United States Patent

[11] 3,595,414

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[54] **BOX DUMPER**
6 Claims, 7 Drawing Figs.

[52] U.S. Cl. 214/313, 214/620
[51] Int. Cl. B65g 7/00, B65g 65/00
[50] Field of Search 214/315, 318, 55, 620, 313, 314, 52

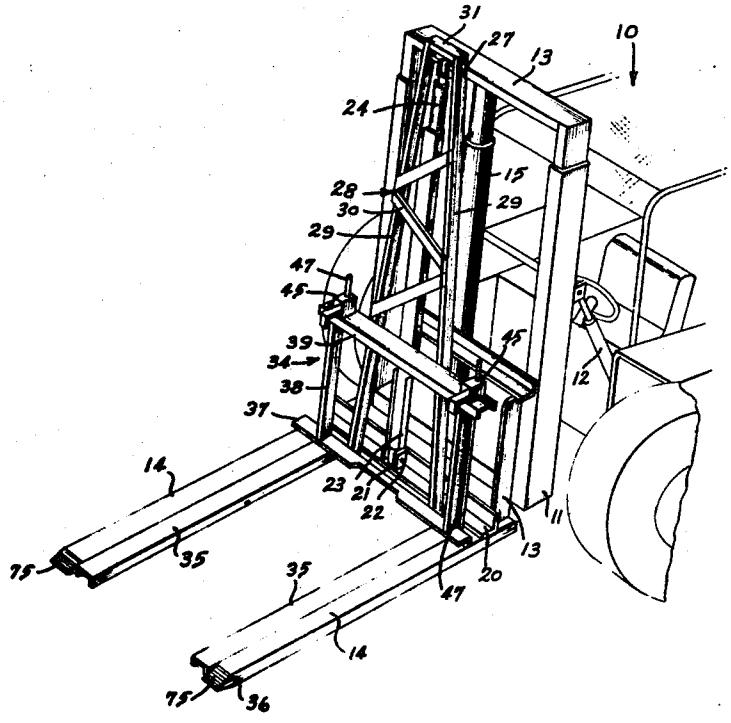
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ABSTRACT: Apparatus mountable on a forklift-type vehicle and adapted to be moved into engagement with an open top box, automatically clamped thereto so that the box can be rotated more than 90° to completely discharge the contents of the box, and then automatically released to remove the box from the apparatus.



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SHEET 1 OF 4

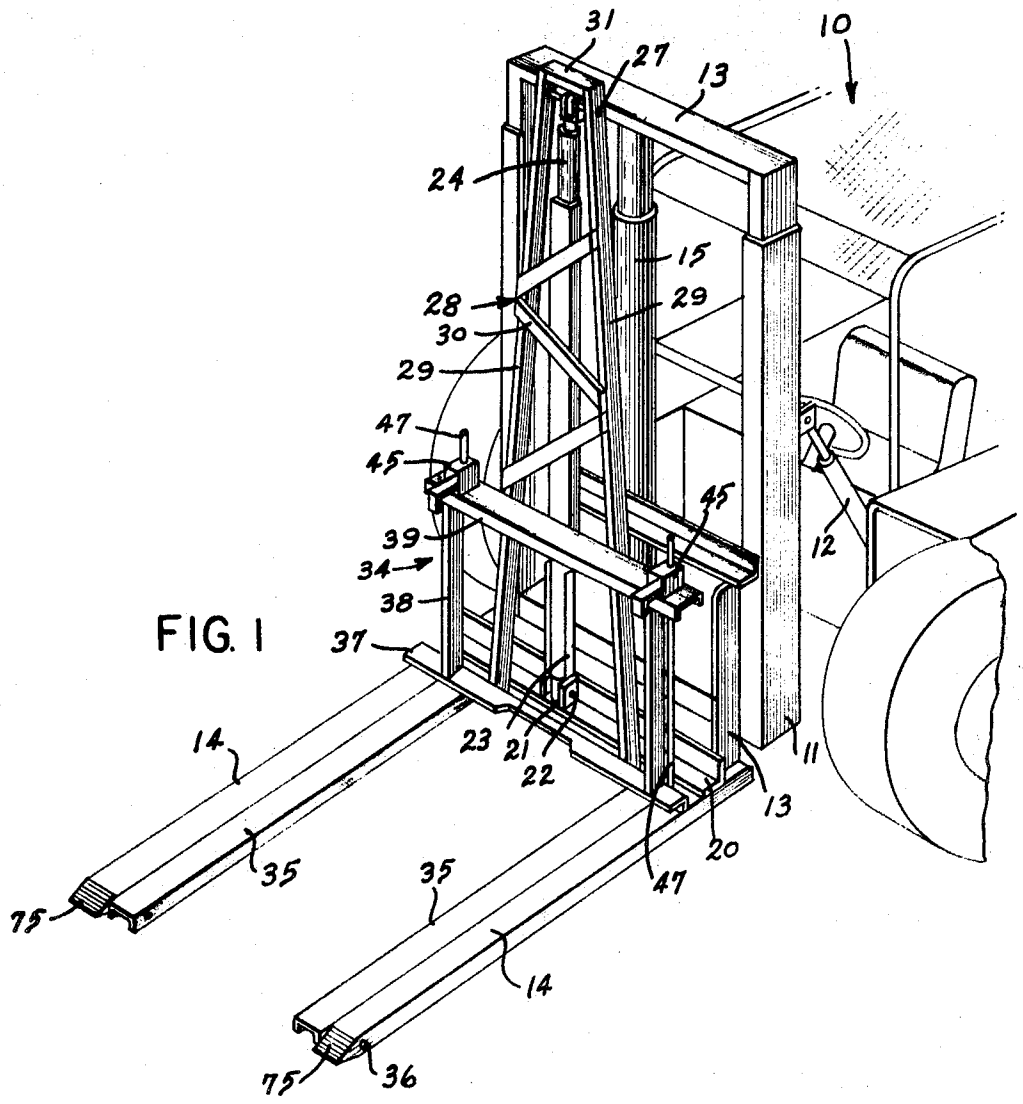


FIG. 1

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FIG. 3

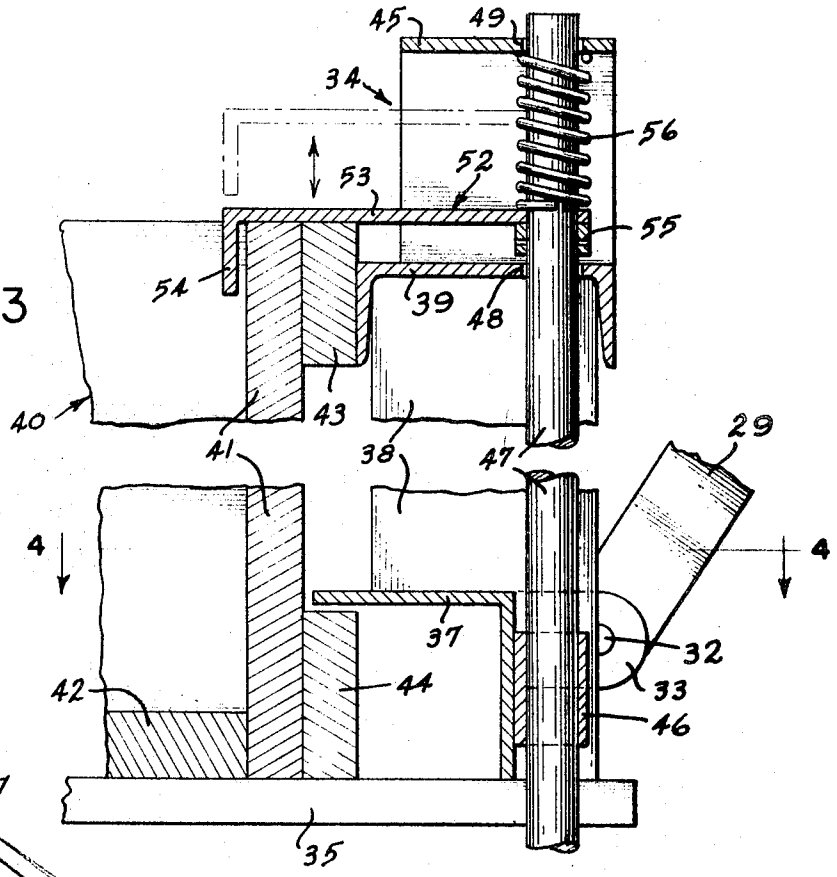
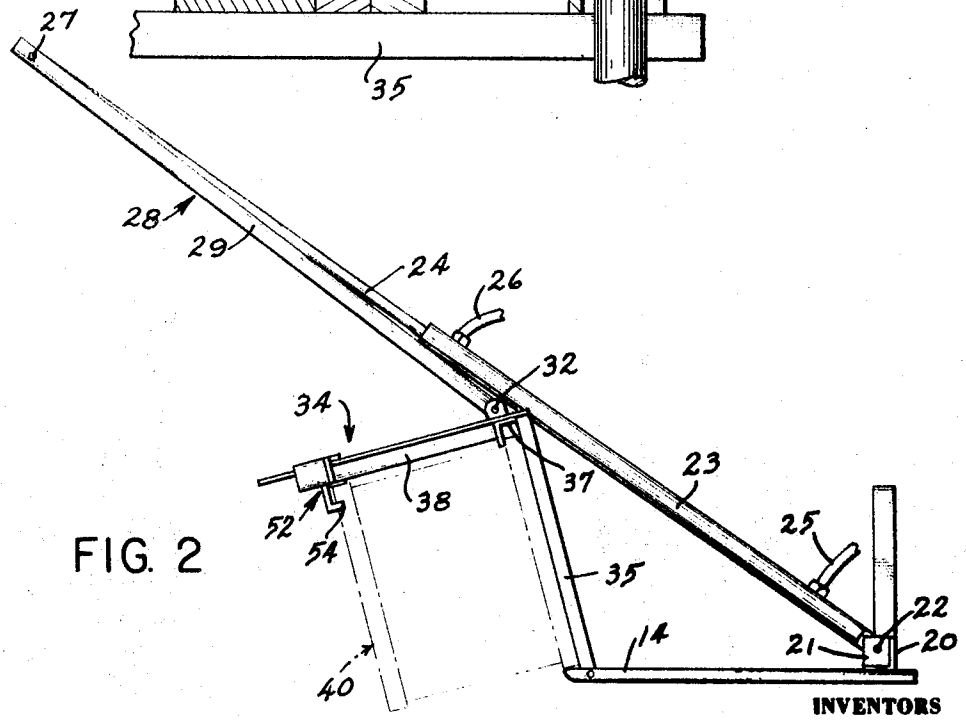


FIG. 2



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FIG. 4

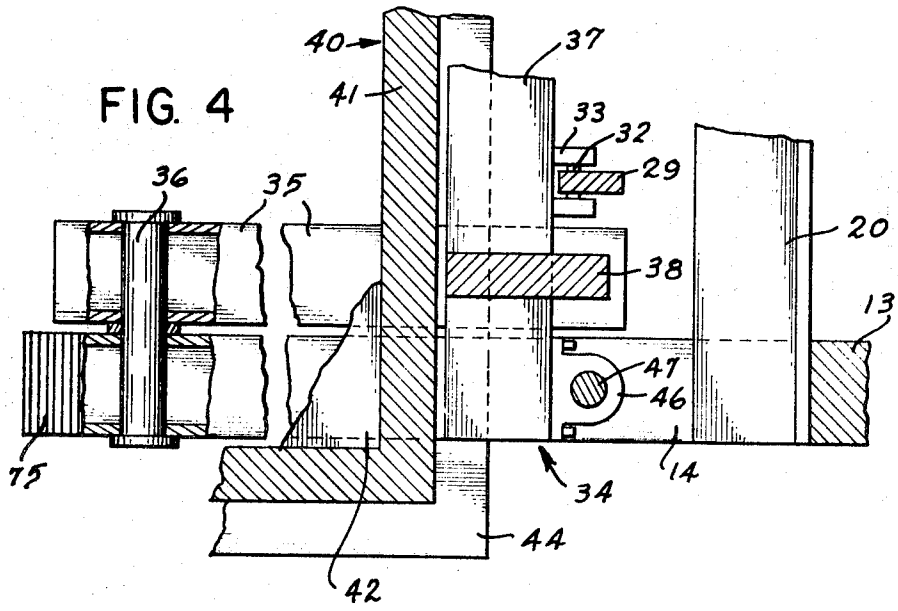
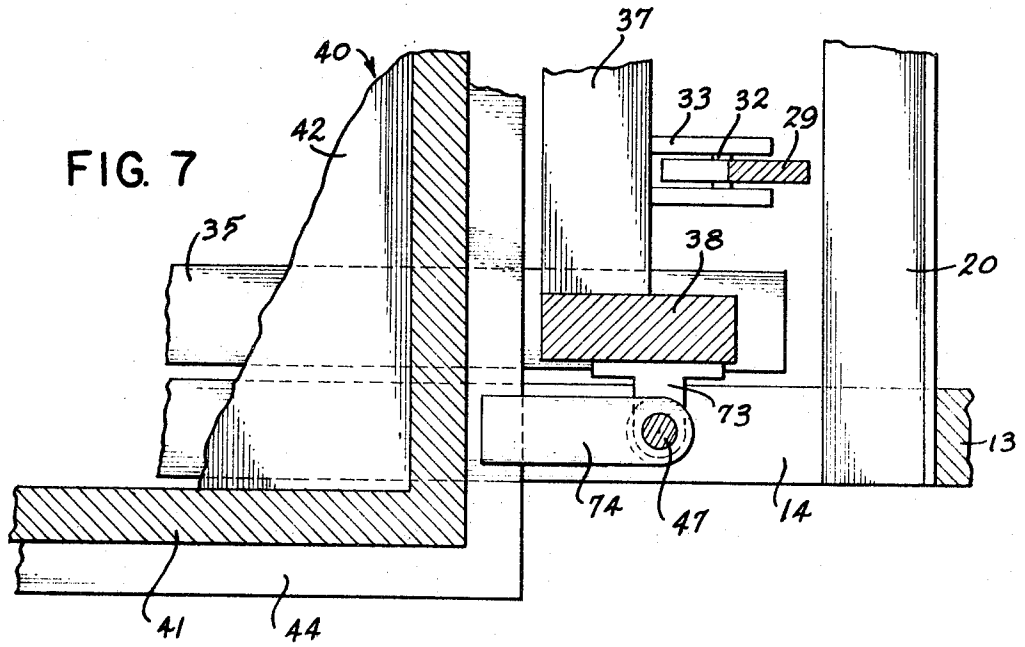


FIG. 7



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FIG. 6

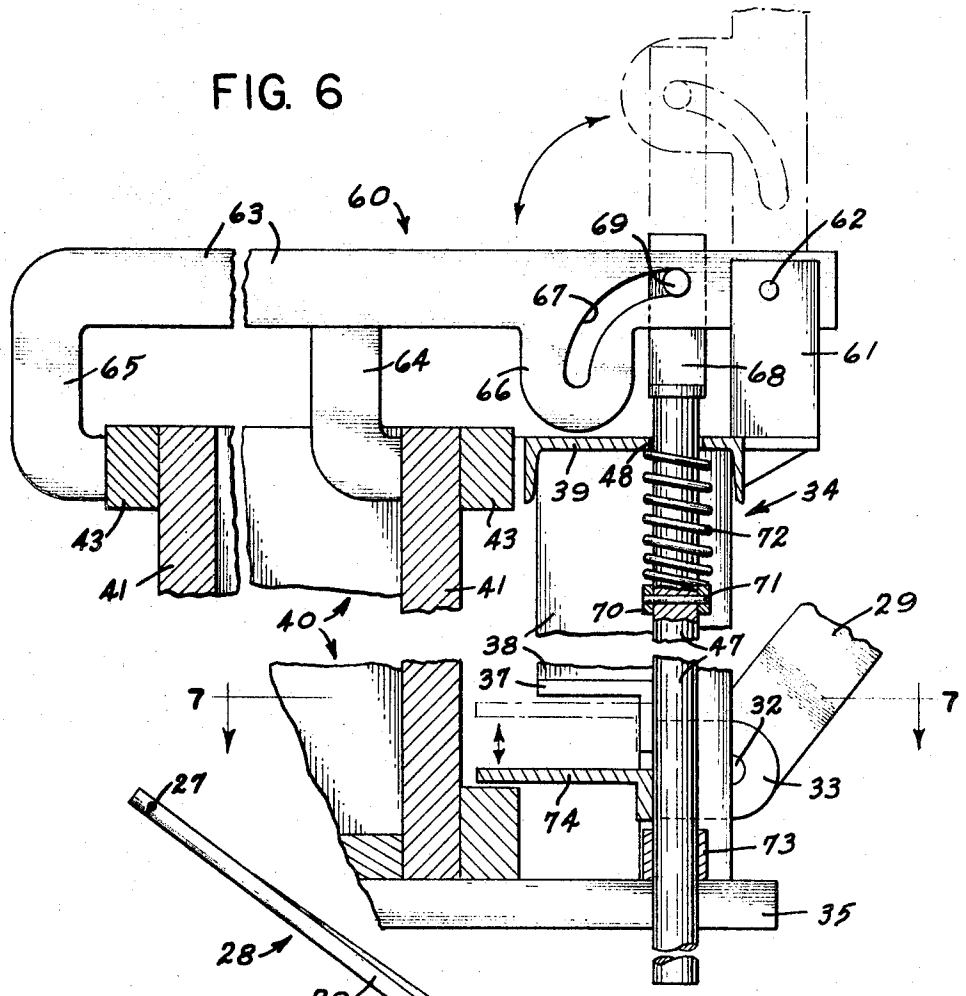
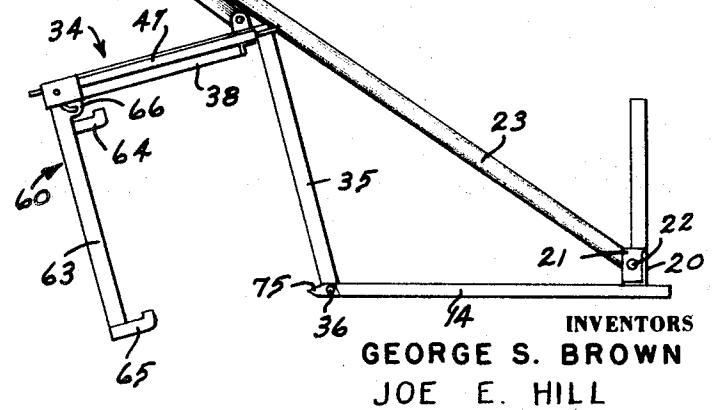


FIG. 5



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BOX DUMPER

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates generally to the discharging of objects from containers and relates particularly to apparatus which will automatically clamp an open top box or container and dump or discharge the contents therefrom.

2. Description of the Prior Art

Heretofore many efforts have been made to provide a forklift type of vehicle with means for receiving a box, raising the box to a desired level, and then dumping the contents of the box. Most of these devices, such as the U.S. Pat. Nos. 3,199,697 to Gatz et al. and 3,207,346 to Beutler et al., have utilized a chain or cable to tilt the box and this has limited the tilting of the box to less than 90° because the box is returned by gravity. German Pat. No. 931,579 discloses a forklift-type vehicle having a C-shaped hook for removing and stacking boxes, cartons, barrels or the like; however, these would have a tendency to slip when approaching a vertical position. Other rather complicated structures have been provided; however, all of these prior art structures have failed to provide a simple dumping apparatus which will rotate an open top box more than 90° to completely discharge the contents therefrom.

SUMMARY OF THE INVENTION

The present invention is an apparatus mountable on a forklift type of vehicle and adapted to receive an open top box, automatically clamp the box, rotate the box more than 90° to completely discharge the contents, return the box to a substantially level upright position, and release the box so that the vehicle can carry the box to a remote location and remove the same from the forklike arms for refilling or storage.

It is an object of the invention to provide a relatively simple device mountable on a forklift type of vehicle and having potions operable by a fluid cylinder for tilting a box more than 90° to completely discharge the contents therefrom.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective illustrating one application of the invention in retracted position.

FIG. 2 is a side elevation thereof in extended, box-dumping position.

FIG. 3 is an enlarged fragmentary section of the automatic box clamping mechanism

FIG. 4 is a section on the line 4–4 of FIG. 3.

FIG. 5 is a side elevation similar to FIG. 2 of a modified form of the invention.

FIG. 6 is an enlarged fragmentary section of the automatic box-clamping mechanism of the invention of FIG. 5.

FIG. 7 is a section on the line 7–7 of FIG. 6.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

With reference to the drawings a forklift type of vehicle 10 has a generally upright frame 11 pivotally mounted thereon, which can be swung back and forth by fluid cylinder means 12. A movable frame 13 having outwardly extending lift arms 14 is adapted to be raised and lowered relative to the frame 11 by a fluid cylinder 15 or other means such as a chain, cable or the like. The structure thus far described is conventional in the prior art and forms no part of the present invention.

A base 20 is mounted on the movable 13 of the vehicle and such base includes a pair of upstanding lugs 21 to which a pivot 22 swingably connects one end of a fluid cylinder 23. A piston rod 24 extends outwardly of the cylinder 23 and such piston rod is extended and retracted by the introduction and discharge of fluid into and from the cylinder through fluid lines 25 and 26.

At its outer end, the piston rod 24 is connected by a pivot 27 to a connecting frame 28 located adjacent to the upper end thereof. Such connecting frame includes a pair of side members 29 connected by braces 30 and an upper crossmember 31. Side members 29 diverge outwardly and downwardly from the crossmember 31 and the lower end of each of such members is pivotally connected by a pivot 32 to lugs 33 carried by a tilt frame 34. The tilt frame 34 includes a pair of spaced box support arms 35 located adjacent to and generally parallel with the lift arms 14 when in the lowered position. One end of each lift arm is connected to one end of a support arm by a pivot 36 so that the support arms will swing about the ends of the lift arms. The opposite ends of the support arms 35 are welded or otherwise connected to a lower frame member 37 which in turn is connected by spaced generally upright posts 38 to an upper frame member 39.

The tilt frame 34 is adapted to receive an open top box or container 40 having sidewalls 41 and a bottom wall 42. Preferably, the sidewalls 41 have upper and lower reinforcing bands 43 and 44 respectively, extending entirely around the same.

With reference to FIGS. 1—4, in order to automatically secure the box 40 to the tilt frame 34 and permit the dumping of the contents from the box, the lower and upper frame members 37 and 39 extend outwardly to a position overlying the lift arms 14. A housing 45 having at least one end open is welded or otherwise mounted on the upper frame member 39 above each of the lift arms and a guide 46 is mounted on the lower frame member 37 substantially in vertical alignment with each of the housings 45. An elongated rod 47 is slidably received within the guide 46 and extends upwardly through openings 48 and 49 in the upper frame member 39 and housing 45, respectively.

Within the housing 45, a clamp 52, having a generally horizontal portion 53 terminating in a downwardly extending lip 54, is attached to the rod 47 in any desired manner, as by a pin 55. A compression spring 56 is located about the rod 47 between the clamp 52 and the top of the housing 45 so that when the tilt frame 34 is in its lowermost position, the lower end of the rods 47 engage the lift arms 14 and raise the clamp 52 against the tension of the springs 56. As soon as the tilt frame is pivoted about the pivots 36, the springs 56 will move the rods 47 downwardly so that the horizontal portion 53 of the clamp is in engagement with the top of the box and the lip 54 will be located within the box 40 to clamp the box in fixed position. At the lower end of the tilt frame, the lower frame member 37 extends outwardly a distance sufficient to overlie the lower band 44 and prevent movement of the box when such box is being dumped.

With reference to FIGS. 5—7, a clamp mechanism 60 is provided including upstanding lugs 61 carried by the upper frame member 39 and connected by a pivot 62 to one end of an elongated clamping arm 63. The arm 63 has a pair of spaced inner and outer box-engaging fingers 64 and 65 adapted to engage the inner rear portion and outer front portion, respectively, of the box 40 adjacent to the open top. Although the fingers 64 and 65 have been illustrated as fixed to the arm 63, it is contemplated that such fingers could be adjustable relative to the arm to accommodate boxes or containers of different sizes and configurations.

In order to raise and lower the clamping arm 63 automatically, such arm has a projection 66 extending from one side and an arcuate slot 67 located partially in the arm and partially in the projection. A yoke 68 is welded or otherwise attached to the top of the rod 47 and has a pin 69 slidably received within the slot 67. A collar 70 is fixed to the rod 47 by any desired means, such as a pin 71, and spaced below the upper frame member 39. A compression spring 72 is disposed about the rod between the collar 70 and the lower surface of the upper frame member 39 so that the rod normally will be urged downwardly.

At the lower portion of the tilt frame 34, the lower frame member 37 does not extend outwardly to a position overlying the lift arms 14, but instead terminates at the support arms 35. A guide 73 is mounted on the upright post 38 at each side of the tilt frame 34 and such guides slidably receive the rods 47

and maintain such rods over the lift arms **14**. Above the guide **73**, a lower clamp **74** is welded or otherwise attached to the rod **47** and such lower clamp is adapted to engage the lower reinforcing band **44** of the box when the tilt frame **34** is raised.

As illustrated in FIGS. **1** and **4**, the outer ends of the lift arms **14** preferably are provided with an angular surface **75** which has been roughened or provided with a series of ridges which resist sliding movement of the box while such box is being dumped.

In the operation of the device, the vehicle **10** maneuvers until the lift arms **14** and the support arms **35** are located below a box **40** containing material to be discharged. The fluid cylinder **15** is operated to raise the movable frame **13** to lift the box off of its supporting surface and raise the same to any desired height after which the vehicle is driven to a desired location having facilities for receiving the material within the box. When the vehicle is in position, the fluid cylinder **23** is operated to raise the connecting frame **28** and swing the tilt frame **34** about the pivots **36** connecting the same to the lift arms **14**. In the modification illustrated in FIGS. **1—4**, as soon as the rear of the tilt frame is raised, the spring **56** will move the clamp **52** and the elongated rod **47** downwardly until the horizontal portion **53** engages the top of the box and the lip **54** is disposed within the box. Continued movement of the fluid cylinder **23** will continue to pivot the tilt frame about the pivots **36** until the box has been moved through an arc of approximately 110° so that substantially all of the material within the box is discharged by gravity. As soon as the material is discharged, the introduction of fluid under pressure into the fluid cylinder **23** is reversed and the box is returned to its normal position. As the tilt frame approaches its normal position, the elongated rods **47** at each side will engage the lift arms **14** and will force the clamps **52** upwardly against the tension of the spring **56** so that the empty box can be removed and replaced with another box to be dumped.

In the modification illustrated in FIGS. **5—7**, the clamping arm **63** is in a substantially vertical position when the tilt frame **34** is retracted. However, when the fluid cylinder **23** is operated to swing the tilt frame about the pivots **36**, the spring **72** will move the elongated rod **47** downwardly until the lower clamp **74** is substantially in engagement with the lower reinforcing band **44**. Simultaneously the pin **69** will bear against the lower edge of the slot **67** and cause the clamping arm **63** to swing about the pivot **62** to a generally horizontal position, as illustrated in full lines in FIG. **6**, in which the inner fingers **64** are disposed within the box and in engagement with the inner rear sidewall, while the outer fingers **65** are in engagement with the outer front reinforcing band **43**. The clamp mechanism **60** and the lower clamp **74** will maintain the box in fixed position relative to the tilt frame **34** so that the box can move through an angle of approximately 110°, as previously described. When the tilt frame is returned to its usual position, the elongated rods **47** will engage the lift arms **14** and move upwardly against the tension of the spring **72**. The upward movement of the rod will cause the pin **69** to bear against the upper surface of the slot **67** and move the clamping arm **63** to a substantially vertical position, as illustrated in phantom in FIG. **6**.

We claim:

1. Apparatus mountable on a forklift-type vehicle and used for dumping the contents from open-topped containers, comprising a tilt frame having support arms swingably connected to the lift arms of said vehicle, said tilt frame including upper and lower spaced generally parallel frame members, an elongated rod slidably mounted at each side of said tilt frame, clamp means connected to said rod and adapted to selectively engage an open-topped container located on said support arms, means urging said elongated rods toward the lowermost position so that when said support arms are raised the means urging said rods will move said clamp means into engagement with a container carried by said support arms and when said support arms are lowered said rods will engage the lift arms of the vehicle and automatically release the container, and means for swinging said tilt frame relative to said lift arms, whereby a container will be automatically clamped when said tilt frame is moved upwardly to dump the contents from the container and the container will be automatically released when the tilt frame is returned to its lowered position.

2. The structure of claim **1** in which said clamp means includes a horizontal portion fixed at one end to said rod and said opposite end having a depending lip adapted to be received within the container.

3. The structure of claim **1** in which said clamp means includes a clamp arm swingably connected to said upper frame member, spaced depending fingers carried by said clamp arm, and means providing a pivotal connection between said clamp arm and the upper portion of said elongated rod, whereby movement of said rod will move said clamp arm about said swingable connection.

4. The structure of claim **3** in which one of said depending fingers is adapted to engage the rear portion of the container and another finger is adapted to engage the outer front portion of the container.

5. The structure of claim **3** in which said means pivotally connected the elongated rod to said clamp arm includes an arcuate slot in said arm, and pin means carried by said elongated rod and slidably received within said slot.

6. The combination of a forklift vehicle and a container dumping mechanism, said forklift vehicle having a pair of outwardly extending generally parallel lift arms, and means for raising and lowering said lift arms selectively, said container dumping mechanism including a tilt frame having a pair of outwardly extending support arms normally disposed generally parallel with said lift arms, means pivotally connecting said support arms to said lift arms adjacent to one end of each, said tilt frame having upper and lower generally parallel frame members with at least the upper frame member overlying said lift arms, an elongated rod slidably carried adjacent to each end of said upper frame member, guide means carried by said tilt frame and slidably receiving the lower portion of said elongated rods to maintain said rods generally in alignment with said lift arms, clamp means connected to each of said elongated rods adjacent to the upper end thereof, spring means urging said elongated rods downwardly, and means for swinging said tilt frame about said pivot, whereby when said tilt frame is swung upwardly said spring means will urge the clamp means into engagement with a container carried by said support arms to lock the container in position and when said tilt frame is swung downwardly said elongated rods will engage the lift arms of the forklift and automatically release the clamp means from the container.