UNITED STATES PATENT OFFICE

2,527,369

HOIST AND DUMPING MECHANISM FOR SEPARABLE BODIES

Arnold F. Meyer, Pewaukee, Wis., assignor to The Heil Co., Milwaukee, Wis., a corporation of Wisconsin

Application June 28, 1946, Serial No. 689,040

17 Claims. (Cl. 298—11)

1 This invention relates to improvements in hoist and dumping mechanisms for separable bodies.

In the handling of certain types of materials such as refuse from a packing plant, it is desirable to have separable bodies, in the form of four legged hoppers, which can be left beneath a discharge chute. The refuse may then be collected in the separable body as it is accumulated in the packing house, and it is thus unnecessary to tie up an entire truck while the body is being filled. It has heretofore been proposed to provide mechanism on trucks which is capable of lifting a separable body off the ground, transporting the body to a dumping location, and then tilting the body for dumping purposes. These prior mechanisms, however, have been objectionable. The mechanism illustrated in Eisenberg Patent No. 2,027,421, is too expensive because it requires the use of two hoists for elevating purposes and the use of an additional hoist for body tilting. Other structures have lacked a desirable stability.

It is a general object of the present invention to provide an improved hoist and dumping mechanism for separable bodies wherein a single hydraulic cylinder and ram is so arranged, in conjunction with cooperating elements, as to perform both the vertical elevating and the tilting operations.

A further object of the invention is to provide a structure as above described wherein novel means is utilized for stabilizing the linkage and for resisting forces which might tend to cause an undesired movement of the elevating mechanism, particularly while the body is being tilted for dumping purposes.

A further, more specific object of the invention is to provide a construction as above described wherein there are interlocking cams and rollers arranged to perform a stabilizing function while the body is being tilted.

A further, more specific object of the invention is to provide hoist and dumping mechanism for separable bodies wherein the elevating structure includes X-frames having a scissors action and wherein means such as stop links is utilized for temporarily locking the X-frames in a raised position so that undesired lowering will not occur, such as during transportation.

A further object of the invention is to provide a device as above described, wherein said stop links limit the amount of vertical elevating movement which takes place prior to the beginning of the tilting movement.

With the above and other objects in view, the invention consists of the improved hoist and dumping mechanism for separable bodies, and all of its parts and combinations, as set forth in the claims, and all equivalents thereof.

In the accompanying drawings, illustrating one complete embodiment of the preferred form of the invention, in which the same reference numerals designate the same parts in all of the views:

Fig. 1 is a perspective view, principally in side elevation, showing a truck about to be driven into operative position with respect to a separable body;

Fig. 2 is a fragmentary side elevational view of the rear of the truck frame, the separable body being illustrated in dot and dash lines, and the dot and dash line position of the elevating frame showing the parts in elevated but nontilted position;

Fig. 3 is a top view of the mechanism illustrated in Fig. 2, the vehicle wheels being illustrated by dot and dash lines;

Fig. 4 is a perspective view showing the mechanism in tilting position, parts being broken away;

Fig. 5 is a sectional view taken approximately on the line 5—5 of Fig. 2;

Fig. 6 is a fragmentary detail perspective view of one of the elevating frame side members illustrating the roller freeing cut-out in the bottom flange;

Fig. 7 is a fragmentary top view at the end of one of the arms of the X-frame;

Fig. 8 is a fragmentary partially diagrammatic view in side elevation showing the elevating mechanism in raised position, part of one of the arms being broken away to show the cam and roller cooperation;

Fig. 9 is a similar view showing the parts in tilting position and showing part of the separable body in place.

Referring more particularly to the drawings, the numeral 10 designates a truck having a rearwardly extending chassis 11 including wheels 12.

Mounted on the chassis portion 11 is an auxiliary frame 13 having spaced side members 14, a front end member 15, and a rear-end member 16. Movingly supported on top of the auxiliary frame 13 is an elevating frame 17. The elevating frame comprises side members 18, and a front end member 19, and a rear end member 20 (see Fig. 3).

Arms 21 are pivotally connected as at 22 to the rear end member 18 of the auxiliary frame 13. Arms 23 are pivotally connected at their rear
ends to the rear of the frame 18 through the medium of a pivot rod 24. The arm 21 on one side is pivotally connected to the adjacent arm 23, intermediate the length of both arms as at 28, and there is a similar pivot 28 between the arms 21 and 23 on the opposite side. The arms 21 and 23 form X-frames which have a scissors action during the elevating operation.

The forward ends of the arms 23 are provided with rollers 27 which ride in tracks 28 (see Fig. 4). The forward ends of the arms 21 are formed with similar rollers 29 which ride in the channels of the side members 18 of the elevating frame 17. The bottoms 30 of the channels 18 are formed with openings 31 (see Fig. 6) located below the dot and dash line position of the rollers in Fig. 2, so that when tilting of the frame 17 is begun, as will be hereinafter described, the rollers 29 can be freed from the frame 17 through the openings 31 to leave the frame 17 free for tilting as in Fig. 4.

The forward ends of the arms 23 are connected and transversely braced by a U-shaped rod or bar 32 which is shaped to span the cylinder 33 of an hydraulic hoist 34 (see Fig. 4). Said cylinder has its head pivotally connected as at 35 to the frame member 17 and its lower end connected in the slot 36 connected to a pivot sleeve 37 surrounding a rod which has its ends connected to the innermost plates of two spaced pairs of triangular plates 38 (see Figs. 3 and 5). The plates 39 constitute lifting levers.

Pivotally connected to one corner of each pair of the plates 39 are links 39 (see Fig. 4). The outer ends of each pair of links embrace respective longitudinal members 39 of the top frame 17, as is clear from Fig. 4, and the outer ends of the links 39 are pivotally connected to the frame 17 in any suitable manner as at 40. The other corners of the triangular plates 38 are rigidly secured to a pivot sleeve 41 which is rotatable on a transverse rod 42 connected to the auxiliary frame 13 (see Fig. 5).

A leg can be swung through an eye 43 projecting from the inner side of one of the frame members 23 as is rod 44. A coil spring 45 extends between the eye and an adjustment nut 46 (see Fig. 7).

The opposite end of the rod 44 is rigidly connected to a slotted member 47 (see Fig. 4). (A lever 48 has its upper end connected in the slot of the member 47, and the lever 48 is pivotal intermediate its length to a bracket 49 on the frame member 15. The lower end of the lever is pivotally connected to one end of a rod 50 (see Fig. 2) and the other end of the rod 50 is pivotally connected to the upper end of a valve operating lever 51. The valve operating lever is connected at an intermediate point to a valve assembly 52 to operate a valve within the latter. Pivotally connected to the lower end of the valve operating lever 51 is one end of a rod 53. The other end of the rod 53 is pivotally connected to the lower end of an immediately pivot member 54. The upper end of the member 54 is connected to one end of a rod 55, and the other end of the rod 55 is pivotally connected to the lower end of an arm 56 suitably operated by a hand lever 57.

Another hand lever 58 is pivotally connected through arm 59, rod 60, and an immediately pivot lever 61 with a power take off unit 62. Thus, when the hand lever 58 is in a predetermined position, the shaft 62 will be rotated to drive an hydraulic pump 63 adjacent the valve assembly 52.

The separable body 64 is in the form of a four-leggered hopper as is clear from Fig. 1, and is provided with legs 65 and with transverse members 66 below the body proper, the lower edges of which are adapted to be engaged by the upper edges of the elevating frame 17 when the separable body is associated with the truck.

When the valve operating hand lever 51 is in the position shown by full lines in Fig. 2 and the rod 53 and lever 54 are in the full line position shown in Fig. 2, the valve within the valve assembly 52 is in a neutral position. If the power take-off lever 58 is in a position to cause driving of the shaft 62 and pump 63, oil within the hydraulic system will circulate entirely within the pump and valve assembly 52. If it is desired to pick up a hopper 64, then a truck, in the position shown in Fig. 1, is backed under the hopper to a position where the hopper legs straddle the auxiliary frame 13 and elevating frame 17 of the truck.

Next, the hand lever 51 is moved to the dot and dash line position of Fig. 2. This causes the lever 51 to be moved to an approximately vertical position to open the valve within the valve assembly 52 and cause oil to circulate through the hydraulic line 61, into the bottom of 15, and the piston rod 36 is extended and produces movement of the parts to the dot and dash line position of Fig. 2 and to the position of Fig. 8. When in this position, the frame members 16 are raised straight upwardly by the scissors action of the members 21 and 23 and a distance of approximately 10" in the preferred embodiment. This is sufficient to lift the legs 65 of the hopper 64 off the ground. The hopper has been previously locked to the truck, in transporting position, by use of a rod 53 seen in Fig. 4, and may be passed through the registering openings in ears 59 on the hopper and ears 70, on the truck.

During the elevating movement from the full line position of Fig. 2 to the dot and dash line position therein (which is the same as the position of Fig. 8), as the frame 17 is being moved upwardly the rollers 27 on the ends of the frame members 23, move in the tracks 28 from the dotted line position of Fig. 2 to the dot and dash line position of Fig. 2 and the position of Fig. 4. When the rearward movement of the rollers 27 and the slotted member 47 may move rearwardly for a distance without actuating the lever 48. After an elevation of approximately 15° has taken place, however, and during the last three inches of the elevating movement, the lever 48 is actuated and this, in turn, causes a pull on the rod 50 and movement of the operating lever 51 on the valve assembly 52 to a holding position to prevent further extension of the piston rod 36.

After the frame member 19 has been elevated vertically the full 18°, links 71 which are pivotally connected to each other as at 72 (see Fig. 4), come into play to prevent further elevating movement and to prevent retrograde movement of the members 23. The end of one of these links is pivotally connected as at 73 to one of the X members 23 and the end of the other link is pivotally connected as at 74 to the frame member 17. When the frame is in the fully elevated dot and dash line position of Fig. 2, the link pivot 72 will drop slightly below dead center as is clear from Fig. 4, and be held in this position by a stop 73. This will prevent the arms 23 from travelling forwardly in the tracks 28 to cause an undesired lowering of the body. Thus the frame and
3,527,369

separable body are locked by the links 71 in an elevated transporting position.

After the truck arrives at a location where it is desired to leave the hopper, it is necessary to release the stop link 71. This can be accomplished by tripping the links upward past dead center either manually or by any suitable mechanism, e.g., by moving the hand lever 57 to a lowering position, fluid is caused to flow in a reverse direction, that is, into the upper end of the cylinder 33 through the line 76.

At the start of a tilting operation, as the triangular plates 9 start to swing from the position of Fig. 8 to the position shown in Figs. 4 and 9, the cams 77 which move with the triangular plates, being anchored to the same sleeve 41, engage beneath rollers 78 (see Fig. 8) and during further tilting movement the rollers roll along the convex upper edges of the cams 77 to the position of Fig. 9. This provides a stability during tilting which is an important feature of the present invention.

Various changes and modifications may be made without departing from the spirit of the invention, and all such changes are contemplated, as may come within the scope of the claims.

What I claim is:

1. In a vehicle having a rearwardly extending chassis portion, an elevating frame, spaced arms pivotally connected at their rear ends to the rear of said chassis portion and having a slideable connection at their forward ends with a forward portion of said elevating frame, spaced arms pivotally connected in scissors relationship with said first mentioned arms and having their rear ends slidably connected with the forward portion of said chassis, and means for causing elevating movement of said elevating frame and for causing tilting movement thereof on its pivotal connection with the forward ends of the first mentioned arms, and stop means for limiting the amount of elevating movement which takes place prior to tilting movement, said stop means comprising a chain of pivotally connected links, one end of which is pivotally connected to the chassis and the other end of which is pivotally connected to said elevating frame and the chassis for elevating movement.

2. In a vehicle having a rearwardly extending chassis portion, an elevating frame, means connecting said elevating frame to said chassis portion for elevating movement with respect thereto and for rearward tilting movement, means including a common hydraulic ram for causing said elevating movement and for causing tilting movement of said elevating frame, and stop means for limiting the amount of elevating movement which takes place prior to tilting movement, said stop means including a pair of pivotally connected links, one end of one link being pivotally connected to the chassis and the opposite end of the other link being pivotally connected to said elevating frame, and stop means for limiting the amount of elevating movement which takes place prior to tilting movement, said stop means including means for supporting the pivotal connection between the links beyond dead-center when the elevating frame is in fully elevated position to prevent undesired lowering movement of the elevating frame.

4. In a vehicle having a rearwardly extending chassis portion, an elevating frame, spaced arms pivotally connected at their rear ends to the rear of said chassis portion and having a slideable connection at their forward ends with a forward portion of said elevating frame, spaced arms pivotally connected in scissors relationship with said first mentioned arms and having their rear ends pivotally connected to the rear portion of said elevating frame and having their forward ends slidably connected with the forward portion of said chassis, and means for causing elevating movement of said elevating frame and for causing tilting movement thereof on its pivotal connection with the rear ends of the first mentioned arms, said elevating frame having openings for freeing the forward portion of the elevating frame from its slideable connection with the forward ends of said first mentioned arms to permit tilting movement.

5. In a vehicle having a rearwardly extending chassis portion, an elevating frame, spaced arms pivotally connected at their rear ends to the rear of said chassis portion and having a slideable connection at their forward ends with a forward portion of said elevating frame, spaced arms pivotally connected in scissors relationship with said first mentioned arms and having their rear ends pivotally connected to the rear portion of said elevating frame and having their forward ends slidably connected with the forward portion of said chassis, and means including a common hydraulic ram for causing elevating movement of said elevating frame and for causing tilting movement thereof on its pivotal connection with the rear ends of the first mentioned spaced arms, said elevating frame having openings for freeing the forward portion of the elevating frame from its slideable connection with the forward ends of said first mentioned arms to permit tilting movement.
first mentioned arms and having their rear ends pivotally connected to the rear portion of said elevating frame and having their forward ends slidable connected with the forward portion of said chassis, means for causing elevating movement of said elevating frame and for causing tilting movement thereof on its pivotal connection with the rear end of said elevating frame and the forward ends of said arms, said elevating frame having openings for freeing the forward portion of the elevating frame from its slidable connection with the forward ends of said first mentioned arms to permit tilting movement, and means for preventing collapsing movement of said arms after tilting has begun.

7. In a vehicle having a rearwardly extending chassis portion, an elevating frame, spaced arms pivotally connected at their rear ends to the rear of said chassis portion and having a slidable connection at their forward ends with a forward portion of said elevating frame, spaced arms pivotally connected in scissors relationship with said first mentioned arms and having their rear ends pivotally connected to the rear portion of said elevating frame and having their forward ends slidable connected with the forward portion of said chassis, means for causing elevating movement of said elevating frame and for causing tilting movement thereof on its pivotal connection with the rear ends of the first mentioned spaced arms, said elevating frame having openings for freeing the forward portion of the elevating frame from its slidable connection with the forward ends of said first mentioned arms to permit tilting movement, stop means for limiting the amount of elevating movement, and means for preventing collapsing movement of said arms after tilting has begun.

8. In a vehicle having a rearwardly extending chassis portion, an elevating frame, spaced arms pivotally connected at their rear ends to the rear of said chassis portion and having a slidable connection at their forward ends with a forward portion of said elevating frame, spaced arms pivotally connected in scissors relationship with said first mentioned arms and having their rear ends pivotally connected to the rear portion of said elevating frame and having their forward ends slidable connected with the forward portion of said chassis, means for causing elevating movement of said elevating frame and for causing tilting movement thereof on its pivotal connection with the rear ends of the first mentioned spaced arms, said elevating frame having openings for freeing the forward portion of the elevating frame from its slidable connection with the forward ends of said first mentioned arms to permit tilting movement, stop means for limiting the amount of elevating movement, and means for preventing collapsing movement of said arms after tilting has begun.

9. In a vehicle having a rearwardly extending chassis portion, an elevating frame, spaced arms pivotally connected at their rear ends to said chassis, and having crossing arms pivotally connected at their rear ends to said elevating frame, the forward ends of said arms having slidable connection with said elevating frame and having crossing arms pivotally connected at their rear ends to said elevating frame, the forward ends of said arms having a slidable connection with said elevating frame and having crossing arms pivotally connected at their rear ends to said elevating frame, the forward ends of said arms having a slidable connection with said elevating frame and having crossing arms pivotally connected at their rear ends to said elevating frame, the forward ends of said arms having a slidable connection with said elevating frame and having crossing arms pivotally connected at their rear ends to said elevating frame, the forward ends of said arms
having slidable connection with said elevating frame and chassis, respectively, a triangular lifting plate pivotally connected near one corner to said chassis for swinging movement in a vertical plane, a link pivotally connected at one of its ends to another corner of said lifting plate and at its other end to said elevating frame, power means for swinging said lifting plate to cause said link to exert an upward push on said elevating frame, means for freeing the forward portion of the elevating frame from the X-frame during tilting, the arm carrying said follower being an open bottomed channel and said cam being located to engage with said channel.

13. In a vehicle having a rearwardly extending chassis portion, an elevating frame, spaced arms pivotally connected at their rear ends to the rear of said chassis portion and having a slidable connection at their forward ends with a forward portion of said elevating frame, spaced arms pivotally connected in scissors relationship with said first mentioned arms and having their rear ends pivotally connected to the rear portion of said elevating frame and having their forward ends slidable connected with the forward portion of said chassis, a control rod slidably carried by one of said ends, means including a common hydraulic ram for causing elevating movement of said elevating frame and for causing tilting movement thereof on its pivotal connection with the rear ends of the first mentioned spaced arms, said elevating frame having openings for freeing the forward portion of the elevating frame from its slidable connection with the forward ends of the other pair of arms to permit tilting movement, a valve for controlling the flow of hydraulic fluid to said hydraulic ram, and means connected between said control rod and valve for automatically stopping the flow of hydraulic fluid to said ram after the elevating frame has been elevated a predetermined distance and before tilting movement has begun.

14. In a vehicle having a rearwardly extending chassis portion, an elevating frame, spaced arms pivotally connected at their rear ends to the rear of said chassis portion and having a slidable connection at their forward ends with a forward portion of said elevating frame, spaced arms pivotally connected in scissors relationship with said first mentioned arms and having their rear ends pivotally connected to their rear portion of said elevating frame and having their forward ends slidable connected with the forward portion of said chassis, and means for causing elevating movement of said elevating frame and for causing tilting movement thereof on its pivotal connection with the rear ends of the first mentioned spaced arms, there being means for freeing the forward portion of the elevating frame from its slidable connection with the forward ends of the other pair of arms to permit tilting movement.

15. In a vehicle having a rearwardly extending chassis portion, an elevating frame, means connecting said elevating frame to said chassis portion to provide first for elevating movement only with respect thereto, and then provide for rearward tilting movement after a predetermined amount of elevating movement has taken place, said last means including a lifting lever pivotally connected to said chassis for swinging movement in a vertical plane, a link pivotally connected at one end to a portion of said lever remote from the pivotal connection between the lever and chassis and at its other end to said elevating frame, power means for swinging said lever to cause said link to exert an upward push on said elevating frame, a cam swingable with said lifting lever, and a cam follower positioned to engage on top of said cam after tilting movement of the elevating frame begins in order to prevent collapse during tilting.

16. In a vehicle having a rearwardly extending chassis portion, an elevating frame, means connecting said elevating frame to said chassis portion to provide first for elevating movement only with respect thereto, and then provide for rearward tilting movement after a predetermined amount of elevating movement has taken place, and cam mechanism embodied in the means which connects the elevating frame to the chassis for preventing collapse when tilting movement of the elevating frame begins.

17. In a vehicle having a rearwardly extending chassis portion, an elevating frame, an X-frame having arms pivotally connected at their rear ends to said chassis and having crossing arms pivotally connected at their rear ends to said elevating frame, the forward ends of said arms having slidable connection with said elevating frame and chassis respectively, a triangular lifting plate pivotally connected near one corner to said chassis for swinging movement in a vertical plane, a link pivotally connected at one of its ends to another corner of said lifting plate and at its other end to said elevating frame, power means for swinging said lifting plate to cause said link to exert an upward push on said elevating frame, and means for freeing the forward portion of the elevating frame from the X-frame after a predetermined amount of elevating movement has taken place to provide for tilting movement of said elevating frame upon further operation of said power means.

ARNOLD F. MEYER.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

<table>
<thead>
<tr>
<th>Number</th>
<th>Name</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,049,210</td>
<td>Cole</td>
<td>Dec. 31, 1912</td>
</tr>
<tr>
<td>1,294,786</td>
<td>Harvey</td>
<td>Feb. 18, 1919</td>
</tr>
<tr>
<td>1,294,789</td>
<td>Harvey</td>
<td>Feb. 18, 1919</td>
</tr>
<tr>
<td>1,460,679</td>
<td>Barfoot</td>
<td>Dec. 3, 1927</td>
</tr>
<tr>
<td>2,023,184</td>
<td>Watson</td>
<td>Dec. 3, 1935</td>
</tr>
<tr>
<td>2,027,421</td>
<td>Eisenberg</td>
<td>Jan. 14, 1936</td>
</tr>
</tbody>
</table>