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DUMP TRUCK MECHANISM

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The invention relates to an hydraulic hoist for use on dump trucks to cause tilting of the truck body about one end or side. More particularly, the invention relates to an hydraulic hoist of the type described having means connecting thereto and to the body and chassis capable of improving the action of the hoist in various ways.

One of the primary objects of the present invention is to provide an improved connection between the tiltable truck body and the hydraulic power means so that the lifting force is most effective from a power standpoint at the initial stages of the lift, when the load is heaviest, and by which the hoisting or lifting rate is increased at the latter stages of hoisting, when the load has been decreased.

A further object of the invention is to provide an improved connector mechanism of the type mentioned which includes a lost motion linkage connection so that in effect the power is applied directly against the body at the initial stages of lifting and thereafter is applied through a movable linkage member at the latter stages of the hoisting, due to the action of the lost motion linkage connection.

Still further objects and advantages of the present invention will appear from the following description and appended claims when considered in connection with the accompanying drawings in which:

Figure 1 is a side view of a dump truck or like vehicle showing in dotted lines the hydraulic hoist and associated mechanism constituting the present invention;

Figure 2 is a view in perspective showing one end of the truck with its body raised and clearly showing the hydraulic device used in accordance with the present invention to accomplish this;

Figure 3 is a side view partly in section of the rear portion of the truck showing the position assumed by the hydraulic hoisting means when the body of the truck is in its lowermost position;

Figure 4 is a side view partly in section similar to Figure 3, but showing in dot and dash lines the position of the hoisting means when the body is raised to an intermediate position, and in full lines the position of the hoisting means when the body is in a substantially fully raised position;

Figure 5 is a sectional view taken on the line 5—5 of Figure 3, looking in the direction of the arrows;

Figure 6 is a sectional view taken on the line 6—6 of Figure 3, looking in the direction of the arrows; and

Figure 7 is a sectional view taken on the line 7—7 of Figure 3, looking in the direction of the arrows.

Before explaining in detail the present invention, it is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawings, since the invention is capable of other embodiments and of being practiced or carried out in various ways. Also, it is to be understood that the phraseology or terminology employed herein is for the purposes of description and not of limitation, and it is not intended to limit the invention claimed herein beyond the requirements of the prior art.

In the embodiment of the invention shown in the drawings, the numeral 10 represents a dump truck of more or less conventional construction having a chassis 11 and a driver's cab 12 and body 13 supported thereon. The body 13 has longitudinally extending body members 14, each of which is provided on its rear end with a depending bracket 15. The chassis 11 is provided with longitudinally extending sill members 16 which underlie the members 14. The members 16 have rearwardly extending plate members 101 welded thereto; and the brackets 15 are pivotally connected to such plates by suitable pivot pins 102. The members 14 are arranged to rest upon the upper portions of sills 16 when the body 13 is in its lowermost position. The body 13 is provided with transversely extending bracing members 17 which are welded to the members 14 at spaced intervals therealong. Transversely extending members 18 are welded to the members 16 at spaced intervals therealong to brace the same.

In order to raise and lower the body about the pivots 102, an hydraulic hoisting device, generally indicated at 20, is provided. Such hoisting device 20 comprises a cylinder 21 having a tapered end cap 22 at its upper or rearwardly projecting end, and a pair of hollow supporting and reinforcing wings 23 and 24 extending sidewardly of the cylinder and longitudinally thereof which are in communication with the cylinder through the front ends thereof. Bearing members 25 are fixed to the corners of wings 23 and 24 and serve to pivotally receive the inner ends of stub shafts 10. Such stub shafts have their outer ends journaled in bearings 104 which are fixed to the facing walls 26 and 28 of the sill members 16. A piston 27, having a piston rod 28 extending through the end cap 22, is reciprocably received within the cylinder 21. A packing element 29 may be disposed within the opening through the cap 22 in surrounding relation to the rod 28 in the usual way.
A coil spring 32 is mounted within the end cap 22 and within the adjacent end of the cylinder 21 in surrounding relation to the piston rod 28. The spring 32 is seated within and fixed to an inner annular groove formed in the end of the cap 22. The spring 32 serves as a bumper or cushion against which the piston 27 abuts as it approaches the end of its travel.

A plate or bracket member 33 is fixed to the under surface of each of the wings 23 and 24 and serves as a mounting for a gear pump 34. Such gear pump may be fixed to either of the plates 33 depending upon which side of the vehicle the pump will be most conveniently accommodated.

The gear pump is of conventional construction and is intended to be driven by means of a flexible shaft 35 which is connected to the take-off box 36 of the vehicle transmission in the usual way. The pump 34 may be controlled from the driver's cab by means of an operating lever 37 which is connected to a control lever 38 on the pump through a cable 39. The control lever 38 is illustrated in Fig. 3 as being in a neutral or non-operative position, while in Fig. 4 it is shown in its operative position, at which time the pump 34 is actuated to force fluid under pressure through a fluid conductor 40 into the lower end of cylinder 21. This results in the upward movement of the piston 27 which causes dumping of the body 13 through a connection which will be hereinafter described in detail. Movement of the lever 38 to the other side of its neutral position results in a reversing action, and causes a lowering of the body.

The structure described so far forms no part of the present invention, but according to the present invention a novel connection between the piston rod 28 and the body 13 is provided whereby an improved lifting action results.

A leverage mechanism, generally indicated at 44, is provided for pivotally connecting the rod 28 to the body 13. This leverage mechanism includes a plurality of linkage members which are so disposed relative to each other and which are so connected to the chassis frame and to the body that at the initial stages of hoisting, the forces in effect are applied directly against the under surface of the body by the piston rod. Certain of the linkage members, which have lost motion connections with the other linkage member, come into action to effect an action of the latter mentioned linkage member which serves a lever to accelerate the rate of hoisting.

The leverage mechanism 44 thus comprises an upper linkage member 45 which is preferably formed of sheet metal. The member 44 is generally U-shaped in cross-section and has an upper wall 41, side walls 48 and 49, and an end plate 48a. The side walls 48 and 49 are generally trapezoidal in shape having the greatest depth toward the rear end thereof. The ends of the piston rod 41 project beyond the sides 48 and 49 and are trunnionally within bearings formed in longitudinally extending plate members 42. Such plate members 42 are welded to the facing sides of the longitudinal bearing members 44 adjacent the floor of the body. These members 42 are provided with aligned bearing openings therein which receive the ends of a pivot rod 41 and thus pivotally mount the leverage member 44 with respect to the body 13.

The leverage mechanism 44 also includes lower linkage members, one of such linkage members being disposed at each side of the leverage member 44 at each side of the cylinder 21. The lower or forward ends of the members 45 are pivotally connected to the stub shafts 19 on the outside of cylinder 21. Such linkage members extend alongside of the cylinder 21 beyond the end of cap 22. U-shaped members 46 are welded to the inner faces of members 45 and form slotted integral extensions thereof, such slots being indicated at 60.

A pivot shaft 46 extends transversely of the member 44 and passes through openings in the side walls thereof adjacent the rear end thereof. Such pivot shaft also passes through openings in reinforcing plates 52 which extend longitudinally of the member 44 and which are welded to the base thereof in parallel relation to each other and to the side walls of member 44. The outer ends of the shaft 46 project beyond the sides of the walls 48 and 49 and pass through the slots 53 formed by members 56 and 57. Washers may be mounted on the outer ends of the shaft 46 and be fixed in position relative to the shaft by cotter keys, so that the shaft 46 is slidably and pivotally connected to the members 45 through the slots.

A chain 58 has one end thereof connected to the shaft 46 and the other end thereof connected to one of the cross braces 17 on the body 13 so as to limit the movement of the lever arm 44 as the body is raised.

The piston rod 28 is connected to the leverage member 44 by means of a pivot shaft 50 which is mounted within aligned openings in the reinforcing plate members 52 and 53 and the side walls 48 and 49. Such shaft may be fixed in position by washers and cotter keys on the outer ends thereof.

When the body 13 is in its lowest position, the top wall 47 of the leverage element 44 is in a position beneath and in contact with the floor 59 of the body, as shown in Fig. 3. At this time, the shaft 46 is in its lowest position and is in a position rearwardly of and beneath the center lines of pivot shafts 41 and 50. The pivot shaft 46 is also at the forwardmost ends of slots 60 in members 45. The members 45 are of such a length with respect to the length of member 44, and in the embodiment illustrated is longer than the member 44, so that upon actuation of the piston 27, the piston rod 28 effects a raising of the body 13 by direct application of force against the body at the point of the pivot shaft 50. This continues until the body has been raised a predetermined distance when upon further movement the shaft 46 slides within the slots 50 toward the rear ends thereof. When the shaft 46 reaches the ends of the slots 60, further raising of the body pulls the leverage member 44 away from the floor 59 of the body 13, so that the body is caused to pivot about the pivots 101 while the force applied to the body at the point of the shaft 41. This causes an acceleration in the rate of dumping from the point at which the shaft 46 abuts against the ends of slots 50, and it will be seen that at this point the load has been partially dumped and that the greatest lifting effort is required at the initial stages of lifting.

Upon reversing the pump, the action of the lever arms is reversed, with the result that the body descends most quickly at the beginning of its downward operation until the lever arm 44 again lies against the under surface of floor 59 when the body is lowered at a decelerated rate.
To prevent damage of the floor 59 of the body as it contacts the upper wall 43 of the leverage element 44, a transversely extending angled brace 61 is fixed on the rear end of member 44, in such a position as to contact one of the cross braces 17. Thus, the brace 61 takes a substantial part of the jar as the member 44 abuts against the floor 59. For this purpose, a lever may be made in the specific embodiment of the invention described without departing from the spirit and substance of the invention, the scope of which is commensurate with the appended claims.

What is claimed is:

1. Apparatus for tilting the body of a dump truck comprising, in combination, a truck chassis, a body pivotally connected to said chassis, a hoisting device having one end pivotally connected to said chassis and including a reciprocable element, an elongated lever element having one end thereof pivotally connected to said body and pivotally connected to said reciprocable element intermediate the ends of said lever element, an elongated linkage member having one end thereof pivotally connected to the other end of said lever element through a lost motion connection and having its other end pivotally connected to said body, means pivotally connecting the forward end of said lever element to said body, means pivotally connecting one end of said reciprocable element to said lever element intermediate the ends thereof, an elongated linkage element having one end thereof pivotally connected to said chassis through said first named means, the other end of said linkage element being pivotally connected to the other end of said lever element through a lost motion connection, and means for reciprocating said reciprocable element to tilt said body with respect to said chassis.

2. Apparatus for tilting the body of a dump truck, comprising, in combination, a truck chassis, a body pivotally connected to said chassis, a hydraulic hoisting device including a cylinder, means pivotally connecting one end of said cylinder to said chassis, a reciprocable element operatively associated with said cylinder, an elongated lever element having one end thereof pivotally connected to said body, means pivotally connecting one end of said reciprocable element to said lever element intermediate the ends thereof, an elongated linkage element having one end thereof pivotally connected to said chassis through said first named means, the other end of said linkage member being pivotally connected to the other end of said lever element, and means for reciprocating said reciprocable element to tilt said body with respect to said chassis.

3. Apparatus for tilting the body of a dump truck, comprising, in combination, a truck chassis, a body pivotally connected to said chassis, a hydraulic hoisting device including a cylinder, means pivotally connecting one end of said cylinder to said chassis, a reciprocable element operatively associated with said cylinder, an elongated lever element having one end thereof pivotally connected to said chassis, a reciprocable element operatively associated with said cylinder, an elongated lever element having one end thereof pivotally connected to said body, means pivotally connecting one end of said reciprocable element to said lever element intermediate the ends thereof, an elongated linkage element having one end thereof pivotally connected to said chassis through said first named means, the other end of said linkage member being pivotally connected to the other end of said lever element through a lost motion connection, and means for reciprocating said reciprocable element to tilt said body with respect to said chassis.

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