

[54] **CONTAINER LIFT AND DUMP APPARATUS**

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[22] Filed: **Feb. 28, 1972**

[21] Appl. No.: **229,685**

[52] U.S. Cl. .... **214/302, 214/130 R, 214/317**

[51] Int. Cl. .... **B65f 3/02**

[58] Field of Search ..... **214/302, 303, 313, 214/317, 715, 315, 130 R**

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[57] **ABSTRACT**

Apparatus is provided for lifting a container and dumping its contents into a receptacle such as a truck body. The apparatus has a horizontal fulcrum mounted on the outside of the receptacle and an elongated frame is swingable about the fulcrum between a lowered and a raised position. Endless chains on the frame have drive sprockets coaxial with the fulcrum and hooks on the chains engage the container to first lift the same while the frame remains in its lowered position. In the lifted position of the container the hooks cooperate with abutments on the frame so that continued movement of the chains swings the frame with the container to a raised position in which contents of the container are dumped into the receptacle.

**12 Claims, 11 Drawing Figures**

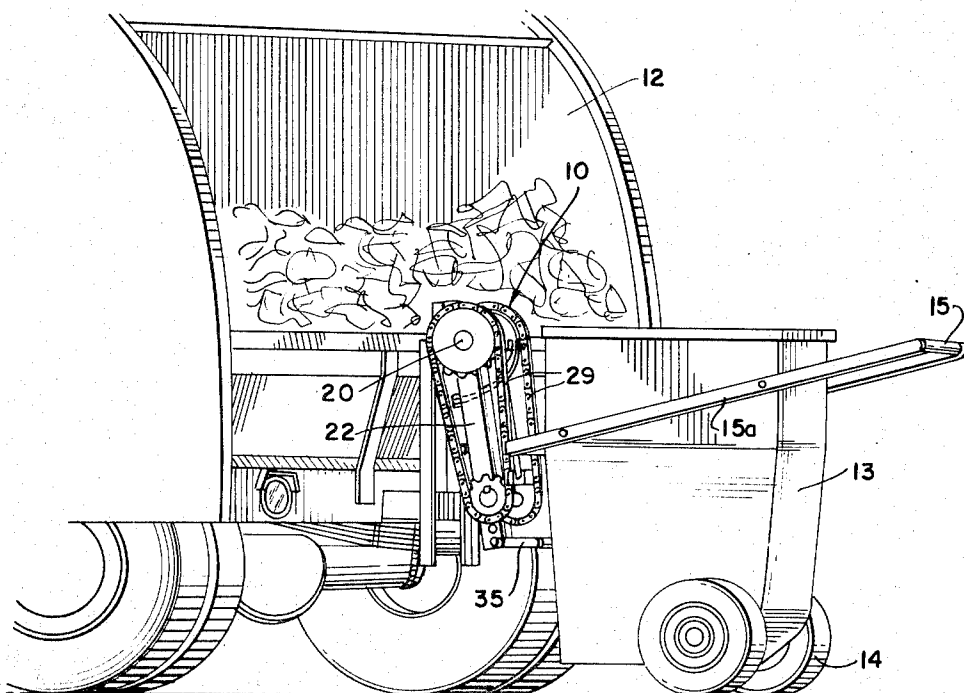


FIG. 1.

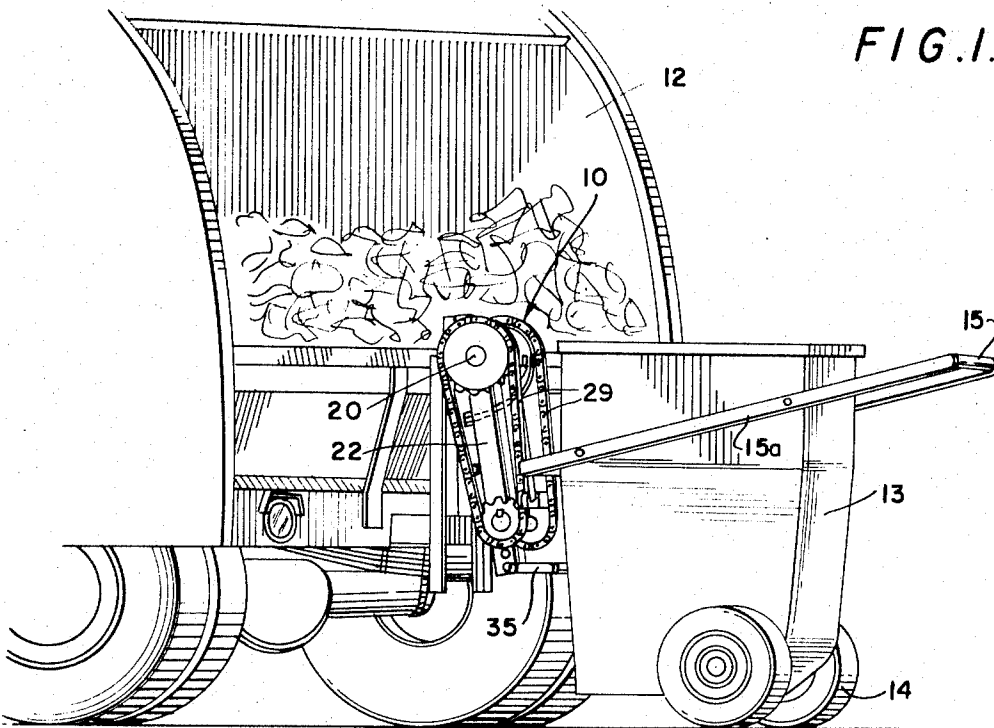


FIG. 2.

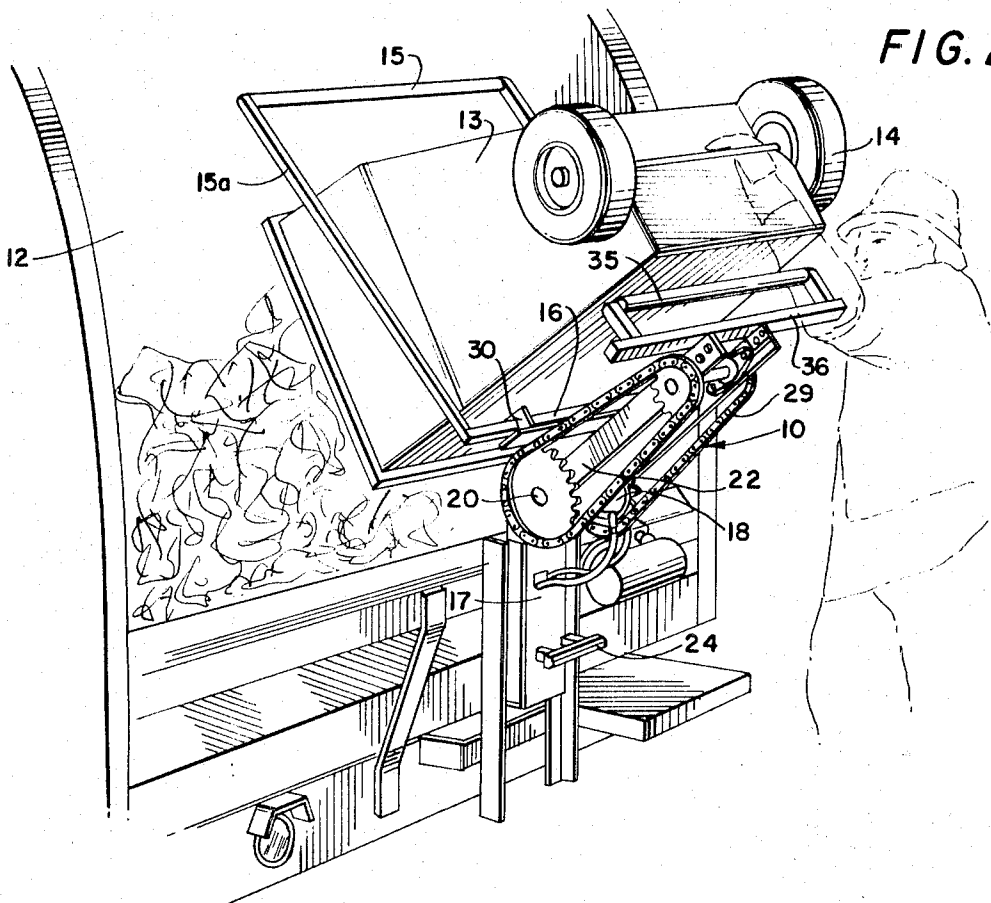


FIG. 3.

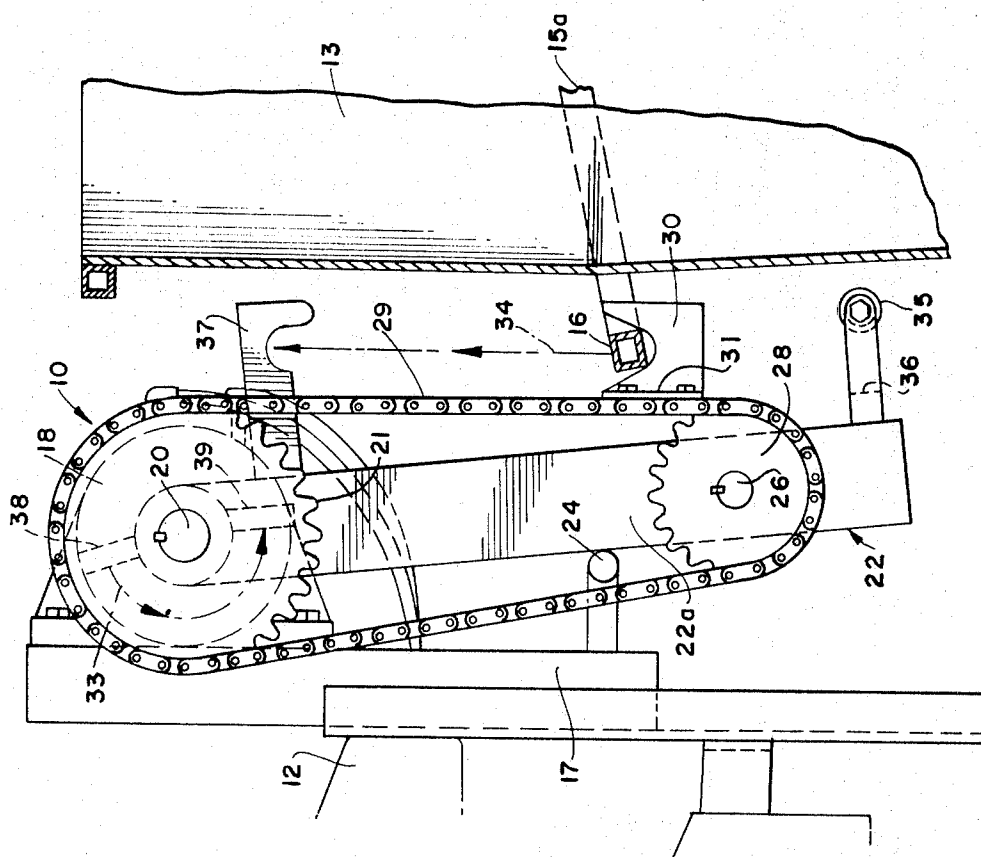


FIG. 4.

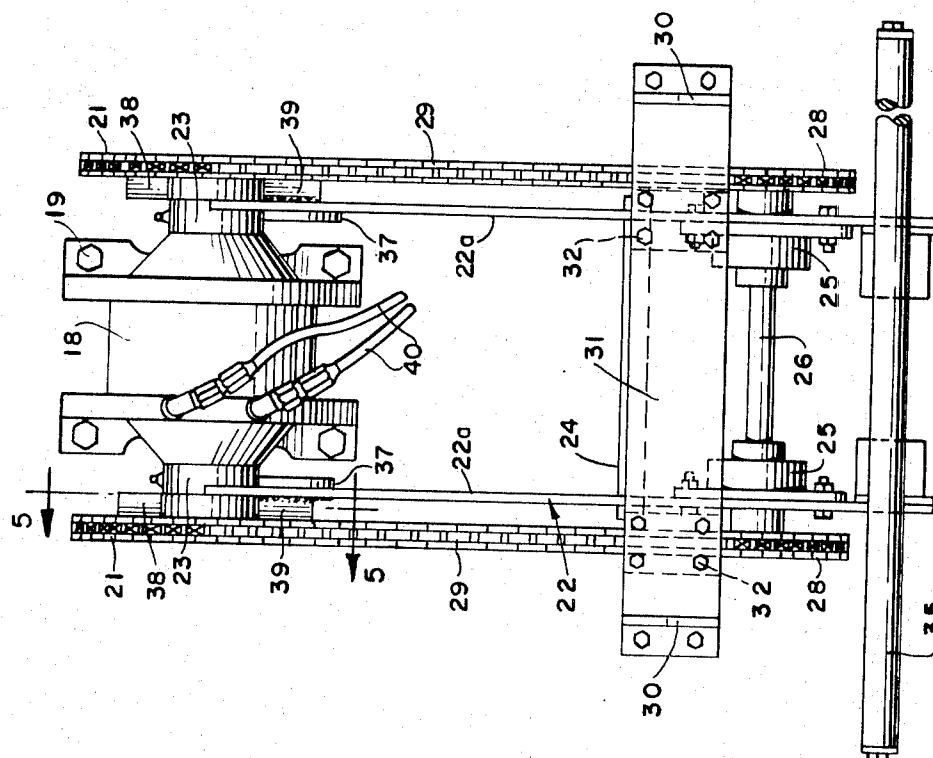


FIG. 5a.

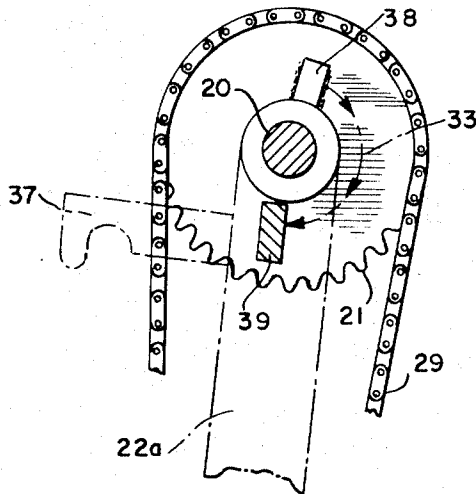


FIG. 5b.

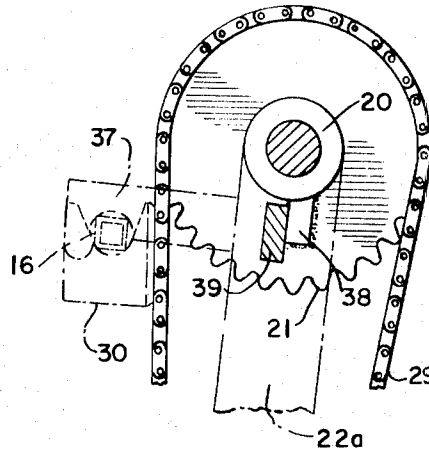


FIG. 5c.

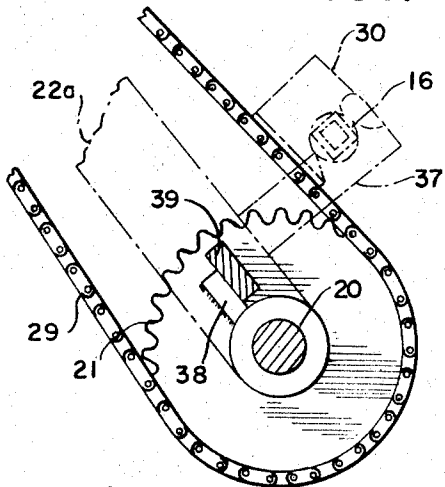
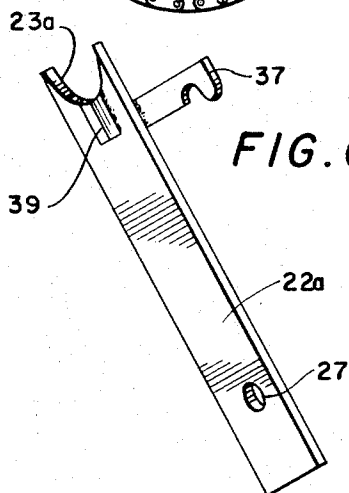


FIG. 6.

FIG. 7.

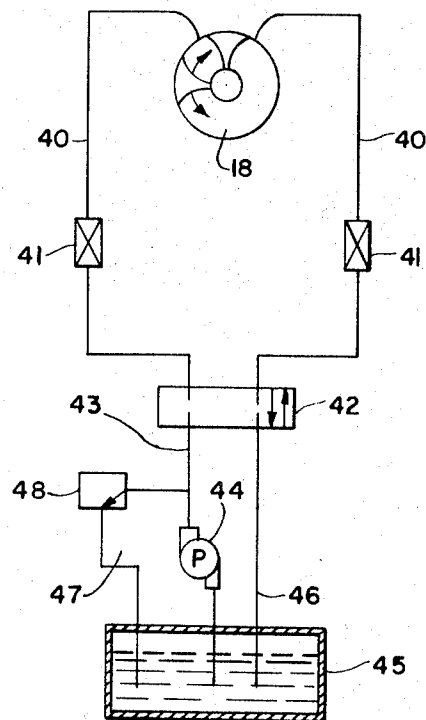


FIG. 9.

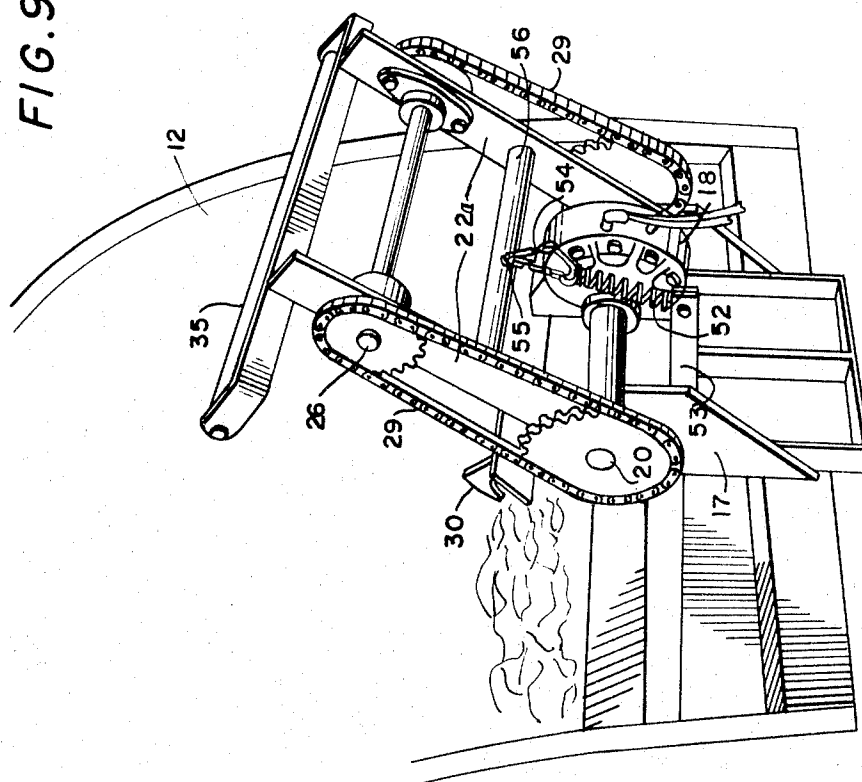
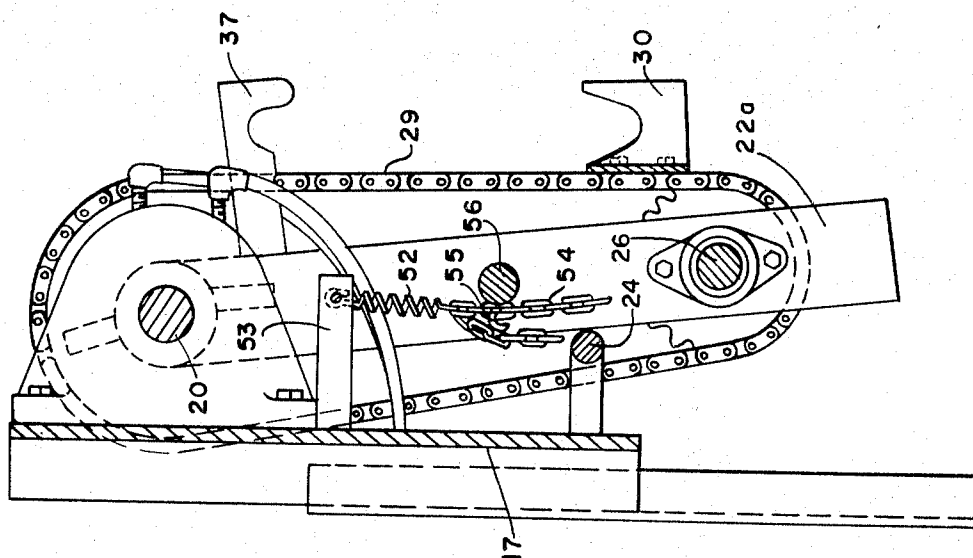


FIG. 8.



**CONTAINER LIFT AND DUMP APPARATUS**

This invention relates to new and useful improvements in apparatus for lifting and tilting containers so as to dump the contents thereof into a suitable receptacle, and the principal object of the invention is to provide a power-driven apparatus whereby the container lifting and dumping operation may be very quickly and easily performed.

While the apparatus of the invention may be used with different types of containers and various types of receptacles, it is particularly useful for emptying refuse bins or carts into the bodies of refuse trucks, or the like. This is shown and described in the disclosure which follows, although it is to be understood that either or both the container and the receptacle may be mobile or stationary, as required by conditions of the environment in which the invention is used.

Inasmuch as the receptacle, such as a truck body for example, is raised off the ground, it is necessary for the container to first be lifted prior to dumping. The apparatus of the invention, which is mounted on the outside of the receptacle and has means for releasably engaging the container, is especially adapted to first lift the container to an elevated position and then to tilt the same for dumping the contents thereof into the receptacle. An important feature of the invention resides in a novel structural arrangement whereby the container lifting and dumping phases are effected successively by a continuous operation of only one power source.

With the foregoing more important object and features in view and such other objects and features which may become apparent as this specification proceeds, the invention will be understood from the following description taken in conjunction with the accompanying drawings, in which like characters of reference designate like parts, and in which:

FIG. 1 is a fragmentary perspective view of a refuse truck with the container lifting and dumping apparatus of the invention mounted thereon, the container being shown in the lowered position;

FIG. 2 is a view similar to FIG. 1 but with the container in the dump position;

FIG. 3 is an enlarged, fragmentary view, partly in section and partly in elevation, showing the lift and dump apparatus with the container lowered;

FIG. 4 is a rear elevational view of the apparatus *per se*;

FIGS. 5a, 5b and 5c are fragmentary sectional views, taken substantially in the plane of the line 5—5 in FIG. 4 and showing the apparatus in the lowered, elevated and dumping positions, respectively;

FIG. 6 is a perspective view of one of the frame side members;

FIG. 7 is a diagrammatic view of the hydraulic system; FIG. 8 is a view, similar to FIG. 3, but showing a modified embodiment of the invention; and

FIG. 9 is a perspective view of the modified embodiment of FIG. 8 mounted on a refuse truck.

Referring now to the accompanying drawings in detail, more particularly to FIGS. 1—6, the lift and dump apparatus of the invention is designated generally by the reference numeral 10 and is shown as being mounted at the back of a refuse truck 12 for use in lifting and dumping a container 13 into the body of the truck. For illustrative purposes the container 13 is shown as being in the form of a refuse cart having a pair of wheels 14 and a handle 15, the side members 15a of

the handle being fixed to the sides of the cart and extended to form a fixed bail 16 on the side of the cart opposite from the handle 15.

The lift and dump apparatus 10 comprises a support 17 which is suitably mounted at the back of the truck 12. A hydraulic motor 18 is mounted on the support 17, as by the screws 19, the motor having a horizontal drive shaft 20 with a pair of sprockets 21 secured to the ends thereof. The shaft 20 constitutes a fulcrum for a vertically swingable frame 22, the latter including a pair of transversely spaced frame side members 22a provided with bearings 23 at one end thereof, as is best shown in FIG. 4. The bearings 23 are secured in cut-outs 23a formed in one end of the side members 22a as shown in FIG. 6, and the bearings are rotatably positioned on the motor shaft 20 inside of the sprockets 21 so that the entire frame 22 is swingably mounted by one end thereof on the fulcrum shaft 20. The frame is swingable between a lowered position shown in FIG. 1 wherein it extends downwardly from the fulcrum shaft 20, and a raised position wherein it slants upwardly and outwardly from the fulcrum shaft, as shown in FIG. 2. A suitable rest 24 is provided on the support 17 for the frame 22 in the lowered position of the latter.

The end portion of the frame 22 remote from the fulcrum shaft 20 is provided with a pair of bearings 25 for a countershaft 26 which extends through apertures 27 in the frame side members 22a and has a pair of idler sprockets 28 secured thereto. A pair of transversely spaced endless chains 29 pass around the drive sprockets 21 and idler sprockets 28, as will be apparent.

Means are provided on the chains 29 for engaging the fixed bail 16 of the container 13, these means consisting of a pair of upturned hooks 30 provided at the ends of a cross bar 31 which is suitably secured to the chains 29 as at 32. When the frame 22 is in its lowered position as in FIG. 3 (and also in FIG. 1) the cross bar 31 with the hooks 30 is disposed adjacent the idler sprockets 28, or adjacent what then is the lower end of the frame. However, when the motor 18 is energized to rotate the shaft 20 in the direction of the arrow 33, the chains 29 move the cross bar with the hooks upwardly, as indicated at 34 in FIG. 3.

A container rest 35 is supported by a transversely elongated bracket 36 on the lower or outer end of the frame 22, adjacent the idler sprockets 28 and in spaced relation from the hooks 30. Conveniently, the rest 35 may be in the form of a roller for engaging the adjacent side of the container 13 when the latter is applied to the apparatus of the invention as presently described.

When the contents of the container 13 are to be emptied into the body of the truck 12, the container is wheeled toward the apparatus 10 at the back of the truck. By using the handle 15, the container 13 may be tilted slightly about the axis of its wheels 14, so that the fixed bail 16 on the container is slightly raised and then permitted to drop into the upturned hooks 30 on the chains 29, as shown in FIGS. 1 and 3. Then, by energizing the motor 18 to rotate the drive shaft 20 in the direction of the arrow 33, the chains 29 move the cross bar 31 with the hooks 30 upwardly as at 34. The engagement of the hooks 30 with the bail 16 of the container lifts the entire container off the ground to an elevated position in which the container still remains substantially upright and the frame 22 still remains relatively stationary in its lowered position. As the container is being lifted, it may tilt slightly about a fulcrum

provided by engagement of the hooks 30 with the bail 16, so that the container comes to rest against the roller 35 on the frame 22.

A pair of abutments in the form of downturned hooks 37 are secured to the side members 22a of the frame 22 at points adjacent the drive sprockets 11 but in radially spaced relation from fulcrum shaft 20. When the container 13 is lifted from its lowered position to its elevated position, the container bail 16 carried by the upturned hooks 30 is received in the downturned abutment hooks 37 on the frame 22 as shown in FIG. 5b. Since the hooks 37 are fixed to the frame, further raising movement of the container relative to the frame is not possible. However, as rotation of the drive shaft 20 in the direction 33 continues, the upward moving force exerted by the hooks 30 through the bail 16 against the abutment hooks 37 at a point spaced radially from the shaft 20 produces a leverage action by which the entire frame 22 is swung upwardly about the fulcrum shaft 20 to its raised position shown in FIGS. 2 and 5c. This carries the container 13 into the dumping position shown in FIG. 2, wherein its contents are emptied into the truck body 12. It may be mentioned at this point that as shown in the drawings, the transverse spacing of the lifting hooks 30 is greater than that of the abutment hooks 37 and consequently, the leverage action which swings the frame 22 upwardly comes about through the medium of the container bail 16 when seated in the hooks 30, 37. However, if the transverse spacing of the hooks 30, 37 were substantially the same, that is, if the hooks 37 were disposed in substantially the same vertical planes as the hooks 30, the two sets of hooks would come into physical contact in the lifted position of the container and such contact between the two sets of hooks would then provide the leverage action for swinging the frame 22 and the container to the dumping position.

In any event, additional means may also be provided to effect or to assist in effecting the leverage action for swinging the frame to the dumping position of the container. Such additional means comprise a pair of driving lugs 38 secured to the respective drive sprockets 21 at points spaced radially from the fulcrum shaft 20, the lugs 38 being engageable with fixed abutment lugs 39 secured to the respective frame side members 22a. FIGS. 3 and 5a show the relative positions of the lugs 38, 39 when the frame 22 is lowered and the container 13 is on the ground. When the chains 29 raise the container to its elevated position shown in FIG. 5b where the hooks 30 being the container bail 16 into the hooks 37, the drive sprockets 21 will have rotated sufficiently for the lugs 38 on the sprockets to come into abutment with the fixed lugs 39 on the frame 22. Thereafter, continued rotation of the sprockets will provide a leverage action at the abutting lugs 38, 39 for swinging the frame 22 to the dumping position of the container, as in FIG. 5c, quite independently of or in addition to any leverage action such as may exist at abutment of the hooks 30, 37 with each other or with the container bail 16. FIG. 7 diagrammatically shows the hydraulic system including the driving motor 18 which is connected by hoses 40 through flow control valves 41 to a four-way actuating valve 42, the latter communicating through a line 43 with a pump 44 and with a fluid reservoir 45. The four-way valve 42 has a fluid return line 46 to the reservoir 45, and a by-pass 47 from the outlet of the pump 44 to the reservoir is provided with a pressure re-

lief valve 48. The motor 18 is reversible and when the pump 44 is in operation, the motor may rotate in one direction or the other by an appropriate setting of the four-way valve 42 which is manually controlled. The pump 44 may be driven by the engine of the truck 12, or in any other suitable manner.

When the motor 18 rotates so as to drive the shaft 20 in the direction of the arrow 33, the container 13 is first lifted as at 34 and subsequently dumped as in FIG. 2, as has been already explained. When the dumping operation is completed, the direction of rotation of the motor 18 is reversed so that with the assistance of gravity, the frame 22 with the container thereon moves back from the dumping position of FIGS. 2 and 5c to the position of FIG. 5b in which the frame 22 is fully lowered against the rest 24 but the container is still elevated. Thereupon, continued rotation of the motor 18 in the reverse direction causes the chains 29 to lower the container to the ground as in FIGS. 1 and 5a, thus completing the operating cycle.

Generally speaking, the center of gravity of the container 13 in the dumping position of the frame 22 lies at the outside of the fulcrum shaft 20, so that when rotation of the motor 18 is reversed, the returning movement of the container and frame is gravity-assisted. However, if this should not occur, the returning movement of the container may be assisted by hand of the attendant of the machine, at least during the initial stage of the returning movement until gravity takes over.

However, in a slightly modified embodiment of the invention shown in FIGS. 8 and 9, resilient means are provided to positively assist in returning the container from its dumping position. For most part, the modified embodiment is the same as that already described in conjunction with FIGS. 1-7, except for the resilient biasing means which comprise a tension spring 52 having one end thereof secured to a bracket 53 which is rigidly fixed to the support 17. The other end of the spring 52 has connected thereto a length of chain 54, the links of which are selectively engageable with a hook or detent 55 provided on a cross member 56 extending between the frame side members 22a.

It will be apparent that when the container 17 is lifted and then dumped as shown in FIG. 9, the tension spring 52 reacting between the support 17 and the frame 22 will become stretched, and the energy stored in the stretched spring will subsequently assist in returning the frame 22 from the dumping position, at least to the point where gravity takes over in fully lowering the frame 22 against the rest 24 and returning the container to the ground while the drive shaft 20 rotates in the appropriate reverse direction.

While in the foregoing there have been described and shown the preferred embodiments of the invention, various modifications and equivalents may be resorted to within the spirit and scope of the invention as claimed.

What is claimed is:

1. A container lift and dump apparatus, comprising in combination a support, a horizontal fulcrum provided on said support, an elongated frame mounted by one end thereof on said fulcrum for vertical swinging movement between a lowered position wherein the frame extends downwardly from the fulcrum and a raised position wherein it slants upwardly and outwardly from the fulcrum, drive sprocket means coaxial

with the fulcrum, idler sprocket means provided on said frame remote from the fulcrum, endless chain means passing around said drive sprocket means and said idler sprocket means, container engaging means provided on said chain means and disposed adjacent said idler sprocket means when said frame is in its lowered position, fixed abutment means provided on said frame adjacent said drive sprocket means but spaced radially from said fulcrum, and means for driving said drive sprocket means whereby said container engaging means may first be lifted by said chain means to an elevated position against said abutment means while said frame is relatively stationary, and whereby continued rotation of the drive sprocket means may then swing the frame with the chain means to the raised position of the frame in which a container supported by said container engaging means is dumped.

2. The apparatus as defined in claim 1 together with a driving lug provided on said drive sprocket means in radially spaced relation from said fulcrum, and a fixed lug provided on said frame, said driving lug being engageable with said fixed lug when said container engaging means is in its elevated position, whereby to assist in swinging the frame to its raised position.

3. The apparatus as defined in claim 1 together with resilient means reacting between said support and said frame to assist in returning the frame from its raised to its lowered position.

4. The apparatus as defined in claim 1 together with a rest provided on said support for said frame in its lowered position.

5. The apparatus as defined in claim 1 together with a container rest provided on said frame at a point spaced longitudinally from said container engaging means.

6. The apparatus as defined in claim 1 wherein said container engaging means include upturned hook means adapted to engage a fixed bail at one side of a container.

7. The apparatus as defined in claim 1 wherein said abutment means include downturned hook means adapted to engage a fixed bail at one side of a container.

8. The apparatus as defined in claim 1 which is further characterized in that said container engaging means and said abutment means cooperate through the medium of a fixed bail provided at one side of a con-

tainer.

9. The apparatus as defined in claim 1 together with a drive motor mounted on said support and having a drive shaft which constitutes said fulcrum, said drive sprocket means being secured to said drive shaft for rotation therewith and said frame being swingably mounted on the drive shaft.

10. The combination of a container, a receptacle for contents of said container, and apparatus whereby the container may be lifted and its contents dumped into said receptacle, said apparatus comprising a horizontal fulcrum provided on the outside of said receptacle, an elongated frame mounted by one end thereof on said fulcrum for swinging movement between a lowered position wherein the frame extends downwardly from the fulcrum and a raised position wherein it slants upwardly and outwardly from the fulcrum, drive sprocket means coaxial with the fulcrum, idler sprocket means provided on said frame remote from the fulcrum, endless chain means passing around said drive sprocket means and said idler sprocket means, means provided on said chain means for engaging said container, said container engaging means being disposed adjacent said idler sprocket means when said frame is in its lowered position, fixed abutment means provided on said frame adjacent said drive sprocket means but spaced radially from said fulcrum, and means for driving said drive sprocket means whereby said container engaging means may first lift said container to an elevated position in which the container engaging means come into abutment with said abutment means while said frame is relatively stationary, and whereby continued rotation of the drive sprocket means may then swing the frame with said container to the raised position of the frame in which the contents of the container are dumped into said receptacle.

11. The combination as defined in claim 10 wherein said container includes a fixed bail at one side thereof, said container engaging means including upturned hook means engageable with said bail.

12. The combination as defined in claim 10 wherein said container includes a fixed bail at one side thereof, said container engaging means being engageable with said bail and acting through the medium of the bail to abut said abutment means.

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