

May 18, 1954

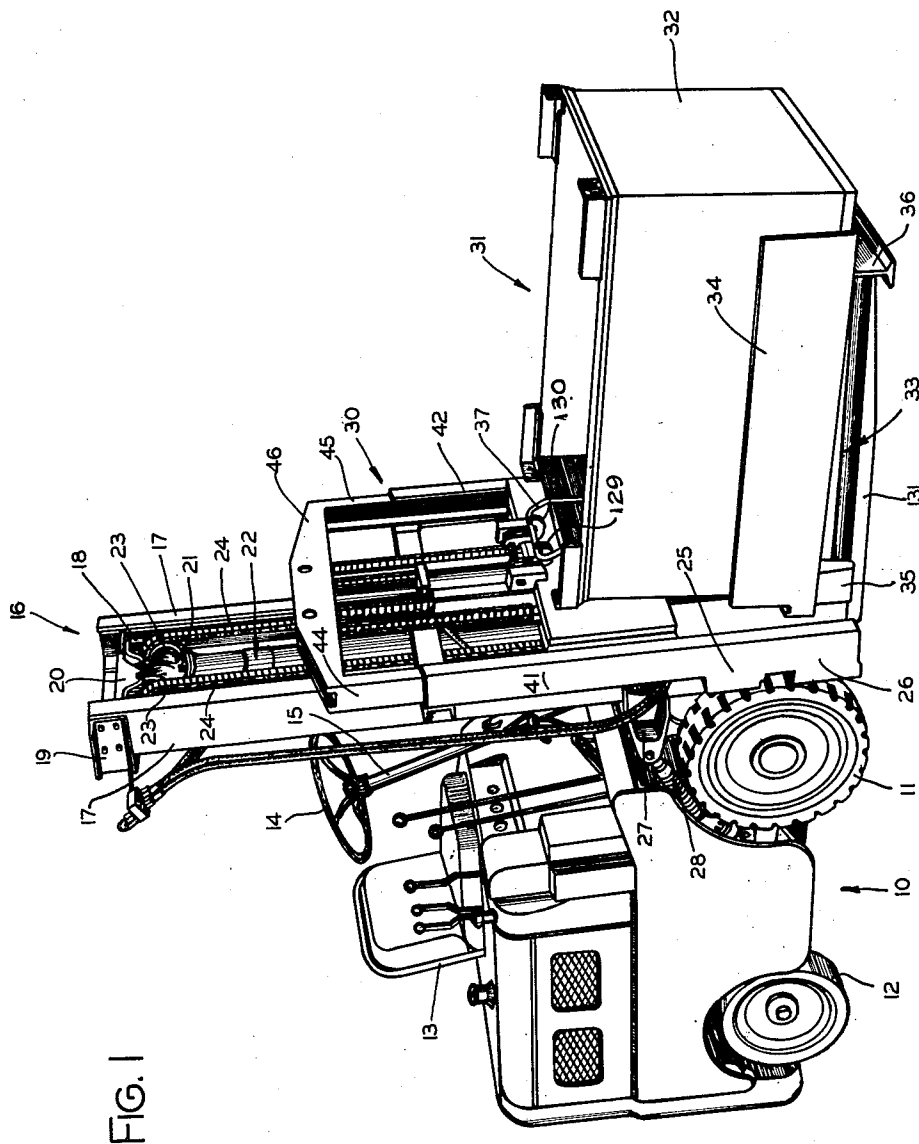
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2,678,742

INDUSTRIAL TRUCK ATTACHMENT

Filed Nov. 21, 1951

5 Sheets-Sheet 1



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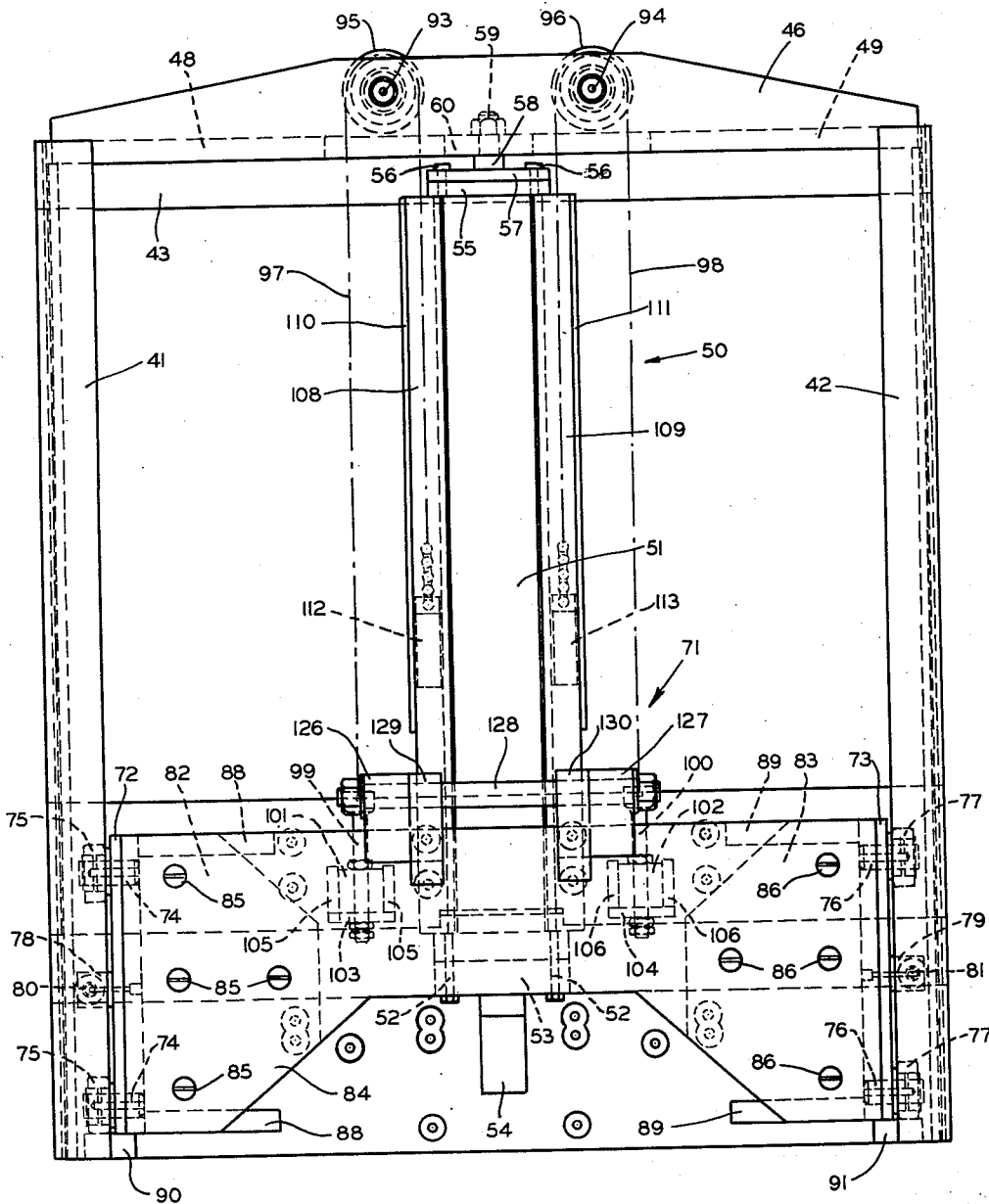
2,678,742

INDUSTRIAL TRUCK ATTACHMENT

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FIG. 2



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FIG. 3

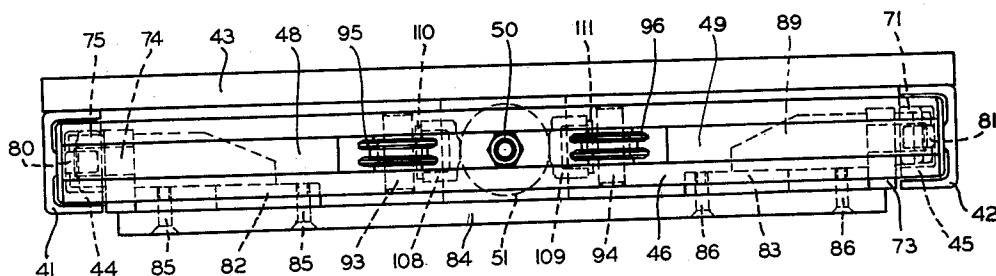
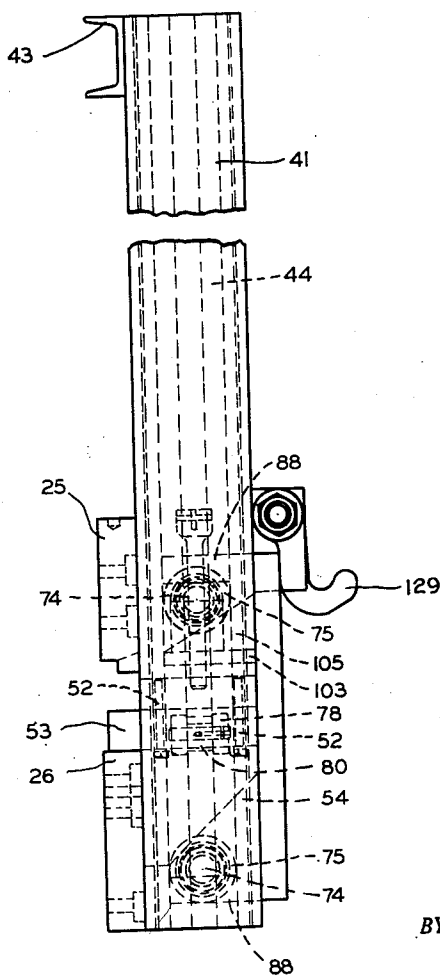


FIG. 4



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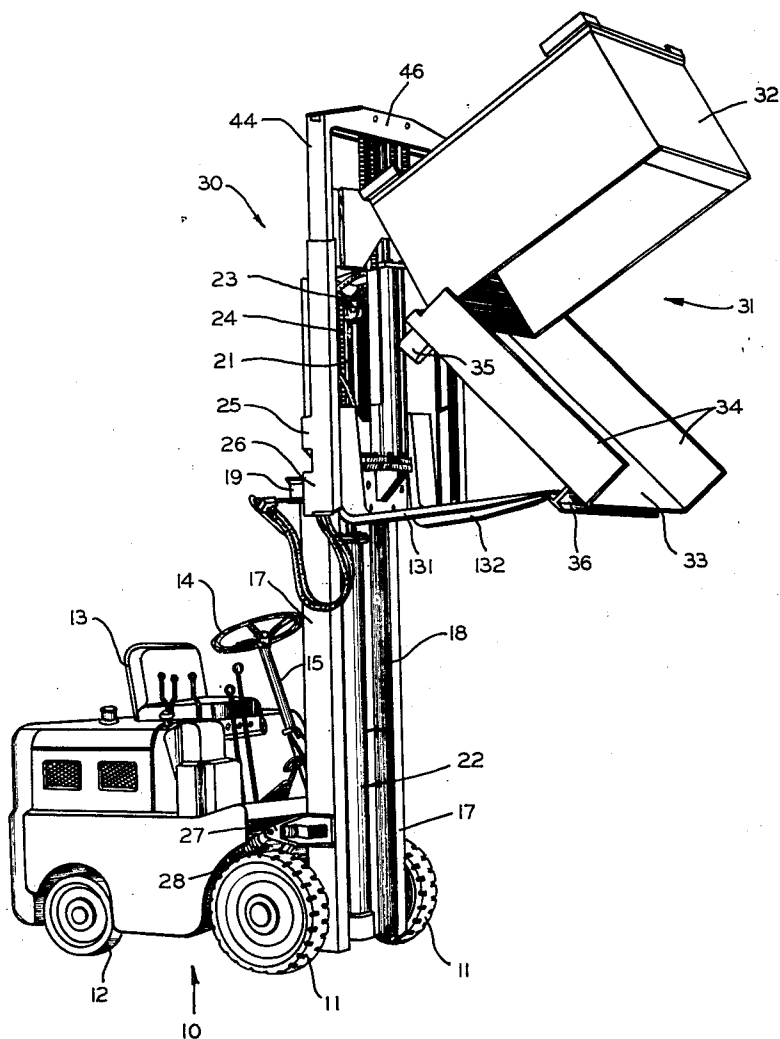
2,678,742

INDUSTRIAL TRUCK ATTACHMENT

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5 Sheets-Sheet 4

FIG. 5



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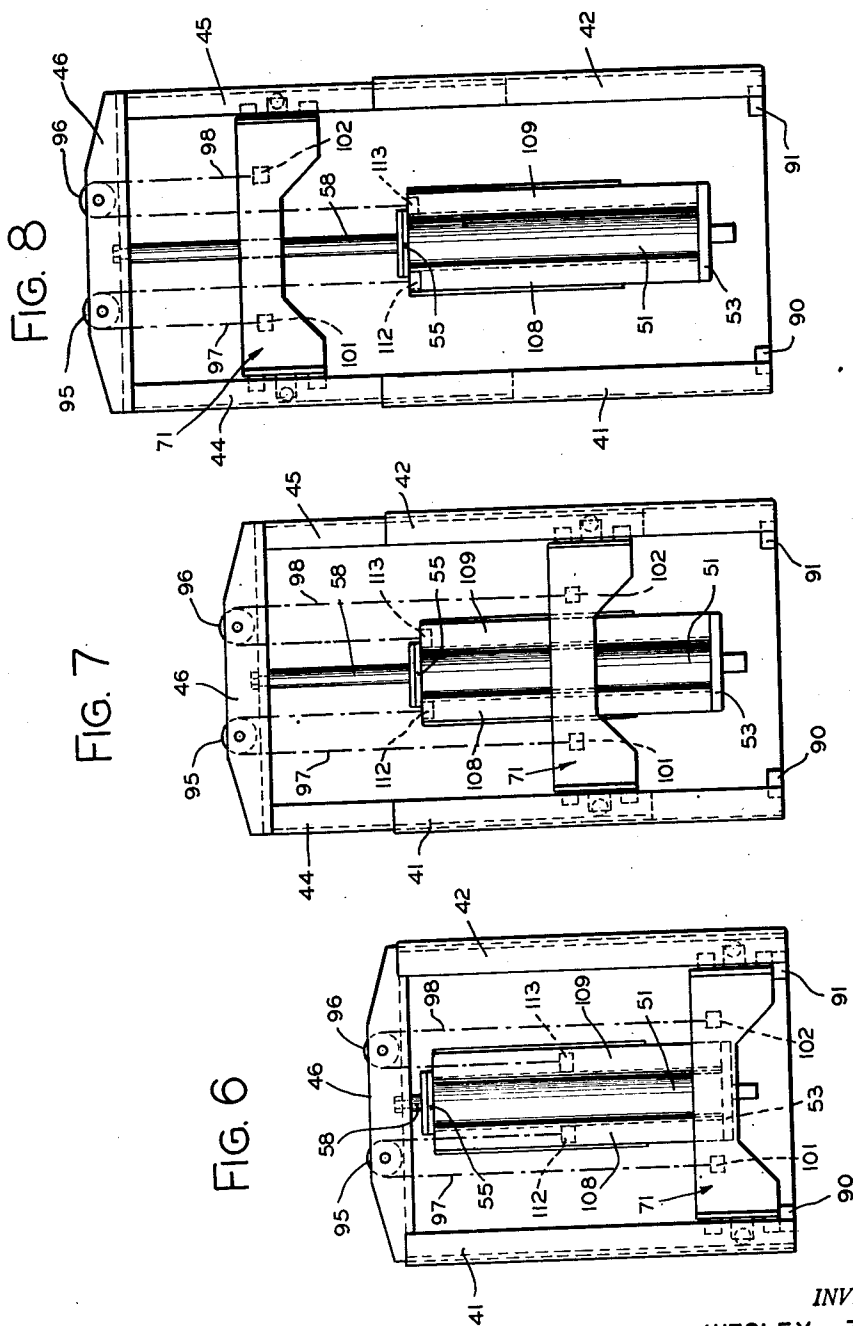
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INDUSTRIAL TRUCK ATTACHMENT

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5 Sheets-Sheet 5



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UNITED STATES PATENT OFFICE

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INDUSTRIAL TRUCK ATTACHMENT

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Application November 21, 1951, Serial No. 257,566

3 Claims. (Cl. 214—315)

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My present invention relates generally to a load elevating mechanism, and, more specifically, is directed to a lift dump attachment particularly adapted for emptying a dump-bottom type hopper.

The present invention constitutes an improvement over the lift dump attachment forming the subject matter of the copending application of E. Ryan Backofen and Wesley Zorn, Serial No. 260,018, filed December 5, 1951.

It is an object of my present invention to provide a lift dump attachment having a sequentially operable 1 to 1 and 2 to 1 lift.

The attachment of my present invention is particularly adapted for emptying a dump-bottom type hopper. This type of hopper comprises a substantially rectangular body portion pivotally mounted at its rear end, about a horizontal axis, to a platform portion. The initially operable 1 to 1 lift is provided to break open the hopper while the 2 to 1 lift is provided to complete the opening of the hopper by causing the forward end of the body portion to swing upwardly and away from the forward end of the platform portion.

It is another object of my present invention to provide a lift dump attachment, as noted, which is of simple construction and economical in operation.

The lift dump attachment of my present invention comprises first frame means which is adapted to be secured to the load supporting carriage of an industrial truck. Slidably mounted in the first frame means is second frame means. A hydraulic assembly is provided for effecting vertical movement of the second frame means. A carriage assembly is mounted for movement within the second frame means and suitable stop means is provided for causing the carriage assembly to move upwardly conjointly with the second frame means during upward movement of the latter. Sprockets are rotatably mounted to the second frame means and chains are trained over the sprockets. The chains are secured at their one ends to the carriage assembly, and at their other ends to means slidably mounted along the actuating cylinder, which means, in the specific embodiment of my invention to be disclosed hereinafter, comprises a pair of slide members slidably mounted in guide tubes secured to opposite sides of the cylinder of the elevating hydraulic assembly.

The slide members are adapted to engage the upper cap of the cylinder of the elevating hydraulic assembly after the second frame means

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has been raised a predetermined height for providing reaction points, whereby, upon continued upward movement of the second frame means, the chains will cause the carriage assembly to move upwardly at twice the speed that the second frame means moves.

Now, in order to acquaint those skilled in the art with the manner of constructing and using devices in accordance with the principles of my present invention, I shall describe, in connection with the accompanying drawings, a preferred embodiment of my present invention:

In the drawings:

Figure 1 is a perspective view of an industrial truck to which is secured, at the forward end thereof, the lift dump attachment of my present invention;

Figure 2 is a front elevational view of the lift dump attachment of Figure 1;

Figure 3 is a plan view of the lift dump attachment of Figure 2;

Figure 4 is a side elevational view of the lift dump attachment of Figure 2;

Figure 5 is a perspective view of the industrial truck of Figure 1 with the lift dump attachment in an elevated position;

Figure 6 is a diagrammatic front elevational view of the lift dump attachment with the elements thereof being shown in the same relative position as they are in Figure 2;

Figure 7 is a diagrammatic front elevational view of the lift dump attachment with the elements thereof being shown in the same relative position as they are in Figure 1; and

Figure 8 is a diagrammatic front elevational view of the lift dump attachment with the elements thereof being shown in the same relative position as they are in Figure 5.

Referring now to Figure 1, there is shown an industrial truck, indicated generally by the reference numeral 10, having a pair of drive wheels 11 disposed at the forward end thereof, and a pair of steering wheels 12 disposed at the rear end thereof. The truck 10 is provided with a conventional prime mover and drive means for effecting driving of the forward wheels 11. Mounted on the truck 10 is an operator's seat 13, and disposed forwardly thereof is a hand steering wheel 14 mounted on a steering column 15 which is operatively connected in a conventional manner to the rear steering wheels 12. Pivotally mounted at the forward end of the truck 10 is a conventional generally vertically extending mast, indicated generally by the reference numeral 16, which comprises a pair of opposed facing, ver-

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tically extending, outer channel members 17, in which are slidably mounted a pair of vertically extending opposed facing channel members 18. The outer channel members 17, adjacent their upper ends, are maintained in spaced relation by means of a brace 19. The inner slidable channel members 18, adjacent their upper ends, are interconnected by means of a cross head 20, which has suitable connection to the upper end of the piston rod 21 of a hydraulic piston and cylinder assembly, indicated generally by the reference numeral 22. The assembly 22 is secured, at its lower end, to the outer channel members 17. Rotatably mounted on the cross head 20, about a horizontal axis, are a pair of sprocket gears 23 over which a pair of chains 24 are trained. The chains 24, adjacent their one ends, have connection to a brace member, not shown, secured to the outer fixed channel members 17, intermediate of the ends thereof. The chains 24, adjacent their other ends, are suitably connected to a load supporting carriage which is mounted for upward and downward movement within the inner channel members 18. Detachably secured to the forward surface of the load supporting carriage are a pair of vertically spaced, transversely extending, frame members or fork bars 25 and 26.

Movement of the load supporting carriage within the inner channel members 18 is effected by selectively admitting fluid under pressure to the lower end of the cylinder of the hydraulic piston and cylinder assembly 22. In this instance, the flow of fluid under pressure to the lower end of the cylinder causes the piston rod 21 to be urged upwardly, which, in turn, causes upward movement of the inner channel members 18, cross head 20, and sprocket gears 23. As the sprocket gears 23 are moved upwardly the chains 24, which as aforescribed, are fixed at their one ends, rotate about the sprocket gears 23 thus urging the load supporting carriage upwardly. When it is desired to lower the load supporting carriage, fluid under pressure is bled from the lower end of the cylinder of the assembly 22 thus permitting the piston rod 21 to move downwardly under the weight of gravity.

Brackets 27 are secured to the outer sides of the outer channel members 17, intermediate of the ends thereof, and pivotally mounted to the brackets 27 are hydraulic piston and cylinder assemblies indicated generally at 28 which are carried by the truck 10. By the selective admission of fluid under pressure to either the forward or rear ends of the hydraulic piston and cylinder assemblies 28, the mast assembly, indicated generally at 16, may be tilted either forwardly or rearwardly.

Secured to the forward surfaces of the fork bars 25 and 26, in a manner to be described fully hereinafter, is the lift dump attachment of my present invention. The attachment is particularly adapted for use with a skid box or hopper of the character indicated generally at 31. The hopper 31 is of the dump bottom type and comprises a substantially rectangular body portion 32 pivotally mounted at its rear end, about a horizontal axis, to a platform portion 33. The platform 33 is formed with upturned sides 34 and is supported at its rear end on a pair of legs 35. A transverse I-beam 36 is secured to the underside of the platform 33 adjacent the forward end thereof. A suitable bracket 37 is secured to the rear end of the body portion 32.

The hopper 31 is normally in the position 75

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shown in Figure 1, in which position a container is defined for storing articles such as metal castings and the like. After the hopper 31 has been filled with castings, or the like, and it is desired to empty the hopper 31, the device of my present invention is adapted to effect raising of the rear end of the body portion 32 relative to the platform 33. As shown in Figure 5, the platform 33 together with the upturned sides 34, define an inclined chute, the lower end of which may be directed toward another container or pile for conveying articles from the hopper 31 to the said container or pile.

The construction of the lift dump attachment of my present invention shall now be described in detail.

A pair of spaced vertically extending channel members 41 and 42, C-shaped in cross section, are secured at their lower ends to the forward surfaces of the fork bars 25 and 26. The channel members 41 and 42 are maintained in proper spaced relation, at their upper ends, by means of a horizontal channel brace member 43. The channel members 41, 42 and 43 define a first frame means. Slidably mounted in the channel members 41 and 42, respectively, are channel members 44 and 45. The inner slidable channel members 44 and 45 are interconnected at their upper ends by a pair of spaced apart transversely extending brace members 46 and 47. The braces 46 and 47 are maintained in position by spacers 48 and 49. The channel members 44 and 45, brace members 46 and 47, and spacers 48 and 49 define a second frame means which is slidably mounted in the afore-described first frame means.

Vertical movement of the inner slidable channel members 44 and 45, together with the transverse brace members 46 and 47, is effected by means of power actuated means which preferably comprises a centrally located hydraulic piston and cylinder assembly indicated generally by the reference numeral 50. The hydraulic assembly 50 comprises a cylinder 51 which is secured, at its lower end, by bolts 52 to a plate 53 suitably secured, as by welding, to the front face of the lower fork bar 26. The cylinder support plate 53 is reinforced by a substantially triangular gusset plate 54.

The upper end of the cylinder 51 is provided with a cylinder cap 55, to which is secured, by bolts 56, a gland clamp plate 57 through which extends a piston rod 58. The upper threaded end of the piston rod 58 is secured, by a nut 59, to a horizontal plate 60 which is secured between the inner channel braces 46 and 47 intermediate of the ends thereof.

The hydraulic piston and cylinder assembly 50 is of the double acting type, and, thus, when fluid is admitted to the lower end of cylinder 51 the piston rod 58 is urged upwardly, thereby moving the inner slide top braces 46 and 47, together with the inner channel members 44 and 45, upwardly. When fluid under pressure is admitted to the upper end of the cylinder and fluid is simultaneously bled from the lower end of the cylinder 51 the piston rod 58 is urged downwardly thereby causing the inner channel top brace members 46 and 47, together with the inner channels 44 and 45, to move downwardly within the outer channel members 41 and 42.

Mounted for upward and downward movement within the inner slidable channel members 44 and 45 is a carriage assembly indicated generally by the reference numeral 71. The carriage

71 comprises end plates 72 and 73 which are disposed respectively adjacent the inner channel members 44 and 45. Laterally extending pin members 74 are fixed in the carriage end plate 72 and project into the inner channel member 44. Rotatably mounted on the outer ends of the pin members 74 are rollers 75 which engage the inner surfaces of the leg portions of the inner channel member 44. Laterally extending pin members 76 are fixed in the carriage end plate 73. The outer ends of the pin members 76 project into the inner channel member 45 and rotatably mounted on the projecting ends of the pin members 76 are rollers 77 which engage the inner surfaces of the leg portions of the inner channel member 45.

Thrust roller blocks 78 and 79 are secured respectively to the carriage end plates 72 and 73. The blocks 78 and 79 extend into the inner channel members 44 and 45 and provide support for rollers 80 and 81 which respectively engage the light portions of the inner channel members 44 and 45.

Secured to the forward edges of the carriage end plates 72 and 73, respectively, are lift brackets 82 and 83 which extend toward each other. Interconnecting the lift brackets 82 and 83 is a transversely extending main carriage plate 84 which is secured to the lift brackets 82 and 83 respectively by bolts 85 and 86.

The junction of the carriage end plate 72 and the lift bracket 82 is reinforced at the upper and lower ends thereof by gusset plates 88. The junction of the carriage end plate 73 and the lift bracket 83 is reinforced at the upper and lower ends thereof by gusset plates 89. Welded to the inner channel members 44 and 45, adjacent the lower ends thereof, are carriage bumper plates 90 and 91. The bumper plates 90 and 91 act as stops for limiting downward movement of the carriage 71 relative to the inner channel members 44 and 45.

Movement of the carriage 71 within the inner channel members 44 and 45 is accomplished by chain means which shall now be described in detail. Mounted intermediate of the inner channel braces 46 and 47, on spaced apart shafts 93 and 94, are compound sprockets 95 and 96. Trained over the sprockets 95 and 96, respectively, are compound chains 97 and 98. The chains 97 and 98, at their one ends, are riveted to chain anchor pins 99 and 100. The chain anchor pins 99 and 100 are respectively bolted to blocks 101 and 102 fixed to horizontal plates 103 and 104 which are suitably secured to the rear surface of the main carriage plate 84. The mountings of the plates 103 and 104 to the main carriage plate 84 are reinforced by gusset plates 105 and 106.

The cylinder 51 of the hydraulic assembly 50 has secured along opposite sides thereof a pair of channel members 108 and 109. The outer ends of the leg portions of the cylinder channels 108 and 109 are interconnected for a portion of their length, adjacent the upper end, by closure plates 110 and 111. The channels 108 and 109 and the respective closure plates 110 and 111 define guide tubes for a purpose to be hereinafter described. The cylinder channels 108 and 109 terminate immediately beneath the cylinder cap 55 and the latter covers a portion of the open section of the channels 108 and 109.

The other ends of the chains 97 and 98 extend downwardly into the open area of the cylinder channels 108 and 109 and are riveted to rectangular members 112 and 113 which are slidably

mounted in the guide tubes defined by the channels 108 and 109 and the respective closure plates 110 and 111.

The upper edge of the main carriage plate 84 has secured to its upper edge a pair of spaced block members 126 and 127 which provide a journal support for a transverse shaft 128. Secured to the shaft 128, adjacent the block members 126 and 127, are a pair of J-shaped hook members 129 and 130.

A pair of L-shaped horizontally spaced load supporting fork frames 131 and 132 are detachably secured along their vertical legs to the afore-described fork bars 25 and 26 immediately inwardly of the outer channel members 41 and 42.

The operation of the lift dump attachment of my present invention is as follows. When it is desired to dump the contents of a loaded hopper, the industrial truck 10 is aligned with the hopper and the load supporting forks 131 and 132 are inserted below the platform 33 between the legs 35. The hopper 31 is then raised to an elevated position by selectively admitting fluid under pressure to the lower end of the cylinder of the hydraulic assembly 22 of the truck mast 16. While the hopper 31 is being elevated as a unit, the elements of the lift dump attachment remain in the positions shown in Figures 2 and 6. After the hopper 31 has been elevated to the desired height, fluid under pressure is admitted to the cylinder 51 of the hydraulic assembly 50 of the lift dump attachment which causes the inner channel top braces 46 and 47 to be raised together with the inner channel members 44 and 45. The carriage assembly 71 of the lift dump attachment is also raised by virtue of the stop members 90 and 91 engaging the lower end of the carriage end plates 72 and 73. Through the initial range of movement of the inner slides 44 and 45, there is no relative movement between the carriage 71 and the piston rod 58 and what I term a 1 to 1 lift is provided.

Now, during initial upward movement of the carriage 71, the hook members 129 and 130 engage the bracket 37 of the hopper 31 causing the rear end of the latter to be moved upwardly. During upward movement of the rear end of the body portion 32 of the hopper 31, the forward end of the body portion 32 pivots upwardly and away from the platform portion 33. It has been determined that a considerable force is required to break open the hopper 31. For this reason, I have provided a lift dump attachment, as described, wherein the carriage 71 carrying the lift hooks 129 and 130 moves initially at the same speed as the piston rod 58. This 1 to 1 lift, however, if continued through the entire range of travel of the carriage 71, would require the attachment to be of considerable height. To overcome the latter objection, the above described chain and slide means are provided which cause the carriage 71 and lift hooks 129 and 130 to move upwardly twice as fast as the piston rod 58, after the latter has been actuated through a predetermined range.

As the piston rod 58 of the hydraulic assembly 50 is urged upwardly, the chain slides 112 and 113 move upwardly within the cylinder channels 108 and 109, until the chain slides 112 and 113 engage the underside of the cylinder cap 55 as shown in Figure 7. At this point, the chain slides 112 and 113 are prevented from moving further upwardly and a reaction or anchor point is provided for the chains 97 and 98.

Upon further upward movement of the piston rod 58, the inner channel top braces 46 and 47

continue upwardly, and since the chains 97 and 98 are anchored at their one ends, the latter will travel over the sprockets 95 and 96 causing the ends of the chains 97 and 98, secured to the carriage 71, to move upwardly relative to the inner channels 44 and 45. Thus, through the final range of upward movement of the inner channels 44 and 45, the carriage 71 is caused to move upwardly twice as fast as the piston rod 58 providing what I term a 2 to 1 lift.

From the afore-described operation of the lift dump attachment of my present invention, it will be readily apparent to those skilled in the art that the attachment provides for initial high force or power and subsequent high speed hook travel. After the hopper 31 has been initially broken open, the force required to move the hopper to a full open position is less than the initial opening force required. Thus, the 2 to 1 lift provides sufficient force to complete the opening of the hopper 31 after the latter has been initially broken open. By providing a sequentially operable 1 to 1 and 2 to 1 lift, the overall vertical height of the attachment may be maintained at a minimum without sacrifice of operating efficiency. The point at which the 2 to 1 lift becomes effective may be varied by altering the lengths of the chains 97 and 98 which extend downwardly in the channels 108 and 109.

After the hopper 31 has been initially broken open, upward movement of the rear end of the body portion 32 causes the forward end of the platform portion 33 to be drawn toward the industrial truck until the I-beam 35 engages the forward ends of the load supporting forks 131 and 132. At this point, the I-beam 35 acts to stop further movement of the platform 33 toward the industrial truck and the hopper 31 will assume the position shown in Figure 5 while the elements of the lift dump attachment will assume the positions shown in Fig. 8. With the hopper 31 in this position, the contents thereof will slide downwardly from the body portion 32 along the inclined platform 33 which acts as a chute for directing the goods where desired.

The hopper 31 may be emptied at any predetermined height within the capacity of the mast 16 of the industrial truck 10. After the hopper 31 has been emptied, fluid under pressure is selectively admitted to the upper end of the cylinder 51 and fluid is simultaneously bled from the lower end thereof thereby permitting the piston rod 58 to move downwardly at which time the hopper 31 will return to the position shown in Figure 1.

Now, while I have shown and described what I believe to be a preferred embodiment of my present invention, it will be understood that various modifications and rearrangements may be made therein without departing from the spirit and scope of my invention.

I claim:

1. For use with an industrial truck having an upwardly and downwardly movable load supporting carriage, the combination of a load elevating mechanism comprising, first frame means secured to said load supporting carriage, second frame means slidably mounted in said first frame means, a hydraulic assembly having a cylinder secured to said carriage and a piston rod secured to said second frame means, said cylinder having a cap at the upper end thereof, a carriage assembly mounted for movement with said second frame means, means for causing said carriage assembly to move upwardly conjointly with said second frame means during initial upward movement of

the latter, channel members secured to opposite sides of said cylinder, sprockets rotatably carried by said second frame means, chains trained over said sprockets and secured at their one ends to said carriage assembly, slide members secured to the other ends of said chains and being slidably mounted in said channel members, and said slide members being adapted to engage the cylinder cap after said second frame means has been raised a predetermined height for providing reaction points whereby upon continued upward movement of said second frame means said chains will cause said carriage assembly to move upwardly at a greater speed than the speed that said second frame means moves.

2. For use with an industrial truck having an upwardly and downwardly movable load supporting carriage, the combination of a load elevating mechanism comprising, first frame means secured to said load supporting carriage, second frame means slidably mounted in said first frame means, a hydraulic assembly having a cylinder secured to said carriage and a piston rod secured to said second frame means, said cylinder having a cap at the upper end thereof, a carriage assembly mounted for movement within said second frame means, stop means secured to the lower end of said second frame means which engage said carriage assembly during initial upward movement of said second frame means for causing said carriage assembly to move upwardly conjointly with said second frame means, guide tubes secured to opposite sides of said cylinder, sprockets rotatably carried by said second frame means, chains trained over said sprockets and secured at their one ends to said carriage assembly, slide members secured to the other ends of said chains and being slidably mounted in said guide tubes, the external peripheries of said slide members conforming to the internal peripheries of said guide tubes, and said slide members being adapted to engage the cylinder cap after said second frame means has been raised a predetermined height for providing reaction points whereby upon continued upward movement of said second frame means said chains will cause said carriage assembly to move upwardly at twice the speed that said second frame means moves.

3. For use with an industrial truck having an upwardly and downwardly movable load supporting carriage, the combination of a load elevating mechanism comprising, a first pair of spaced vertically extending channel members secured to said load supporting carriage, a second pair of channel members slidably mounted in said first channel members, a crosshead extending transversely of the industrial truck and interconnecting said second channel members adjacent the upper end thereof, a hydraulic assembly having a cylinder secured to said carriage and a piston rod secured to said crosshead, said cylinder having a cap at the upper end thereof, a carriage assembly mounted for movement within said second channel members, stop members secured to the lower ends of said second channel members which engage said carriage assembly during initial upward movement of said second channel members for causing said carriage assembly to move upwardly conjointly with said second channel members, vertically extending guide tubes secured to opposite sides of said cylinder, sprockets rotatably carried by said crosshead, chains trained over said sprockets and secured at their one ends to said carriage assembly, slide members secured to the other

ends of said chains and being slidably mounted in said guide tubes, the outer peripheries of said slide members conforming to the inner peripheries of said guide tubes, and said slide members being adapted to engage the cylinder cap after said second channel members have been raised a predetermined height for providing reaction points whereby upon continued upward movement of said second channel members said chains will cause said carriage assembly to move upwardly at twice the speed that said second channel members move.

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