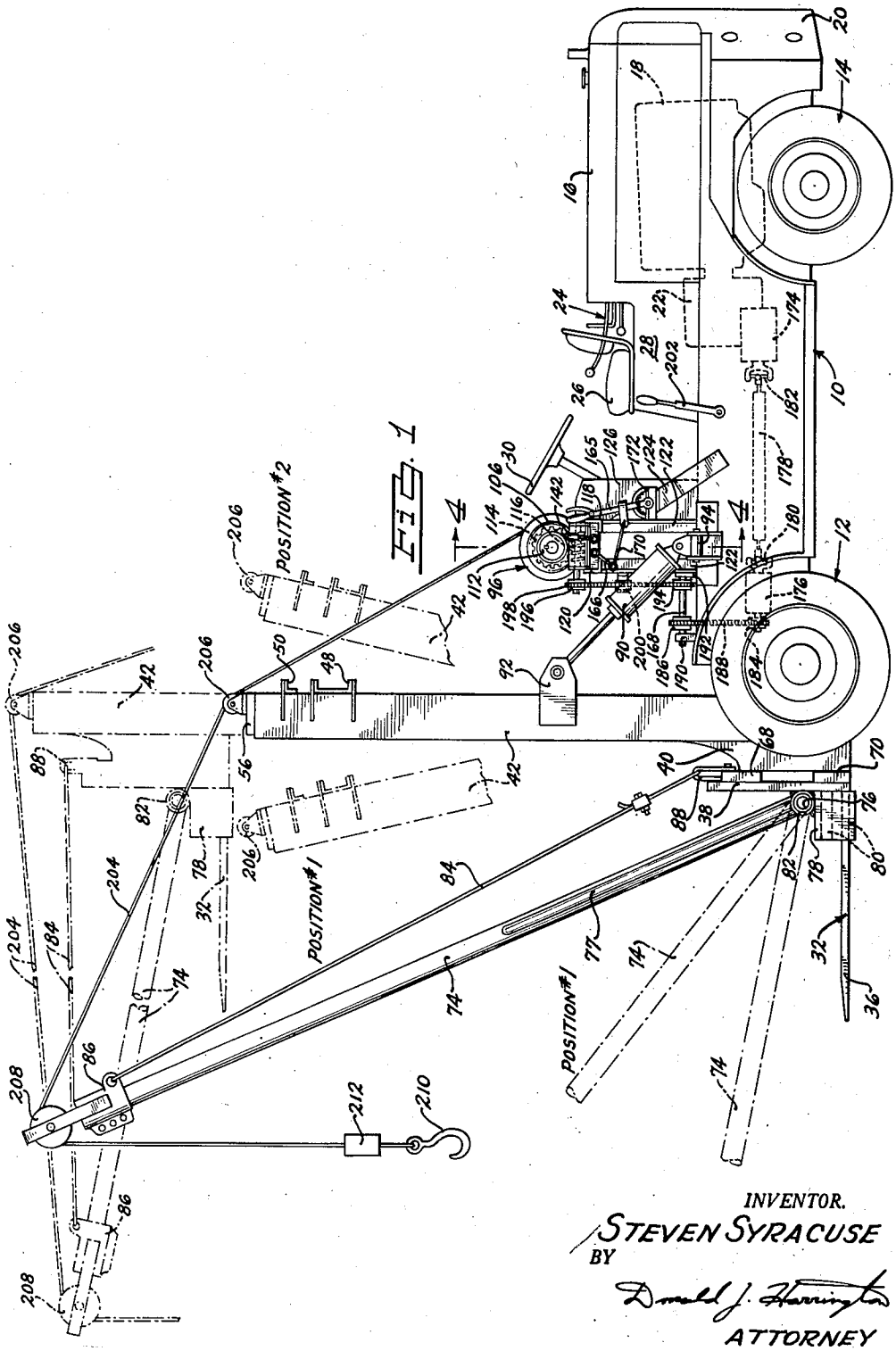
April 22, 1958 S. SYRACUSE 2,831,592

POWER LIFT ATTACHMENT FOR TRUCKS

Filed Nov. 16, 1955 3 Sheets-Sheet 1



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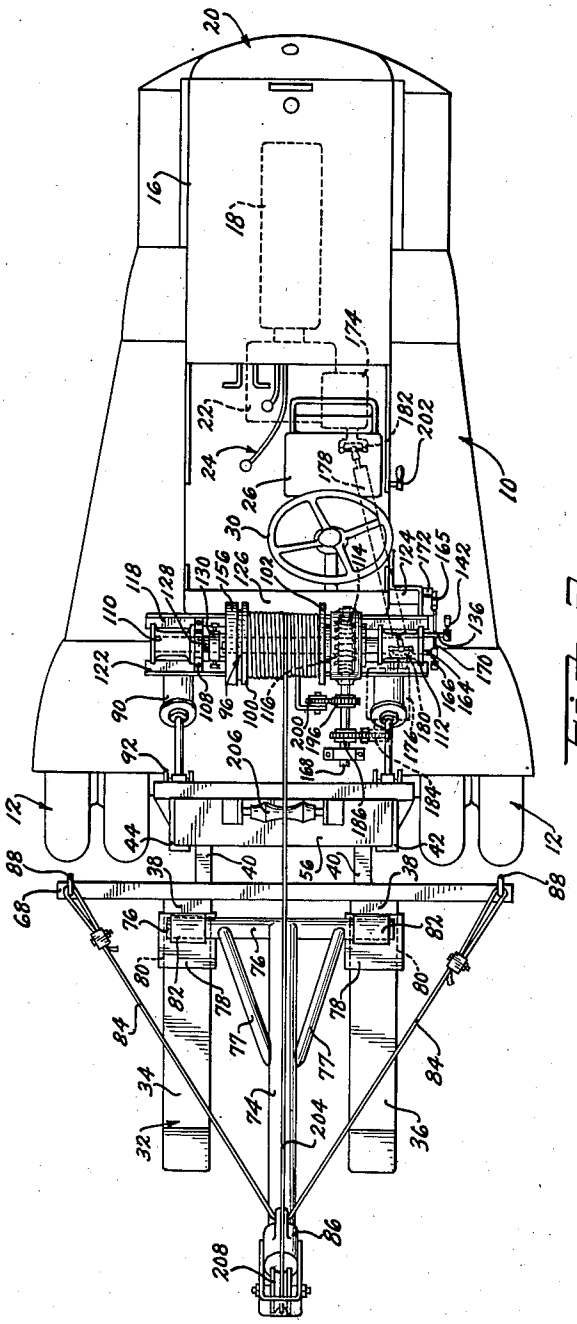


Fig. 2

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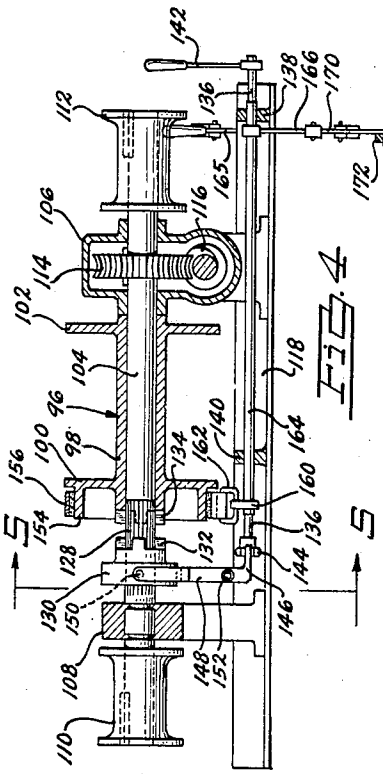


Fig. 4

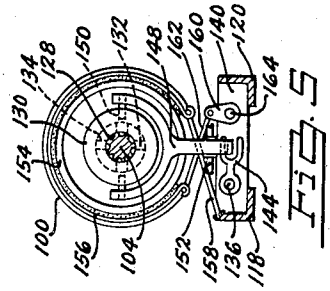


Fig. 5

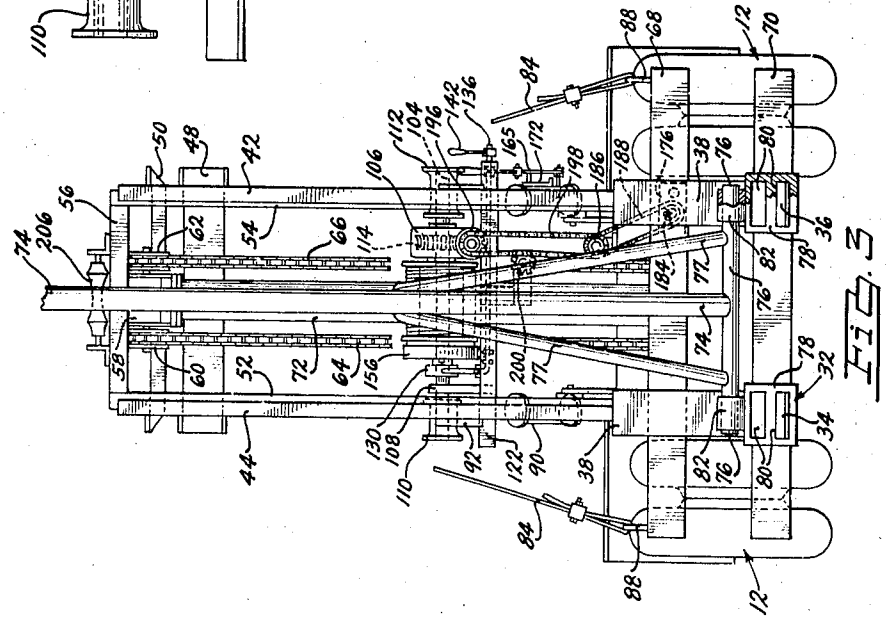


Fig. 3

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POWER LIFT ATTACHMENT FOR TRUCKS

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Application November 16, 1955, Serial No. 547,240

2 Claims. (Cl. 214—513)

My invention relates generally to a new and improved power lift machine for lifting and transporting heavy articles. More particularly, my instant invention comprises a new and unique hoisting mechanism for use in combination with an engine powered construction yard truck.

One type of yard truck which is presently in common use in the construction industry comprises a chassis supported by four wheels and a gasoline engine power plant for powering the forward truck wheels. A structural body is provided for suitably enclosing the truck chassis and the power plant, and the truck operator may be accommodated on the upper portion of the body in a convenient location to enable him to operate the truck controls. These controls include various conventional engine controls such as the throttle and choke, and also the manually operable elements of the truck steering mechanism, said steering mechanism being operatively connected to the rearward truck wheels for controlling directional variations thereof.

The trucks of the type mentioned above further include a load lifting tower and carriage mounted upon the truck chassis at the forward portion thereof, said carriage comprising a movable fork which may be inserted under the load. The fork is guided by the tower and a hydraulic piston and cylinder means is provided for raising and lowering the fork. The fluid working chamber for the hydraulic piston and cylinder means is supplied with working fluid by a fluid pump which in turn is powered by the truck engine.

The improved mechanism of my instant invention makes use of the above described features of the conventional yard truck and in addition it provides a means for hoisting, moving and carrying a large variety of loads of the type which may not be accommodated by the above-described conventional lifting apparatus.

The provision of a new and improved power lift of the type above mentioned being a principal object of my invention, another object of my invention is to provide a boom type lifting apparatus for use in combination with the above-described lifting fork, the former being capable of reaching forward of the truck for a considerable distance.

It is another object of my instant invention to provide a truck lift of the type set forth in the preceding object wherein a winch mechanism is used to feed and to retract a lifting cable associated with the boom type lifting apparatus.

It is another object of my instant invention to provide a truck lift of the type set forth above and to provide a new and unique means for powering the above-mentioned winch and for controlling the motion of the same during operation.

Other objects and features of my instant invention will be readily apparent from a study of the following description and the accompanying drawings wherein:

Figure 1 is a side elevation view of a truck lift embodying the improved lifting mechanism of my instant invention;

Figure 2 is a plan view of the truck lift of Figure 1;

Figure 3 is a front elevation view of the truck lift of Figure 1 showing the structure of my improved lifting mechanism and portions of the means for powering the same;

Figure 4 is a cross sectional view of the winch shown in Figures 1 through 3 and is taken along the section line 4—4 of Figure 1; and

Figure 5 is a detail sectional view of the winch control elements and is taken along section line 5—5 of Figure 4.

Having reference first to the side elevation view of Figure 1, the truck lifting therein illustrated comprises a chassis and body assembly 10, a set of forward driving wheels 12 and a pair of rear dirigible wheels 14, the wheels 12 and 14 being suspended on the truck chassis in a conventional manner. The body assembly 10 includes an engine compartment 16 within which is mounted a liquid cooled, gasoline, internal combustion engine 18, the engine coolant radiator being shown at 20.

The engine 18 is drivably connected to a power transmission mechanism 22 of the multiple speed, synchromesh gear type and suitable controls for manually selecting various transmission reduction speed ratios are shown at 24. A power transmitting driveshaft, not shown, is interposed between the power output member for the transmission 22 and a differential gear assembly, also not shown, situated in the forward portion of the vehicle, said differential gear assembly being drivably connected to each of the aforementioned driving wheels 12.

An operator's chair is provided as shown at 26 and it is secured to and carried by a platform portion 28 of the chassis and body assembly 10. A steering wheel is provided as shown at 30 in a convenient location, said steering wheel forming a portion of a steering linkage mechanism which is adapted to impart a steering motion to the dirigible wheels 14.

Since the structural details of the power transmission assembly and the steerage linkage mechanism, as well as certain other conventional features of the disclosed truck lift, are well known to persons familiar with the art, they have been illustrated merely schematically in Figures 1, 2, and 3. However, these conventional portions of the mechanism are in fact related both functionally and structurally, to the improved lifting mechanism of my instant invention which will be subsequently described in more particular detail.

A carriage is shown at 32 and, as best seen in Figure 2, it comprises two horizontally extending fork arms 34 and 36. As best seen in Figure 1, carriage 32 includes a vertically extending portion 38 which is secured to a guide member 40.

An upright portion of the lifting mechanism is shown in Figures 1, 2 and 3 and it is adapted to receive the guide member 40 and function as a rail along which the guide member 40 may move, said upright portion being hereinafter referred to as the tower. As best seen in Figure 3, the tower includes two side members 42 and 44 which may be joined at the upper portion thereof by suitable structural cross members or channels 48 and 50. The side members 42 and 44 are pivoted at the lower ends thereof to the front portion of the truck chassis by means of suitable bushings and a bearing shaft, not shown. Each of the side members 42 and 44 forms a U-channel and a smaller U-channel may be slidably received therein in longitudinal, telescoping relationship, the telescoping channel associated with side member 44 being shown at 52 and the telescoping channel associated with side member 44 being shown at 54. The upper ends of the channels 52 and 54 are joined by an end cross member 56 to which is secured an idler sprocket mounting means 58, as best seen in Figure 3. A pair of idler sprocket wheels

60 and 62 are rotatably mounted upon the mounting means 58 and one of a pair of lifting chains is trained over each of the wheels 60 and 62, as shown at 64 and 66 respectively.

One end of each of the chains 64 and 66 is anchored to the cross member 48 and the other end thereof is secured to a cross bar 68 disposed transversely across the vertical portion 38 of the carriage 32, as best seen in Figure 3. It may be observed in Figure 1 that the cross bar 68 is disposed between the vertical carriage portion 38 and the guide member 40, suitable fastening means such as bolts being provided for this purpose. Another cross bar may be seen in Figures 1 and 3 at 70 and it is similarly secured between the vertical carriage portion 38 and the guide member 40, the portion 38 and the bars 68 and 70 forming an integral assembly.

A hydraulic cylinder and piston assembly is shown at 72 and it is situated in a substantially vertical position. The upper portion of the assembly 72 is secured to the sprocket wheel mounting means 58 and is adapted to lift the same as working fluid is admitted under pressure to a working chamber within the assembly 72. As previously mentioned, the assembly 72 is supplied with fluid by means of a conventional engine driven pump, not shown. As the mounting means 58 is moved vertically upwards, the lifting chains 64 and 66 are caused to pass over the wheels 60 and 62 and to lift the carriage 32. Prior to the lifting operation, the horizontal fork arms may be inserted under a load and the operator may then cause the working chamber of assembly 72 to become pressurized to elevate the load to any desired level.

As seen in Figures 1, 2, and 3, a boom structure is secured to the forward portion of the truck and it comprises an extension 74 and a perpendicularly disposed base shaft 76. A pair of supporting struts 77 are interposed between the extension 74 and the shaft 76 for the purpose of structurally supporting the former. The ends of shaft 76 are pivotally disposed in mounting brackets 78 situated on the fork arms 32. Each of the brackets 78 comprises a slotted opening 80 through which one of the fork arms 32 may be received and an eyelet or bushing portion 82 for rotatably receiving an end of the shaft 76.

As best seen in Figures 1 and 2, a pair of supporting cables 84 are provided for maintaining the boom extension 74 at a predetermined, fixed angular position, one end of the cables 84 being secured to a bracket 86 of the upper extremity of the boom extension 74 and the other ends thereof being secured to a bracket 88 securely bolted to the cross member 68 of the movable carriage assembly. The angular position of the boom extension may be raised as desired merely by adjusting the effective length of the supporting cables 84. One extreme position for the extension 74 is shown in Figure 1 by means of dotted lines.

The entire boom assembly and the tower, including the carriage 32, may be tilted to any desired angular position by means of a pair of hydraulic cylinder and piston mechanisms shown at 90, the piston portion for one such tilting mechanism being connected to the upright side member 46 by a suitable bracket 92 and the piston portion for the other mechanism being secured to the upright side member 44 by a similar bracket. The cylinder portion for each of the cylinder and piston mechanisms 90 may be anchored to the structural body and chassis assembly 10 by means of a suitable bracket 94. As shown in Figure 1, the boom assembly and the tower 42 may be adjusted to any of a plurality of positions, two extreme positions being shown by means of phantom lines and identified in Figure 1 as "position 1" and "position 2." The position shown by means of full lines in Figure 2 is an intermediate position.

I have provided a winch mechanism on a forward portion of the truck and have generally identified the same by means of numeral 96. The winch 96 includes a drum portion 98 having a pair of side discs 100 and 102 and a shaft 104 disposed axially through the drum portion 98, the drum portion 98 being relatively movable with respect to shaft 104. The shaft 104 is supported at two spaced locations by supporting structures 106 and 108. A capstan or "cat head" may be keyed to each end of shaft 104 if desired, as shown at 110 and 112.

The supporting structure 106 is hollow, as shown, and it is adapted to enclose a worm gear 114 which is secured to shaft 104 and which is drivably engaged with a worm 116.

Each of the supporting structures 106 and 108 may be secured to structural angle members 118 and 120 which may in turn be supported by vertically extending supporting members 122, as shown in Figure 1. Supporting members 122 may be suitably anchored to the top of the body and chassis assembly 10, as shown, and a bracing bracket 124 may be provided to furnish additional support, the bracket 124 being effective to tie the upper ends of the supporting members 122 to the body and chassis assembly 10. Suitable cowling is shown at 126 and the supporting structure for the winch mechanism may be additionally secured thereto if desired to provide still further support.

Referring again to Figure 4, the shaft 104 may be longitudinally splined as shown at 128. A movable dog clutch element is splined to shaft 104 as shown at 130 and it is adapted to move longitudinally into and out of engagement with the winch drum member 98, the clutch element and drum member being provided with engageable clutch teeth as shown at 132 and 134 respectively.

A clutch actuator shaft is shown at 136 and it is situated parallel to the axis of the winch drum member. Shaft 136 may be rotatably supported at 138 and 140 and a suitable crank handle 142 may be fixed to one end of shaft 136 as shown. A forked link element 144 is secured at the other end of shaft 144 and it is positioned adjacent one leg 146 of a clutch actuating fork 148. The fingers of the fork 148 are disposed on either side of the clutch element 130 and is connected thereto by pins 150, best seen in Figure 4. The fork 148 may be pivotally mounted on the base member 118 and 120 about a pivot point 152.

A brake drum 154 is formed on the annular side disc 100 as shown at 154 in Figure 4, and it may be surrounded by a friction brake band 156. As shown in Figure 5, the band 156 may be anchored at one end thereof to the winch base member by a suitable link 158 and the other end of brake band 156 may be secured to a brake link member 160 by another link member 162. Link member 160 may be fixed to one end of a brake actuator shaft 164 which may, in turn, be supported by the aforementioned shaft supports 138 and 140. The other end of shaft 164 has secured thereto a link 166, best seen in Figure 1, which is joined to a hand brake lever 168 of conventional construction by means of a link 170. The hand brake lever 168 is pivoted to a bracket 172 which may be, in turn, secured to the cowling 126.

A power take-off transmission is shown in Figure 1 at 174 and is represented by means of dotted lines. The transmission 174 is comprised of speed transfer gears which are drivably engaged with the power output gears associated with the main transmission 22, the transmission casing for the take-off transmission and the main truck transmission being suitably secured together by means of bolts or the like.

A speed transfer gear case is shown at 176 and it may be secured to the forward portion of the truck chassis, a drive shaft 178 being employed for drivably connecting the speed transfer case 176 and the power take-off transmission 174. Universal joints 180 and 182 are provided at either axial end of shaft 178 to compensate for misalignment of the transfer case 176 and the transmission 182.

A sprocket wheel 184 is secured to an output shaft for

the speed transfer case 176 and it is drivably connected to another sprocket wheel 186 by means of a drive chain 188, the sprocket wheel 186 being secured to a cross shaft 188. Brackets 190 and 192 rotatably support the cross shaft 188 at either end thereof, said brackets being fixed to the upper surface of the body and chassis assembly 10. Another sprocket wheel 194 is secured to cross shaft 188 and it is drivably connected to a sprocket wheel 196 by means of a drive chain 198, the sprocket wheel 196 being drivably secured to the aforementioned worm 116. As best seen in Figure 3, an adjustable idler sprocket 200 is rotatably mounted upon one of the winch supporting members 122, said idler sprocket 200 being effective to maintain a proper chain tension in chain 198.

A gear shift lever may be provided at 202, as best seen in Figure 1, at a location which makes it easily accessible to the operator. A conventional gear shift linkage means may be provided for transferring a shifting movement of lever 202 to the gear elements of the power take-off transmission 174 for the purpose of drivably engaging and disengaging the power source for the above described auxiliary power take-off drive train for the winch.

A lifting cable is shown at 204 in Figures 1 and 2 and it may be wound about the drum portion 98 of the winch 96 between the annular side discs 100 and 102. Cable 204 extends over the tower 42 and is trained over a pulley wheel 206 which may be rotatably journalled on supporting brackets secured to the upper cross member 56. Cable 204 is also trained over a pulley 208 which is secured to the end of the boom extension 74 as shown. The end of cable 204 may be provided with a hook 210 and a suitable weight 212, said hook 210 being adapted to be secured to a load.

In operation, the boom extension may be adjusted to any desired angle with respect to the tower 42 and it may be raised or lowered by supplying fluid under pressure to the lifting cylinder and piston assembly 72. As the piston portion of the assembly 72 moves relatively upward, the side members 52 and 54 extend outwardly in telescoping relationship with respect to side members 44 and 46 respectively, and this in turn causes the chains 64 and 66 to raise the fork arms 34 and 36 on which the boom assembly is carried.

As previously mentioned, the entire lifting assembly may be tilted to any desired angle during operation by means of the tilt cylinders 90.

To raise the lifting hook 210, the operator engages the power take-off drive mechanism by moving crank 202 to an operative position. The rotating driveshaft 178 then delivers power to the sprocket wheel 184 through the speed transfer case 176 and the sprocket wheel 184 in turn drives the cross shaft 188 together with its associated sprocket wheels 186 and 194, the latter driving worm 116 through chain 198 and sprocket 196. The worm 116 drives worm gear 114 which is securely fixed to shaft 104 and the power is delivered to winch drum 98 through the clutch means 130, 132, 134, and 128.

To cause the clutch element 130 to move axially to an engaged position, the crank 142 may be actuated by the operator and this motion is transmitted to fork 148 through shaft 136 and hub element 144.

To brake the drum to the stationary winch mounting structure, the operator exerts a braking effort on crank 168 thereby causing shaft 164 and link element 160 to rotate in a clockwise direction, as viewed in Figure 5. This causes band 156 to tighten against drum 154.

The above-described brake mechanism may be employed to control the rate of descent of a load carried by hook 210.

Although the above-described embodiment of my invention is the preferred construction, I contemplate that the winch 96 may be employed independently of the boom assembly. Such an adaptation would be desirable in those instances where a pulling effort in a horizontal direction is required.

It is apparent that the structure of my instant invention provides an exceptionally versatile apparatus which is capable of performing a large variety of lifting operations which may not be carried out by a conventional power lift apparatus.

If desired, the rotatable capstans 110 and 112 may be used for the purpose of producing a horizontal pulling force upon an auxiliary cable which may be provided for this purpose. Such an auxiliary cable may be wound about one of the rotating capstans with one or two turns, for example, and as the pulley cable is fed onto the capstans, it may be removed manually at the same rate. The frictional force existing between the auxiliary cable and the capstans may be varied by manually adjusting the cable tension as it is being removed.

What I claim and desire to secure by United States Letters Patent is:

1. In a power lift mechanism comprising an engine powered wheeled truck having a structural body and chassis assembly, a load lifting apparatus having a tower and a carriage, the latter having horizontally extending fork arms carried thereon, said tower including a stationary part and a relatively movable part, means for pivoting said tower at the base thereof on a portion of said body and chassis assembly to provide tilting adjustments of said tower and said fork arms, hydraulic means for raising and lowering said fork arms with respect to said stationary tower part, a boom assembly having a boom extension pivoted at the base thereof on said carriage, a winch assembly including an engine driven drum carried by said body and chassis assembly, a lifting cable wound about said drum and trained over a portion of said tower and the upper extremity of said boom extension, and pulleys mounted on said tower portion and the upper extremity of said boom extension for accommodating said lifting cable.

2. In a power lift mechanism comprising an engine powered wheeled truck having a structural body and chassis assembly, a load lifting apparatus having an upright portion and a carriage, the latter including horizontally extending fork arms, means for pivoting said upright portion at the base thereof on a portion of said body and chassis assembly to provide tilting adjustments of said upright portion and said fork arms, hydraulic means for raising and lowering said fork arms with respect to said upright portion, a boom assembly having a boom extension pivoted at the base thereof on said carriage, a winch assembly including an engine driven drum carried by said body and the chassis assembly, a lifting cable wound about said drum and trained over said upright portion and upper extremity of said boom extension, and pulleys mounted on said upright portion and the upper extremity of said boom extension for accommodating said lifting cable.

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