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W. KOEHLER

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BIN HANDLING DEVICE

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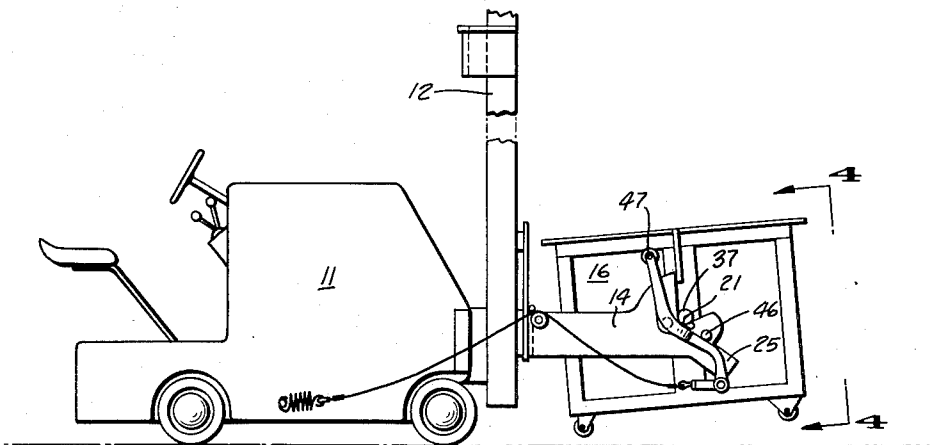


FIG. 1

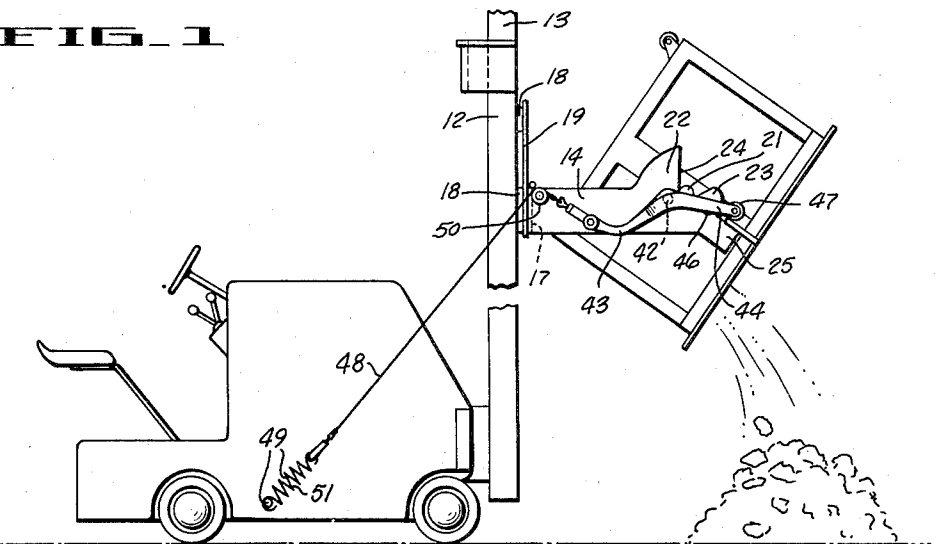


FIG. 2

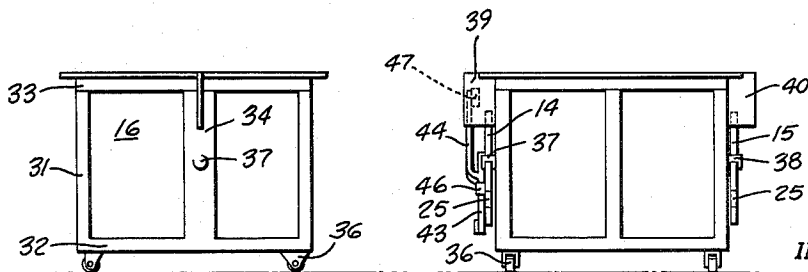


FIG. 3

FIG. 4

INVENTOR.

WAYNE KOEHLER

BY

Gardner & Zimmerman
ATTORNEYS

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BIN HANDLING DEVICE

Wayne Koehler, San Leandro, Calif., assignor to R. Stenzel Foods, Inc., San Leandro, Calif., a corporation of California

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The present invention relates to material handling devices, and in more particular to the combination of a lift truck and its hoist, a bin provided with trunnions, and means associated with said truck for lifting said bin by its trunnions and for overturning said bin to dump it.

There have been many kinds of lift trucks used for innumerable purposes, and there have been many types of containers provided with trunnions so that the contents of such containers could be discharged by tilting the containers about their trunnions.

However, the modification of a lift truck so that it can readily pick up and dump a trunnioned bin is believed to be new, and, in the present instance, patentable.

Thus, it is an object of the present invention to modify a lift truck so that it may readily pick up a trunnioned bin.

It is a further object of the present invention to so modify a lift truck so that it may readily pick up and automatically dump a trunnioned bin.

A still further object of the present invention is the addition to a standard bin of certain attachments so that it may be readily picked up and dumped by a lift truck.

The invention possesses other objects and features of advantage, some of which, with the foregoing, will be set forth in the following description of the preferred form of the invention which is illustrated in the drawing accompanying and forming part of the specification. It is to be understood, however, that variations in the showing made by the said drawing and description may be adopted within the scope of the invention as set forth in the claims.

These objects are achieved and the prior difficulties attendant upon emptying a movable bin are remedied by providing a standard box-like bin with trunnions which have their axes located above and to the side of the center of gravity of the bin, and with a cam follower surface; and by providing a lift truck hoist with a pair of forwardly extending fork arms, each arm having a forwardly and upwardly opening trunnion notch to receive a trunnion of the bin, and with a cam, or arm, which will be moved by the rise of the hoist to contact the cam follower surface to rotate the bin on its trunnions to thereby dump such material as may be in the bin.

A preferred form of my invention made in accordance with the above outline is hereinafter described in detail and shown in the accompanying drawing, in which:

Figure 1 is an elevational side view of a lift truck and bin embodying the present invention, with the bin hoisted just off the floor by the truck.

Figure 2 is a view similar to Figure 1 but with the bin fully raised and dumped.

Figure 3 is a side view of the bin alone.

Figure 4 is an end view of the bin and fork arms on the line 4—4 of Figure 1.

In the drawings, Figures 1 and 2 are side views of a lift truck and bin embodying a preferred form of the invention. In Figure 1, the truck has been maneuvered into position to lift the bin and the truck hoist has been actuated to lift the bin off the floor only a short distance. In Figure 2, the truck hoist has been further actuated as compared to the showing of Figure 1, to raise the bin to the desired height for dumping, and the dumping mechanism has operated to rotate the bin to dumping position.

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The lift truck 11 may be like any standard make having a hoist frame 12 carried at its forward end. Inside of the hoist frame 12 is a hoist 13 that may be actuated by suitable mechanisms (not shown) deriving their power and motion from the truck motor, to raise and lower the hoist parallel to and inside of the frame 12. Secured to the hoist 13 and extending forwardly thereof and of the truck are a pair of fork arms 14 and 15, both arms having the same shape. These arms are spaced apart slightly more than the width of the bin 16 so that the bin may be placed between the arms. The arms are joined together at their bases by a base piece 17. In fact, the arms and base may be made from a single piece bent in the form of a U with the base secured to and across the hoist 13 which is built outward of the frame 12 by blocks 18 and straps 19 to receive the base.

Adjacent the outer, or forward, end of each arm 14 and 15, there is formed in the arm an upwardly and forwardly opening trunnion notch 21. This notch may be considered to have a rearward ear 22 and a forward ear 23. The rearward ear extends above the forward ear a considerable distance, and the front edge 24 of the rearward ear 22 is vertical or nearly so. The front end of each arm extends downward to form a dump stop 25, the purpose of this stop and the other configurations of the forward portion of each arm will be set forth in explaining the cooperation between the fork and the bin 16.

The bin 16 shown in side view in Figure 3 and in end view in Figure 4 is composed of a frame made up of angle iron, and sheet metal filling in the panels of the walls and bottom. The angle iron is framed to form the bin corners 31 and bottom edges 32 by having the V of the iron to the inside of the box, and to form the flanged top edge 33 of the bin by having the V of the iron to the outside of the box. Each panel is reinforced by a heavy strip 34 placed across the panel, those of the side and end panels being perpendicular to the top and bottom edges. A caster 36 is secured under the bin at each corner. A trunnion 37, 38 is secured to each side strip 34, and these trunnions form an axis about which the bin may be rotated to dump the contents thereof. If one end of the bin is called the forward end and the other the rearward end, then the trunnions are so placed that their axis is closer to the forward end than to the rearward end and about midway between the top and bottom edges of the bin. As the top of the bin is open and the bottom is closed by a heavy sheet of metal, the center of gravity of the empty bin is below the center of the volume of the bin and below the trunnions' axis. A cam follower plate 39, 40 is placed on edge against each side strip 34, above a trunnion, and under the top edge flange 33 so that the plane of the plate is perpendicular to the side of the bin. The function of these follower plates and further limitations upon their dimensions will be presently described.

With the mechanisms so far described, the lift truck may be maneuvered with respect to a bin setting on a floor with the truck so that the fork arms 14 are alongside of the bin 16 and each of the bin trunnions is against the forward edge 24 of the rearward ear 22 and above the trunnion notch 21 of each fork arm. In maneuvering the truck into position to pick up a bin, the rearward ears 22 act as stops for the trunnions to position them above the trunnion notches. Further, the pick-up of the bin is always made with the center of gravity of the bin between the trunnions' axis and the truck so that as the fork is raised and the bin leaves the floor, the top of the bin will rotate toward the truck. As this rotation takes place, the lower portion of each cam follower plates 39, 40 will contact the front edge 24 of the adjacent rearward ear 22. This will limit rotation of the bin so that further actuation of the hoist and raising of the fork will lift the

bin clear of the floor with the top of the bin upward, and the bin will not dump. The cam follower plates 39, 40 must extend downwardly a distance which will provide ample engagement of them with the rearward ears 22. The forward ears 23 prevent forward movement of the trunnions when each is seated in its notch 21. If when the bin is supported by its trunnions in the notches of the fork arms, and is rotated so that its top moves away from the truck, it will rotate until the follower plates 39, 40 contact the dump stops 25 which are the downward extensions of the front ends of the fork arms. It has been found when the front end of the bin is about at an angle of thirty degrees below the horizontal, all material will flow from the bin. It is obvious that this angle may be increased, if desired. However, it is desirable that the center of gravity of the bin remain between the trunnions' axis and the truck so that when the bin has been dumped, the force of gravity may be used to return the bin to its upright position. It is obvious that the closer the axis of the trunnions is to the top of the bin, the farther the bin may be rotated for dumping and still readily return upright under the force of gravity, and that the dump stops may be relocated to allow such further rotation.

Automatic dumping of the bin upon raising of the fork and bin to the proper height is accomplished by the following mechanism. On the right side fork arm 14 adjacent the trunnion notch 21 there is pivoted on a pin 42 secured to the arm and extending outward thereof, a dump lever which is in the form of a double crank with offset arms 43, 44. These arms are called the cable arm 43 which lies close to the fork arm 14, and the cam arm 44 which is offset from the cable arm to lie outside of the cable arm and away from the fork arm. The cam arm is joined to the cable arm at a point between the pivot pin 42 and its free end. This construction allows the pivot 42 to be placed very close to the trunnion notch. Of course, the pivot for the dump lever could be on the trunnions' axis by providing a suitable bracket on the fork arm and extending outward therefrom. Offsetting the cam arm 44, allows the cam arm to clear the bin trunnion and a stop pin 46 which is secured to the forward ear 23. This stop pin 46 acts as a stop for the cable arm 43 when it is in the position shown in Figure 1. The outer end, the free end, of the cam arm 44 is provided with a cam roller 47 which, when the dump lever is rotated dextrally, from the viewpoint of Figures 1 and 2, contacts the cam follower plate 39 and thereby rotates the bin from the position of Figure 1 to the dumping position of Figure 2. After dumping of the bin, the force of gravity acting on the bin will return it and the dumping lever to the position of Figure 1. The dumping lever remains in the position of Figure 1 under the force of gravity acting on the dumping lever alone as the cam arm and cam roller are made heavy enough in comparison with the cable lever to accomplish this. A spring may be provided to aid in or to accomplish the holding of the dump lever in the position of Figure 1. Automatic rotation of the dumping lever is accomplished by a pull on a cable 48, one end of which is secured to the free end of the cable arm 43 of the dump lever, and the other end of which is secured to the side of the truck 11 at a point 49; and between which ends the cable 48 passes over a sheave 50 secured to the outside of the right side fork arm 14. A spring 51 is interposed in the line of the cable so as to prevent it being subjected to excessive strain or shock. It will be apparent that as the fork is raised, the distance between the sheave 50 and the anchor point 49 will increase so as to tension the cable. This pulls on the dump lever to rotate its arms 43, 44 and bring the cam roller 47 against the follower plate 39 to rotate the bin to dumping position. As the fork is lowered, the bin will return to its upright position, as previously described. The cable is given a length and the hoist actuated to give this described performance. When the bin has been lifted

free of the floor it may be moved about from one location to another without dumping. Dumping is only had when the hoist is raised to the proper height.

Having thus described the construction and operation of a preferred form of construction for a lift truck, bin, and associated mechanisms, it will be appreciated that I have devised a mechanism which will lift a bin and automatically dump such bin in a simple and easy manner. Therefore, I claim:

1. A lift truck having a hoist, a pair of fork arms secured to said hoist and extending forwardly from said truck and hoist, an upwardly and forwardly opening trunnion notch formed near the outer end of each arm, a bin having trunnions located above and to one side of the center of gravity of said bin, a cam follower surface formed integral with said bin, said bin being of a size to fit between said arms with said trunnions in said notches, a dump lever pivoted to one of said arms adjacent its trunnion notch, a cable having one end thereof secured to one end of said lever and the other end thereof secured to said truck so that upon upward movement of said arms said cable will be tensioned to swing said lever to contact said cam follower surface and to thereby rotate said bin on its trunnions.

2. A lift truck having a hoist, a pair of fork arms secured to said hoist and extending forwardly from said truck and hoist, an upwardly and forwardly opening trunnion notch formed near the outer end of each arm, a dump lever pivoted to an arm adjacent its notch, a cable having one end thereof secured to one end of said lever and the other end thereof secured to said truck so that upward movement of said arms will tension said cable and pivotally move said lever, a bin having side trunnions engageable in said notches, and means on said bin engageable with said lever upon pivotal movement of the latter for rocking said bin on its trunnions.

3. A lift truck having a hoist, a pair of fork arms secured to said hoist, an upwardly opening trunnion notch formed near the outer end of each arm, a dump lever pivoted to one of said arms adjacent its trunnion notch, a cable having one end thereof secured to one end of said lever whereby upon tensioning of said cable, said lever will be rocked, a bin having opposed trunnions engageable in said notches, a member on said bin normally spaced from one end of said lever and engageable by the lever upon rotation thereof for rocking said bin about said trunnions.

4. A lift truck having a hoist, a pair of fork arms secured to said hoist and extending forwardly from said truck and hoist, an upwardly and forwardly opening trunnion notch formed near the outer end of each arm, a bin having trunnions located above and to one side of the center of gravity of said bin, a cam follower surface formed integral with said bin, said bin being of a size to fit between said arms with said trunnions in said notches, and a cam operated by upward movement of said hoist and bin to engage said follower and to thereby rotate said bin on its trunnions.

5. Apparatus as set forth in claim 3 in which said member comprises a cam follower plate disposed above said trunnion, and said lever end is provided with a roller for engaging said plate.

6. Apparatus as set forth in claim 3 in which said lever is pivoted to said arm intermediate the ends thereof, one of said lever ends having a roller journaled thereon, said roller being normally spaced from said bin member, and means for limiting rocking movement of said bin upon rotation of said lever, said means including said bin member being engageable with a portion of said arm.

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