July 2, 1957 F. J. AVERY 2,797,831

MATERIAL UNLOADING DEVICE

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Fig. 1

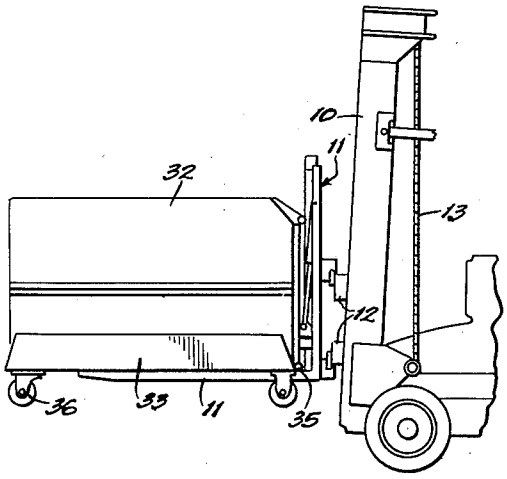


Fig. 2

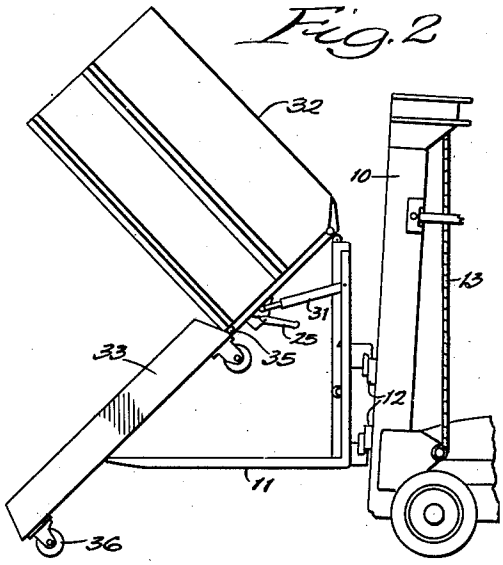


Fig. 3

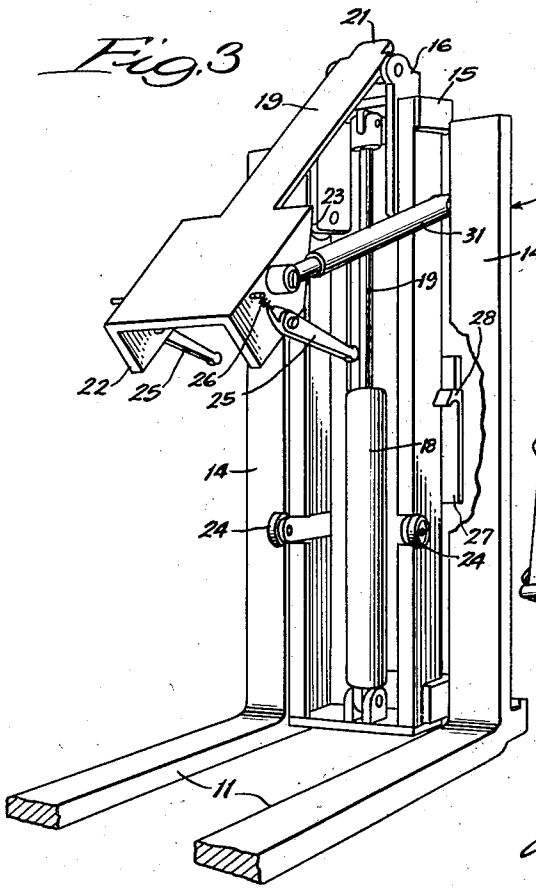
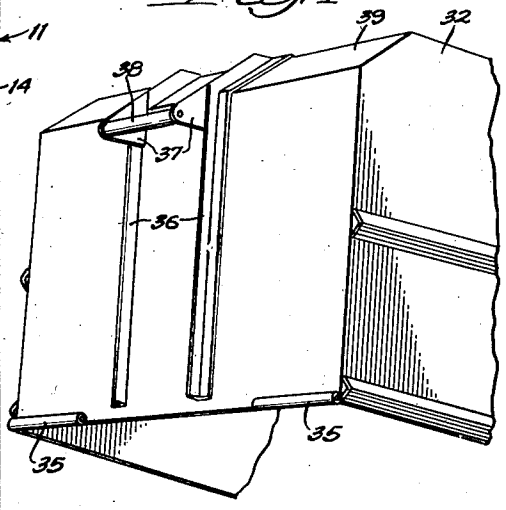


Fig. 4



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Fig. 5

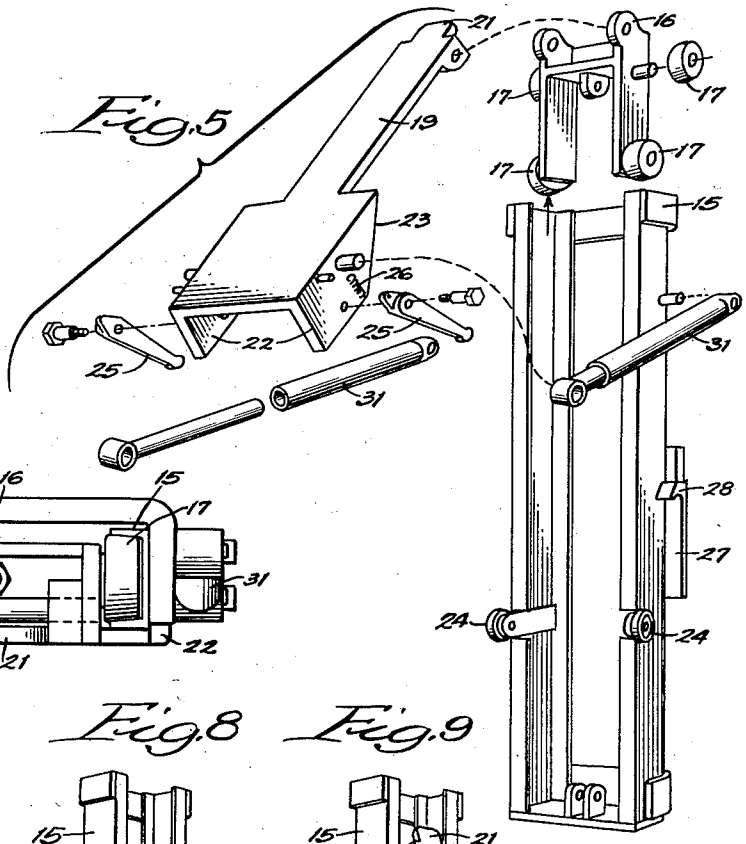


Fig. 6

Fig. 7

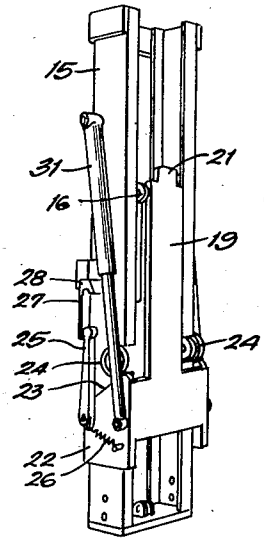


Fig. 8

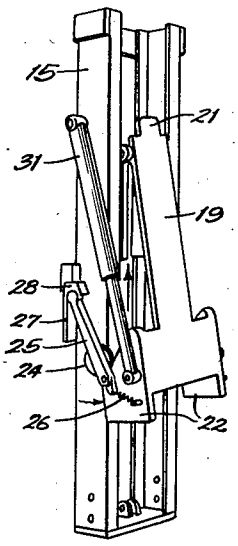
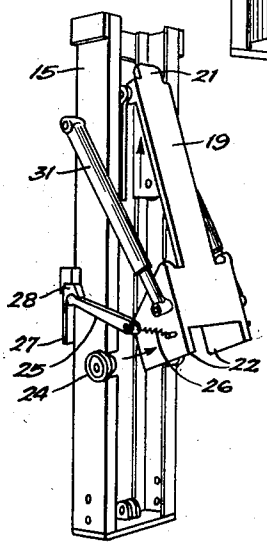


Fig. 9



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MATERIAL UNLOADING DEVICE

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Application July 6, 1954, Serial No. 441,443

11 Claims. (Cl. 214—317)

This invention relates to a material unloading device and more particularly to an apparatus for use with a fork lift truck or the like to transport and unload loose material.

In handling loose material such as small parts, scrap and the like with fork lift trucks, it is highly desirable to be able to discharge the material from the bottom of a container carried by the truck. For this purpose it has been proposed to use drop bottom boxes or containers to be picked up by the forks of the truck together with mechanism to elevate the boxes above the truck forks. The boxes are provided with hinged bottoms which drop when the boxes are elevated to allow the contents to spill out.

Such mechanisms normally raise the boxes straight up so that a substantial elevation thereof is necessary before the material can be discharged. A relatively long stroke of the elevating mechanism is, therefore, required to effect complete emptying of the box.

It is one of the objects of the present invention to provide a material unloading device in which discharge of material from the container or box is started after a relatively small elevation of the container and may be completely effected with a relatively short stroke of the mechanism.

Another object is to provide a material unloading device in which the container is tilted simultaneously with elevation thereof.

Still another object is to provide a material unloading device in which one tilting means is effective during initial raising of the container to tilt the container through a limited degree of movement and additional tilting mechanism becomes effective during continued raising of the container to tilt it an additional amount.

According to one feature of the invention the initial tilting mechanism is a cam mechanism which provides an efficient mechanical advantage during initial movement and the additional mechanism is in the form of levers which reach an efficient operating angle at termination of the cam throw. In the preferred construction there are two sets of levers, one of which is relatively short to become effective at the end of the cam operation and the other of which is relatively long collapsible levers which reach an efficient operating angle at the end of the operation of the short levers.

The above and other objects and features of the invention will be more readily apparent from the following description when read in connection with the accompanying drawing, in which:

Figure 1 is a partial side elevation of a lift truck equipped with an unloading device embodying the invention;

Figure 2 is a view similar to Figure 1 showing the parts in full unloading position;

Figure 3 is a perspective view of the unloading mechanism in full unloading position;

Figure 4 is a partial perspective view of the container or box;

Figure 5 is a disassembled perspective view of the unloading mechanism;

Figure 6 is a plan view of the unloading mechanism; and

Figures 7, 8, and 9 are perspective views of the unloading mechanism illustrating different positions thereof.

The unloading mechanism of the present invention is adapted to be used with a conventional fork truck having an upright frame **10** carrying a fork unit **11**. The fork unit is mounted on supports **12** which may be moved vertically on the frame **10** through a chain **13** or the like to pick up and transport loads.

The fork unit **11** as shown in detail in Figure 3 comprises a pair of uprights **14** which are adapted to be connected to the supports **12** to be elevated thereby. The uprights **14** carry a frame formed by a pair of inwardly facing channel frame members **15** serving as vertical guide tracks for a carriage **16**. The carriage **16** carries rollers **17** riding in the channels **15** to support and guide the carriage for vertical movement on the frame members **15**. The carriage may be elevated by a hydraulic cylinder **18** whose piston rod **19** is connected directly to the carriage, as shown in Figure 3.

The carriage pivotally carries a supporting bar **19** whose vertical length is substantially equal to the height of a box or container to be lifted. At its upper end the supporting bar **19** is pivoted to the carriage **16** on a horizontal axis and is formed with a reduced extension **21** projecting above the pivot to engage the box or container as described hereinafter. At its lower end the supporting bar is preferably wider to provide an enlarged surface for engaging the box and has inwardly turned flanges **22** which are cut off at the upper edge at an angle to provide cam surfaces **23**. When the carriage is lowered the flanges **22** overlie the sides of the channel frame members **15** as shown in Figure 7 and the cam surfaces **23** lie directly beneath cam rollers **24** mounted on the channel frame members **15**. When the carriage is elevated the cam surfaces will cooperate with the rollers **24** to move the lower end of the supporting bar outward from the frame as shown in Figure 8.

For further tilting movement of the supporting bar outward from the frame, levers **25** are provided, pivoted on the lower end of the supporting bar, and urged to a position projecting outward therefrom as shown in Figure 3 by springs **26**. The free ends of lever **25** cooperate with fixed guide plates **27** mounted on the frame members **15** and positioned to engage the ends of the levers and hold them in vertical position when the carriage is lowered as shown in Figure 3. During initial upward movement of the carriage, while the cams **23—24** are effective, the ends of levers **25** will slide freely along the guides **27**. At the end of the effective cam operation the ends of the levers will engage stops **28** at the upper ends of the guides **27** to stop sliding movement of the levers. At this time the levers are at such an angle as shown in Figure 8 that they will be effective during further upward movement of the carriage to swing the lower end of the supporting bar further outward from the frame to the position shown in Figure 9.

To swing the supporting bar still further outward an additional lever mechanism is provided consisting of telescoping levers **31** pivoted at the upper end to the frame members **15** and at their lower ends to the lower portion of the supporting bar. During upward movement of the carriage through the two steps described above, the telescoping levers **31** will collapse freely and will reach the limit of their collapsability when the parts are in the position shown in Figure 9. Upon continued upward movement of the carriage the levers **31** become effective to swing the lower end of the supporting bar still further outward from the frame to the extreme position shown

in Figures 2 and 3. At this time the levers **25** will swing away from the guides **27** and will be held projecting outward from the supporting bar by the springs **26**.

When the carriage is lowered the ends of the levers **25** will engage the top portions of the guides **27** and will be swung inward by the guides **27** to the starting position shown in Figures 1 and 7. During this movement the telescoping lever **31** will extend to the position shown in Figures 1 and 7 so that the mechanism automatically returns itself to operating condition.

The mechanism is adapted to be used with a box or container as shown in Figures 1, 2, and 4 which may be of rectangular shape with vertical side and end walls **32**. The bottom of the box is closed by a hinged closure **33** pivoted at one end to the bottom of an end wall **34** of the box on hinges **35**. The box bottom may carry rollers or foot members **36** to elevate it above the floor so that the forks of the truck can be slipped under the box to pick it up.

The end **34** of the box on which the hinges are provided is preferably reinforced by angle bars **36** extending vertically along the end of the box and spaced apart to receive the supporting bar between them. Near the upper end of the box a pair of spaced lugs **37** are provided connected by a pin **38** which is spaced from the end of the box. The lugs **37** and pin **38** are so spaced as to receive the reduced projection **21** of the supporting bar between the lugs and between the pin **38** and the end of the box thereby to connect the box to the supporting bar for elevation and tilting therewith. Preferably the top edge of the end **34** extends inward at an angle as indicated at **39** so that the box can be of greater height than the supporting bar and can be picked up and tilted thereby without interference with the tilting mechanism and with the ability to hold a full load of material.

In using this device a box may be picked up on the forks with the carriage lowered as shown in Figure 1 and with the supporting bar lying between the angle strips **36**. The box may be elevated by the forks to any desired position at which the material therein is to be unloaded in the usual manner. To unload the material the hydraulic cylinder **18** is energized to elevate the carriage **16**. During initial upward movement the projection **21** will slip between the lugs **37** and between the end of the box and the pin **38** to secure the box to the supporting bar. It can be seen that this operation can be performed without any direct attention on the part of the operator other than controlling hydraulic cylinder.

As the carriage continues to rise the cam surfaces **23** will ride over the rollers **24** to tilt the lower end of the supporting bar and of the box outward. This will tilt the outer end of the box upward away from the bottom **33** and at the same time the bottom will tend to pivot downward about the hinges **35** since it has been elevated above the forks **11**. Material in the box will, therefore, start to spill out promptly over the front edge of the bottom **33** into any desired location.

As the carriage continues to move upward the supporting bar will be tilted further outward first by the levers **25** and then by the telescoping levers **31** until the box is in its full unloading position as shown in Figure 2. In this position the end **34** of the box and the bottom **33** form a substantially straight continuous surface at an acute angle at the horizontal so that all material in the box will flow therefrom.

Upon completion of the unloading operation the parts may be returned to the position of Figure 1 ready to receive a new loaded box.

While one embodiment of the invention has been shown and described in detail, it will be understood that this is for the purpose of illustrating only and is not to be taken as a definition of the scope of the invention, reference being had for this purpose to the appended claims.

What is claimed is:

1. A material unloading device for use on lift trucks and the like comprising a container having its bottom hinged at one end, a supporting frame, a carriage movable vertically on the frame, a supporting bar pivoted on the carriage on a horizontal axis, interengaging parts on the supporting bar and said one end of the container to connect the container to the supporting bar to be elevated thereby, and means operatively connecting the supporting bar and the frame to swing the lower end of the supporting bar outward from the frame as the carriage is moved upward on the frame thereby to tilt the container upward.

2. A material unloading device for use on lift trucks and the like comprising a container having its bottom hinged at one end, a supporting frame, a carriage movable vertically on the frame, a supporting bar pivoted on the carriage on a horizontal axis, interengaging parts on the supporting bar and said one end of the container to connect the container to the supporting bar to be elevated thereby, and telescoping links connected at their opposite ends to the frame and the lower end of the supporting bar to telescope during initial upward movement of the carriage and thereafter to swing the lower end of the supporting bar outward from the frame as the carriage continues to move upward.

3. A material unloading device for use on lift trucks and the like comprising a container having its bottom hinged at one end, a supporting frame, a carriage movable vertically on the frame, a supporting bar pivoted on the carriage on a horizontal axis, interengaging parts on the supporting bar and said one end of the container to connect the container to the supporting bar to be elevated thereby, interengaging parts on the frame and the supporting bar to swing the lower end of the supporting bar a limited distance outward from the frame during initial upward movement of the carriage, and links operatively connecting the frame and supporting bar to swing the lower end of the supporting bar farther outward during continued upward movement of the carriage.

4. A material unloading device for use on lift trucks and the like comprising a container having its bottom hinged at one end, a supporting frame, a carriage movable vertically on the frame, a supporting bar pivoted on the carriage on a horizontal axis, interengaging parts on the supporting bar and said one end of the container to connect the container to the supporting bar to be elevated thereby, interengaging parts on the frame and the supporting bar to swing the lower end of the supporting bar a limited distance outward from the frame during initial upward movement of the carriage, a pivoted arm and a guide member one mounted on the supporting bar and the other on the frame, the guide member slidably engaging the free end of the arm during said initial upward movement and including a stop engageable with the end of the arm to cause it to swing in a direction to force the lower end of the supporting bar farther outward during continued upward movement of the carriage.

5. A material unloading device for use on lift trucks and the like comprising a container having its bottom hinged at one end, a supporting frame, a carriage movable vertically on the frame, a supporting bar pivoted on the carriage on a horizontal axis, interengaging parts on the supporting bar and said one end of the container to connect the container to the supporting bar to be elevated thereby, interengaging parts on the frame and the supporting bar to swing the lower end of the supporting bar a limited distance outward from the frame during initial upward movement of the carriage, and collapsible telescoping links connected at their ends to the supporting bar and the frame to collapse during said initial movement of the carriage and to force the lower end of the supporting bar to swing farther out during continued upward movement of the carriage.

6. A material unloading device for use on lift trucks and the like comprising a container having its bottom hinged at one end, a supporting frame, a carriage movable vertically on the frame, a supporting bar pivoted on the

carriage on a horizontal axis, interengaging parts on the supporting bar and said one end of the container to connect the container to the supporting bar to be elevated thereby, interengaging cam elements on the frame and the supporting bar to swing the lower end of the supporting bar outward from the frame during initial upward movement of the carriage, and links acting between the supporting bar and the frame to swing the lower end of the supporting bar farther outward from the frame during continued upward movement of the carriage.

7. A material unloading device for use on lift trucks and the like comprising a container having its bottom hinged at one end, a supporting frame, a carriage movable vertically on the frame, a supporting bar pivoted on the carriage on a horizontal axis, interengaging parts on the supporting bar and said one end of the container to connect the container to the supporting bar to be elevated thereby, interengaging cam elements on the frame and the supporting bar to swing the lower end of the supporting bar outward from the frame during initial upward movement of the carriage, and collapsible telescoping links connecting the supporting bar to the frame to collapse during said initial movement and to swing the lower end of the supporting bar farther outward during continued upward movement of the carriage.

8. A material unloading device for use on lift trucks and the like comprising a container having its bottom hinged at one end, a supporting frame, a carriage movable vertically on the frame, a supporting bar pivoted on the carriage on a horizontal axis, interengaging parts on the supporting bar and said one end of the container to connect the container to the supporting bar to be elevated thereby, interengaging cam elements on the frame and the supporting bar to swing the lower end of the supporting bar outward from the frame during initial upward movement of the carriage, a pivoted arm and guide member one mounted on the arm and the other on the frame, the guide member slidably engaging the free end of the arm during said initial upward movement and including a stop engageable with the arm to cause it to swing in a direction to force the lower end of the supporting bar farther outward during a second stage of upward movement of the carriage, and collapsible links connected to the supporting bar and the frame to collapse during the initial and second stage movement of the carriage and to force the lower end of the supporting bar to swing still farther out during a third stage of upward movement of the carriage.

9. A material unloading device for use with lift trucks and the like comprising a vertically movable carriage, a supporting bar pivoted adjacent to its upper end on the carriage and including a reduced projection at its upper end, a container having its bottom hinged to the container at one end, a pair of spaced lugs projecting from said one end of the container adjacent to its top to receive the reduced projection between them, and a cross member connecting the lugs to fit over the projection whereby the supporting bar is connected to the container to raise it.

10. In a material unloading device for use with lift trucks and the like, a container having vertical side and end walls, a bottom hinged to one of the end walls, a pair of spaced parallel bars extending vertically along said one end wall of the container, a pair of spaced lugs projecting from said one end wall adjacent to the tops of the spaced parallel bars, and a cross member connecting the lugs and lying substantially parallel to and spaced from said one of the end walls, the spaced parallel bars being adapted to receive between them a supporting bar for lifting and tilting the container with the upper end of the supporting bar fitting between the lugs and between the cross member and said one end of the container.

11. A material unloading device for use with lift trucks and the like comprising a vertically movable carriage, a supporting bar pivoted adjacent to its upper end on the carriage and including a reduced projection at its upper end, a container having side and end walls and a bottom hinged to one of the end walls, a pair of elongated spaced parallel bars extending vertically along said one end of the container to receive the supporting bar between them, a pair of spaced lugs adjacent to the upper ends of the bars to receive the reduced projection between them, and a cross member connecting the lugs and spaced from the container end wall to overlie the reduced projection.

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