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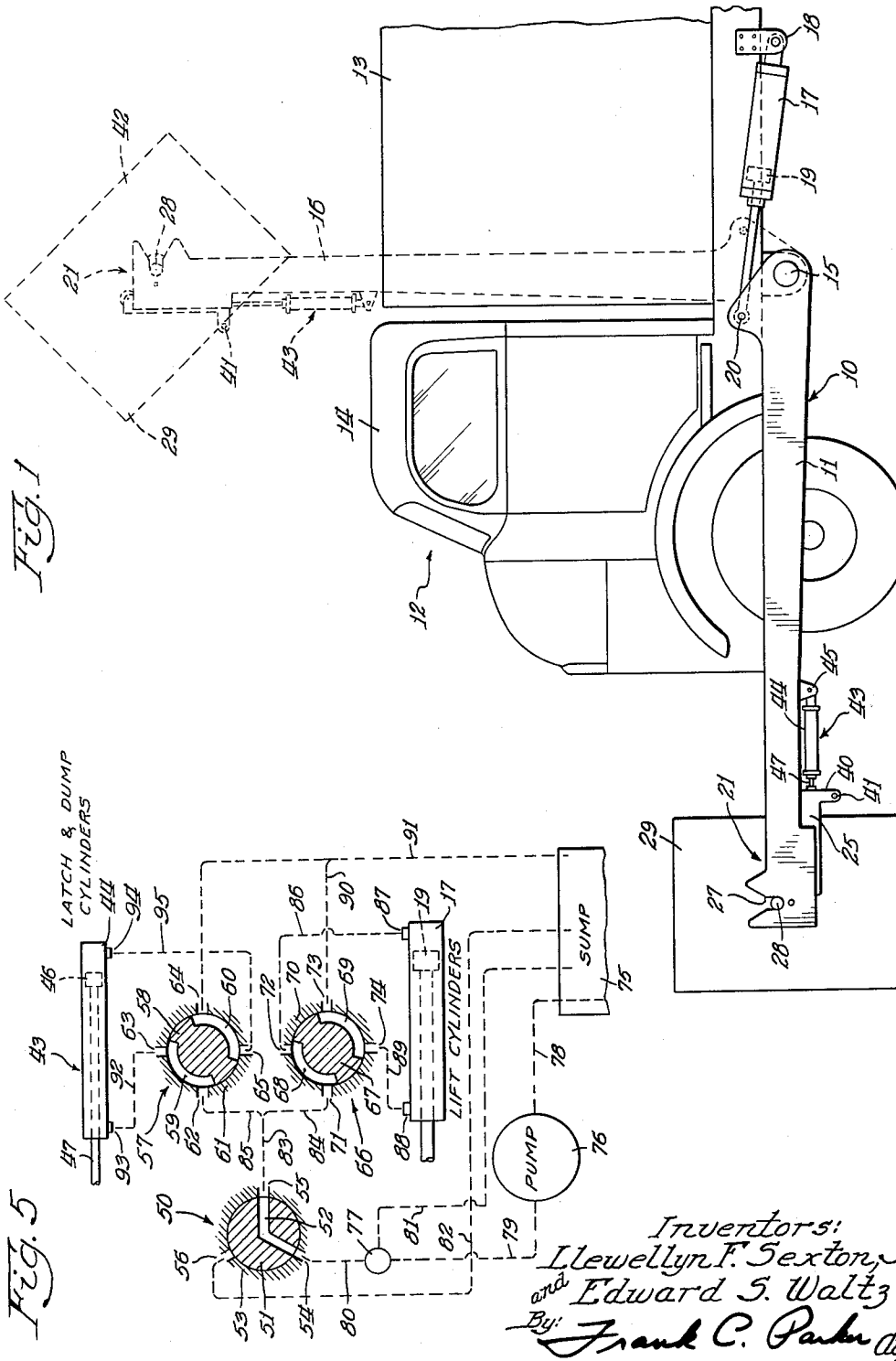
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MATERIAL HANDLING APPARATUS

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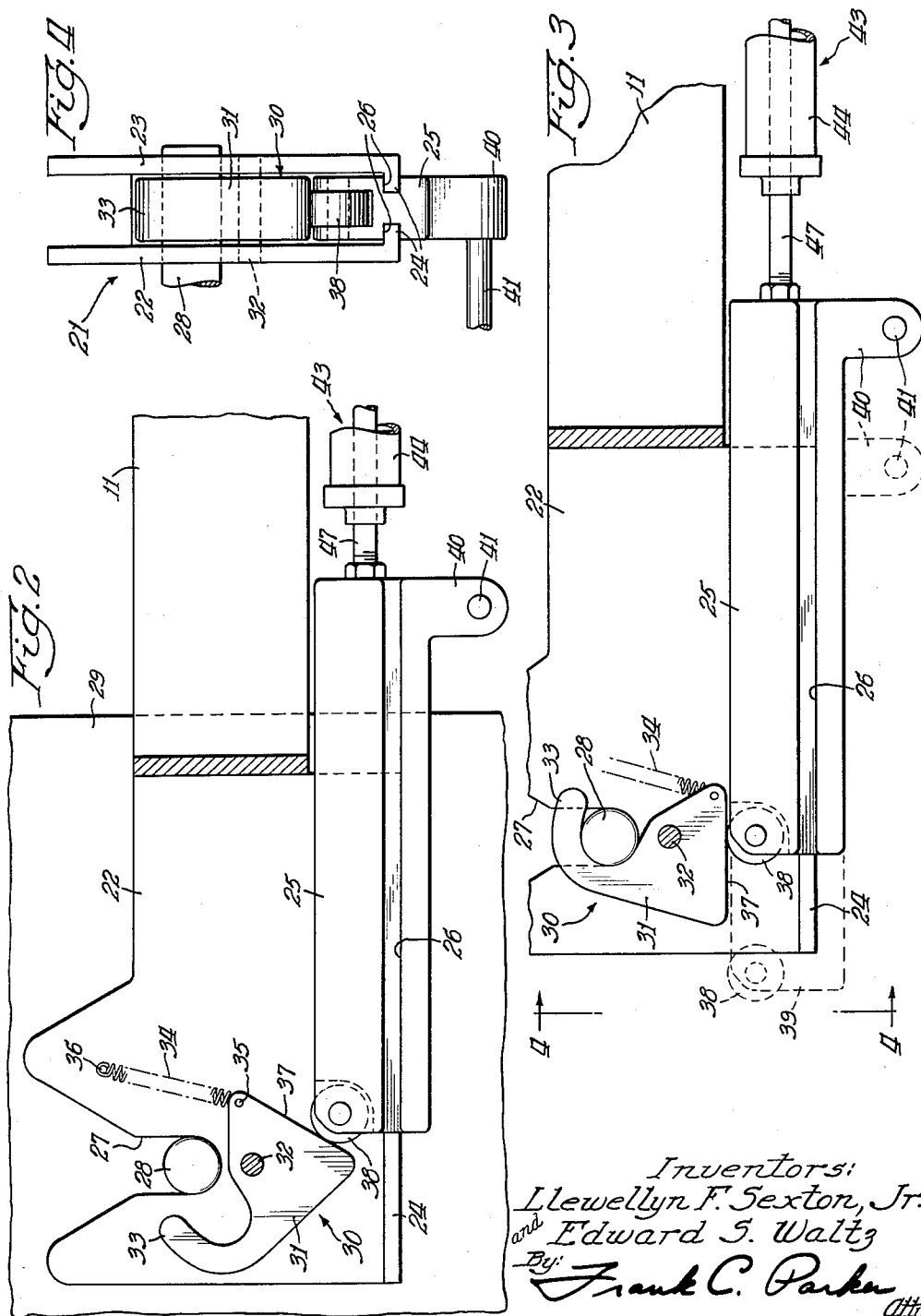
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MATERIAL HANDLING APPARATUS

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11 Claims. (Cl. 214—302)

This invention relates to material handling apparatus and is particularly concerned with that class of material handling apparatus adapted for use with conventional load hauling vehicles.

The principal object of the present invention is to provide an improved material handling mechanism adapted for mounting on a conventional automotive truck in order to enable automatic engagement of a container disposed on the ground, lifting of the container to a position over the load receiving truck body and dumping of the contents of the container into the truck body.

A more particular object of the present invention is to provide improved means for insuring the engagement of the container with the hoisting arms utilized for lifting the container and for tilting the container after it is lifted to a dumping position over the truck load receiving body.

More particularly, the present invention contemplates that the hoisting mechanism will comprise a pair of hoist arms pivotally mounted on the frame on opposite sides of the truck for rocking movement about an axis extending transversely of the frame, with each of the hoisting arms having upwardly opening slots for receiving a pair of lugs projecting respectively from opposite sides of the container, with latch means being provided for engaging the lugs to retain the latter within the slots during rocking movement of the hoisting arms, and with slide mechanism being provided for initially effecting engagement of the latch means with the respective lugs and upon further movement of the slide mechanism, the latter being effective to tilt the container into a dumping position when the arms are moved to a substantially vertical position over the truck receiving body.

More particularly, the slide mechanism is actuated by hydraulic means and includes a roller device at the leading end thereof for engaging a cam surface on the latch in order to pivot the latch against the normal biasing effect of tension spring means which normally urge the latch to a disengaged position. Upon movement of the slide mechanism, the roller engages the cam surface on the latch to effect pivotal movement thereof and further movement of the slide mechanism enables the latter to slide past the cam surface and permit the slide mechanism to engage and tilt the containers.

The latch mechanism and means for actuating the same, as disclosed herein, are particularly advantageous due to the simplicity thereof which enables rigid construction of the elements comprising the same, thereby contributing to the long life and efficient operation of the mechanism.

The foregoing objects and advantages of the present invention will become more apparent from the following detailed description when read in conjunction with the accompanying drawings, wherein:

FIG. 1 is a side elevational view of a material handling truck with the load hoisting arms shown in position to raise a container and also showing the position of the hoisting arms and container when the latter has been moved to a dumping position over the truck body;

FIG. 2 is a detail view, shown partly in section and illustrating the improved latch mechanism and container tilting mechanism disposed in the forward end of each of the hoisting arms and illustrating the elements thereof while the latch means is disengaged from the container supporting lugs;

FIG. 3 is a fragmentary view similar to FIG. 2 and

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showing the latch mechanism engaged with the container hoist lug;

FIG. 4 is a detail sectional view taken substantially along the line 4—4 in FIG. 3 and looking in the direction of the arrows; and

FIG. 5 is a schematic hydraulic circuit diagram illustrating one method whereby the hydraulic means for actuating the hoisting arms and latching mechanism can be controlled.

With reference now to the drawings, wherein like reference numerals in the different views have been used to identify identical parts, the hoisting mechanism, indicated generally by reference numeral 10, comprises a pair of hoisting arms 11 respectively mounted upon opposite sides of an automotive truck 12 having a load receiving body 13 disposed in back of the truck cab 14.

Each of the hoisting arms 11 may comprise rigid steel members pivotally mounted on the vehicle frame on an axis 15 so that the arms 11 can be moved pivotally from the position shown in solid lines in FIG. 1, wherein the arms 11 are substantially horizontal, to a vertical position as shown in dotted lines and designated by reference numeral 16. Means are provided for pivotally moving the hoist arms 11 from their horizontal position to their vertical position and such means comprise a hydraulic cylinder 17 disposed on each side of the vehicle and pivotally mounted on the vehicle frame at 18, and a reciprocable piston 19 mounted within the cylinder 17 and connected for pivotal movement with respect to the arms 11 at 20. Obviously, when fluid under pressure is admitted into the cylinders 17 on the left side of piston 19, the pistons 19 will be moved to the right with the cylinders 17 and this will cause the arms 11 to be lifted from their horizontal position to their vertical position 16.

Each of the arms 11 is formed with a bifurcated portion 21 at the end of the arms opposite the pivot axis 15. The bifurcated portion 21 comprises two substantially parallel flat rigid metal plates 22 and 23 rigidly secured to the end of the arm 11 and extending downwardly beneath the arm 11 somewhat, having inturned portions 24 which provide a guideway or track for a slide mechanism 25 which is formed with complementary longitudinally extending grooves 26 for receiving the tracks 24.

Each of the plates 22 and 23 provides an upwardly opening slot 27 adapted to receive a horizontally projecting lug 28 on opposite sides of a container 29. Latch means 30 are provided for each of the arms 11 and comprise a body portion 31 pivotally mounted between the plates 22 and 23 by means of a suitable pin 32 which is disposed substantially directly beneath the slots 27 when the arms 11 are disposed in their horizontal positions. The latch means 30 also comprise a hook or substantially C-shaped portion 33 adapted to extend over lugs 28 when the latter are seated within notches 27 in order to retain the lugs 28 within the notches 27. Tension spring means 34 connected to the latch 30 at 35 and to a suitable pin 36 extending between the plates 22 and 23 are effective normally to bias the latch means 30 in a counter clockwise direction, which effects disengagement of the hook or C-shaped portion 33 of the latch means 30 from the lugs 28.

The body portion 31 of each of the latch means 30 is provided with a substantially flat cam surface 37 which enables pivotal movement of the latch means 30 in a clockwise direction in opposition to the biasing force of spring means 34 in order to bring the hook-shaped portion 33 into latching engagement with the lugs 28.

The slide mechanism 25 is provided with a roller 38 in its leading end which is engageable with the cam surface 37 and is effective, when the slide mechanism 25 is moved from the position shown in FIG. 2 to the position shown in FIG. 3, to move the latch means 30 to its engaged position, as shown in FIG. 3. Further sliding

movement of the slide mechanism 25 to the left, to the dotted position 39, indicated in FIG. 3, has no substantial effect on the latch means 30 inasmuch as the top of slide mechanism 25 merely slides beneath the flat cam surface 37 on each of the latch means 30.

Each of the slide mechanisms 25 is provided with a depending portion 40 and the depending portion 40 on each slide mechanism 25 is connected with the other by means of rod 41 which extends between the two arms 11 and is adapted to engage the container 29 when the slide mechanism 25 is moved from the full line position shown in FIG. 3 to the dotted position shown in FIG. 3. It is contemplated that the movement of the slide mechanism 25 from the position shown in FIG. 3 to the dotted position 39 will not ordinarily be effected until the arms 11 assume their vertical position 16 as shown in FIG. 1 and under these conditions movement of the slide mechanism 25 to the dotted position 39 is effective to tilt the container 29 to the position designated by reference numeral 42 in FIG. 1.

A second hydraulic mechanism 43 is mounted respectively between each arm 11 and each slide mechanism 25 and comprises a cylinder 44 pivotally mounted at 45 and a piston 46 connected directly with the respective slide mechanism 25 by means of a piston rod 47. When fluid under pressure is admitted to the right side of the piston 46 within the cylinder 44, the piston rod 47 and slide mechanism 25 are moved to the left from the position shown in FIG. 2 and first reach the position shown in FIG. 3 wherein the latch means 30 are each engaged with the respective lugs 28, and upon further movement of the piston 46 to the left, the slide mechanism 25 will move to the dotted position shown in FIG. 3 and in this latter position the rod 41 engages the container 29 in order to tilt it as shown in dotted lines in FIG. 1.

The fluid pressure system for controlling the operation of the cylinders 17 and 44 will now be described. With reference particularly to FIG. 5, the hydraulic control system includes a main control valve 50 comprising a rotatable element 51 having a groove 52 therein and rotatably disposed within a valve block 53 formed with three ports 54, 55 and 56. A latch and dump cylinder control valve 57 comprises a rotatable member 58 having peripheral grooves 59 and 60, each of which extends angularly throughout approximately 120° and the rotatable member 58 is disposed for rotation within a housing 61 provided with ports 62, 63, 64 and 65. A lift cylinder control valve 66 is quite similar to the latch and dump control cylinder valve 57 and comprises a rotatable member 67 formed with opposed peripheral grooves 68 and 69, both of which extend angularly approximately 120° and the rotatable member 67 is maintained within a valve housing 70 formed with ports 71, 72, 73 and 74.

The hydraulic system also includes a source of fluid or sump 75, a pump 76 for providing fluid under pressure, and a pressure control valve 77 for regulating the pressure of the fluid provided to the valves and cylinders. The pump 76 is driven by the engine of the truck 12 and is adapted to draw fluid from the sump 75 through a line 78. The pump output is through a line 79 leading to the pressure regulator valve 77 and fluid leaves the main control valve 50 from the pressure regulator valve 77 through a line 80. The pressure regulator valve 77 may be of any desired construction, it only being contemplated that it will be adapted to open a relief port (not shown in detail) when the fluid in pressure line 79 tends to exceed a predetermined value and fluid exhausting through the exhaust port will return to the sump 75 through line 81. With the valve member 51 in the position shown in FIG. 5 and with the pump 76 in operation, fluid under pressure will be supplied to port 55 and lines 83, 84 and 85, the latter two lines being respectively connected with ports 71 and 62. By rotating the valve member 51 in a clockwise direction through 120°, ports 54 and 56 will be interconnected and any fluid being sup-

plied by the pump 76 will merely return to the sump through line 82.

Assuming that fluid under pressure is supplied to port 71, and that the valve member 67 is in the position shown in FIG. 5, fluid under pressure will therefore be provided for moving the piston 19 in the lift cylinders 17 to the left in order to lower the arms 11. The fluid reaches the right end of lift cylinders 19 through groove 68, port 72, line 86 and port 87. Under these same conditions fluid is exhausted from the left end of cylinders 17 through port 88, line 89, port 74, groove 69, port 73 and exhaust lines 90 and 91, the latter of which extends directly to the sump 75.

By manually rotating the valve member 67 ninety degrees to the right, the ports 71 and 74 are interconnected by groove 69 and thus fluid under pressure is supplied to the left end of cylinder 17 to cause movement of the piston 19 to the right and consequent lifting of the arms 11. Under these same conditions fluid is exhausted from the right end of cylinder 17 through port 87, line 86, port 72, groove 68, port 73 and lines 90 and 91 which lead to the sump 75.

The valve 57 controls the operation of the latch and dump cylinders 43 and when the valve member 58 is in the position shown in FIG. 5, fluid under pressure supplied to port 62 reaches the left end of cylinder 44 through groove 59, port 63, line 92 and port 93 and this causes the piston 46 to move to the right in order to return the slide mechanism 25 to the right, thereby enabling the container 29 to tip more nearly perpendicularly to the arms 11 and also to enable the spring 34 to disengage the latch means 30 from the lugs 38. Under these same conditions fluid is bled from the right end of cylinder 44 through port 94, line 95, port 65, groove 60, port 64 and line 91 to sump 75.

When it is desired to effect movement of the slide mechanism 25 to the left in order to latch the container lugs 28 and to subsequently cause tilting of the container 29 to position 42, the valve member 58 is moved to the right, thereby interconnecting ports 62 and 65 by means of groove 60. Fluid under pressure is thus supplied to the right end of cylinder 44, through port 62, groove 60, port 65, line 95 and port 94 and fluid is bled from the left end of cylinder 44 through port 93, line 92, port 63, groove 59, port 64 and line 91 leading to the sump 75.

Although the physical locations of the valves 50, 57 and 66 within the truck cab 14 are not shown, it will be understood that levers for controlling the respective valves will be positioned at any desirable location within the cab so as to be convenient to an operator of the truck. Thus, when it is desired to pick up a container 29 and dump the contents thereof into the open load receiving body 13 of the truck, the arms 11 are lowered somewhat lower than the position thereof shown in FIG. 1 and the truck is advanced forwardly until the slots 27 are beneath the lugs 28 on opposite ends of the container 29. The sloping sides of the slots 27 enable the operator of the vehicle to pick up the container 29 without absolute alignment of the lugs with the deep portion of each of the slots 27. It is only necessary that the lugs be somewhere within the V formed by the sloping sides of the slots and then the valve 66 is manipulated, assuming that the valve 55 is first moved to the position shown in FIG. 5, so as to lift the arms 11 until the lugs become seated within the slots 27. Thereafter, the valve 57 is manipulated to cause partial movement of the slide mechanisms 25 from the position shown in FIG. 2 to the full line position shown in FIG. 3. This effects movement of the latch means 30 in order to insure that the container lugs 28 will be retained within the slots 27 while the arms 11 are lifted further in response to positioning of the valve member 67 so as to cause lifting movement of the arms 11. When the arms 11 approach the vertical position, as disclosed in dotted lines in FIG. 1, the valve

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mechanism 57 is manipulated to cause the piston 46 to move further to the left and thereby move the slide mechanism 25 to the dotted position designated by reference numeral 39. Under these conditions the rod 41 engages the container 29 and tilts the container to a dumping position as designated by reference numeral 42, in FIG. 1.

In order to return the container 29 to a position on the ground in front of the truck, after it is dumped into the truck body, the valve mechanism 57 is manipulated to cause partial retraction of the slide mechanism 25 and thereafter the valve mechanism 66 is manipulated to cause lowering of the arms 11 to a horizontal position. During the last portion of the movement of the arms 11 the valve mechanism 57 can be again manipulated so as to cause the slide mechanism 25 to move further to the right to thereby disengage the latch means 30 from the lug 28 and when the arms 11 reach the limit of their respective downward strokes, the truck can be backed up and the container 29 will be left in place on the ground.

From the foregoing description of the present invention it is apparent that it provides a simple mechanism for latching a detachable container to a pair of lifting arms and is particularly adapted to be disposed at the forward end of the truck. The latching mechanism insures that the detachable container will be positively held against any tendency to slip from the grasp of the arms while it is being dumped and returned to position on the ground in front of the truck. It will be understood that the present latch mechanism would be equally applicable to a hoisting mechanism designed to raise a container disposed at the rear end of the truck. Numerous other changes and modifications could, of course, be made without departing from the spirit or scope of the invention.

What is claimed is:

1. In combination with the frame of a vehicle having a load receiving body open at the top, a pair of lifting arms respectively pivotally mounted on the frame on opposite sides of the vehicle for rocking movement about an axis extending transversely of the frame, said arms each including means at the end opposite the pivotal mounting and defining an upwardly opening substantially V-shaped slot and adapted to respectively receive projecting lugs disposed on opposite sides of a container, latch means mounted adjacent the V-shaped slot in the end of each of said arms and adapted to cooperate with the respective lugs for retaining the latter within the respective slots upon movement of said arms about said transverse axis, means including a first hydraulic mechanism for rocking said arms from a substantially horizontal position to a substantially vertical position adjacent said load receiving body, and other means including a second hydraulic mechanism and a slide mechanism connected to said second hydraulic mechanism said slide mechanism including means to effect engagement of said latch means with said lugs upon a first movement of said slide mechanism, and said slide mechanism also including means for engaging said container to effect tilting of said container upon further movement of said slide mechanism.

2. The combination as defined in claim 1 wherein said other means also includes abutment means connected to said slide mechanism effective upon further movement of said second hydraulic mechanism and the slide mechanism connected thereto to engage and tilt said container.

3. In combination with the frame of a vehicle having a load receiving body open at the top, a pair of lifting arms respectively pivotally mounted at one end of each arm on the frame on opposite sides of the vehicle for rocking movement about an axis extending transversely of the frame, said arms each including a bifurcated portion at the opposite end and defining upwardly opening slots adapted to receive projecting lugs disposed on opposite sides of a container, latch means pivotally mounted within said bifurcated end portion of each of said arms and normally biased to a position out of alignment with

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said slots, said latch means being movable pivotally into a position to engage one of said projecting lugs to retain the same seated within the slots, means including a first hydraulic mechanism for rocking said arms from a substantially horizontal position wherein the arms may be moved to a position with said slots beneath the lugs on opposite sides of the container to a substantially vertical position adjacent said load receiving body and other means including a second hydraulic mechanism and a slide mechanism connected to said second hydraulic mechanism said slide mechanism including means to positively urge the latch means into engagement and pivot the latter against the normal bias acting on said latch means to thereby latch the lugs within said slots and said slide mechanism further including abutment means to thereafter tilt the container to a dumping position upon movement of said arms to said vertical position.

4. The combination as defined in claim 3 wherein said slide mechanism is reciprocally mounted within the bifurcated portion of each of the arms and effective upon a first movement of the second hydraulic mechanism to effect the pivoting of the latch means to latch the same against the lugs within the slots and effective upon further movement of the second hydraulic mechanism to effect said tilting of the container.

5. In combination with the frame of a vehicle having a load receiving body open at the top, a pair of lifting arms respectively pivotally mounted at one end of each arm on the frame on opposite sides of the vehicle for rocking movement about an axis extending transversely of the frame, said arms each including a bifurcated portion at the opposite end and defining upwardly opening slots adapted to receive projecting lugs disposed on opposite sides of a container, latch means pivotally mounted within said bifurcated end portion of each of said arms and normally biased to a position out of alignment with said slots, said latch means being movable pivotally into a position to engage one of said projecting lugs to retain the same seated within the slots, means including a first hydraulic mechanism for rocking said arms from a substantially horizontal position wherein the arms may be moved to a position with said slots beneath the lugs on opposite sides of the container to a substantially vertical position adjacent said load receiving body and other means including a second hydraulic mechanism and a slide mechanism connected to said second hydraulic mechanism said slide mechanism being effective to first engage the latch means and pivot the latter against the normal bias acting on said latch means to thereby latch the lugs within said slots and thereafter to tilt the container to a dumping position upon movement of said arms to said vertical position.

6. The combination as defined in claim 5 wherein said slide mechanism is reciprocally mounted within the bifurcated portion of each of the arms and having roller means at the leading end thereof engageable with the latch means upon a first movement of the second hydraulic mechanism to pivot the latch means against the lugs within the slots, and the slide mechanisms in the respective bifurcated portions of the arms being interconnected by a rod which is effective upon further movement of the second hydraulic mechanism to engage and effect said tilting of the container.

7. The combination as defined in claim 5 wherein the pivotal mountings of the latch means are respectively below the deepest part of said slots when the arms are disposed substantially horizontally, wherein said slide mechanism is reciprocally mounted within the bifurcated portion of each of the arms which strikes the latch means upon a first movement of the second hydraulic mechanism and thereby pivots the latch means against the lugs within the slots, and wherein the slide mechanism is effective upon further movement of the second hydraulic mechanism to effect the tilting of the container.

8. The combination as defined in claim 5 wherein the

pivotal mountings of the latch means are respectively below the deepest part of said slots when the arms are disposed substantially horizontally, wherein said slide mechanism reciprocably mounted within the bifurcated portion of each of the arms which strikes the latch means upon a first movement of the second hydraulic mechanism and thereby pivots the latch means against the lugs within the slots, the slide mechanisms in the respective bifurcated portions of the arms are interconnected by a rod which is effective upon further movement of the second hydraulic mechanism to engage and effect said tilting of the container.

9. The combination as defined in claim 5 wherein the pivotal mountings of the latch means are respectively below the deepest part of said slots when the arms are disposed substantially horizontally, said latch means having a generally C-shaped portion which engages the container lugs and further having cam surfaces thereon, and said slide mechanism reciprocably mounted within the bifurcated portion of each of the arms and having roller means at the leading end of the slide mechanism engageable with the cam surface on each latch means upon a first movement of the second hydraulic mechanism to thereby effect the pivoting of the latch means to cause the C-shaped portion of each latch means to engage the respective container lugs and wherein the slide mechanisms are effective upon further movement of the second hydraulic mechanism to effect said tilting of the container.

10. The combination as defined in claim 5 wherein the pivotal mountings of the latch means are respectively below the deepest part of said slots when the arms are disposed substantially horizontally, said latch means having a generally C-shaped portion which engages the container lugs and further having cam surfaces thereon, and said slide mechanism reciprocably mounted within the bifurcated portion of each of the arms and having roller means at the leading end of the slide mechanism engageable with the cam surface on each latch means upon

a first movement of the second hydraulic mechanism to thereby effect the pivoting of the latch means to cause the C-shaped portion of each latch means to engage the respective container lugs and wherein the slide mechanisms in the respective bifurcated portions of the arms are interconnected by a rod which is effective upon further movement of the second hydraulic mechanism to engage and effect said tilting of the container.

11. In combination with the frame of a vehicle having a load receiving body open at the top, a pair of lifting arms respectively pivotally mounted on the frame on opposite sides of the vehicle for rocking movement about an axis extending transversely of the frame, said arms each including means at the end opposite the pivotal mounting and defining an upwardly opening substantially V-shaped slot and adapted to respectively receive projecting lugs disposed on opposite sides of a container, latch means mounted adjacent the V-shaped slot in the end of each of said arms and adapted to cooperate with the respective lugs for retaining the latter within the respective slots upon movement of said arms about said transverse axis, means including a first hydraulic mechanism for rocking said arms from a substantially horizontal position to a substantially vertical position adjacent said load receiving body, a second hydraulic mechanism comprising a piston and cylinder arrangement, and a slide mechanism directly connected to said piston and mounted on one of said lifting arms, said slide mechanism including abutment means for engaging said container to effect tilting of said container when said slide mechanism is extended.

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