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Fagre et al.

[11] **3,797,878**

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[54] **DROP BOTTOM CONTAINER**

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[73] Assignee: **said Fagre, by said Kaiser**

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[21] Appl. No.: **285,806**

[52] **U.S. Cl.** ..... **294/71,** 214/307, 294/69 R

[51] **Int. Cl.** **B66c 3/00**

[58] **Field of Search** ..... 294/69 R, 71, 72; 214/300, 214/302, 307; 220/29, 36; 292/216, 217

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Primary Examiner—Evon C. Blunk
Assistant Examiner—Johnny D. Cherry
Attorney, Agent, or Firm—Merchant, Gould, Smith & Edell

[57] **ABSTRACT**

A drop bottom container adapted for use with a fork lift. The container has a pair of hinged door members for closing its open bottom which are latched into closed position and swing by gravity to the open position when the latch is released. The door members are yieldingly limited at the open position to prevent uncontrolled swinging movement. The latching mechanism is released manually, initially with minimum movement and maximum mechanical advantage to overcome load forces, followed by progressively increased movement to quickly effect the release even with the container in a fully loaded condition. Means are also included for closing the doors as the container is lowered, which includes a vertically disposed longitudinal member projecting below the open doors which engages the ground with such lowering movement.

21 Claims, 8 Drawing Figures

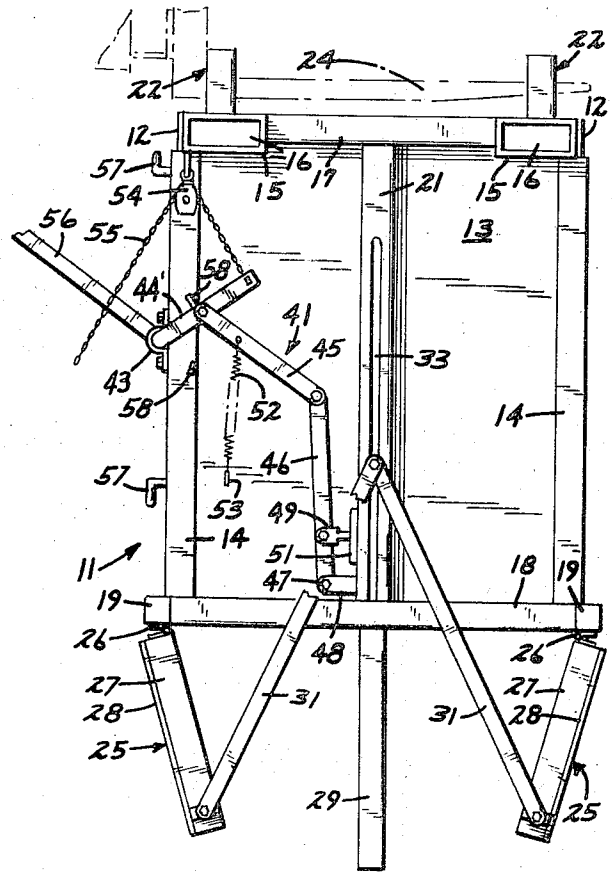

FIG. 1

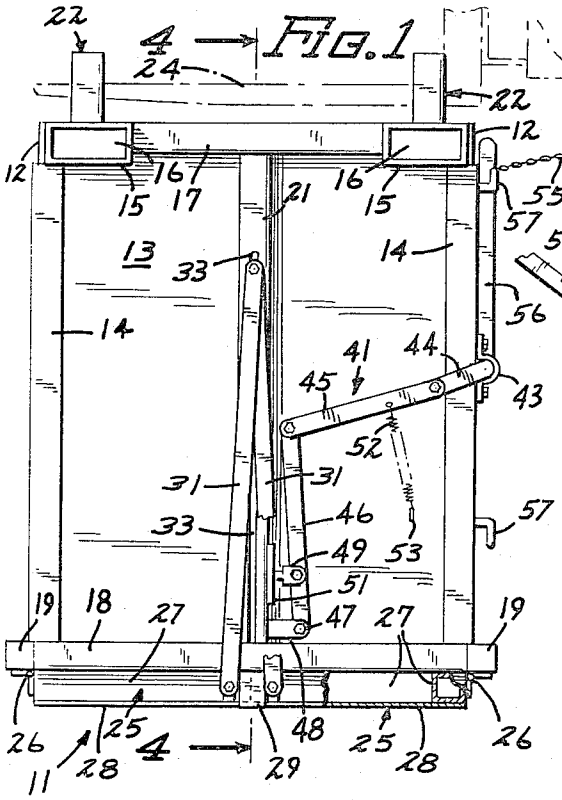

FIG. 2

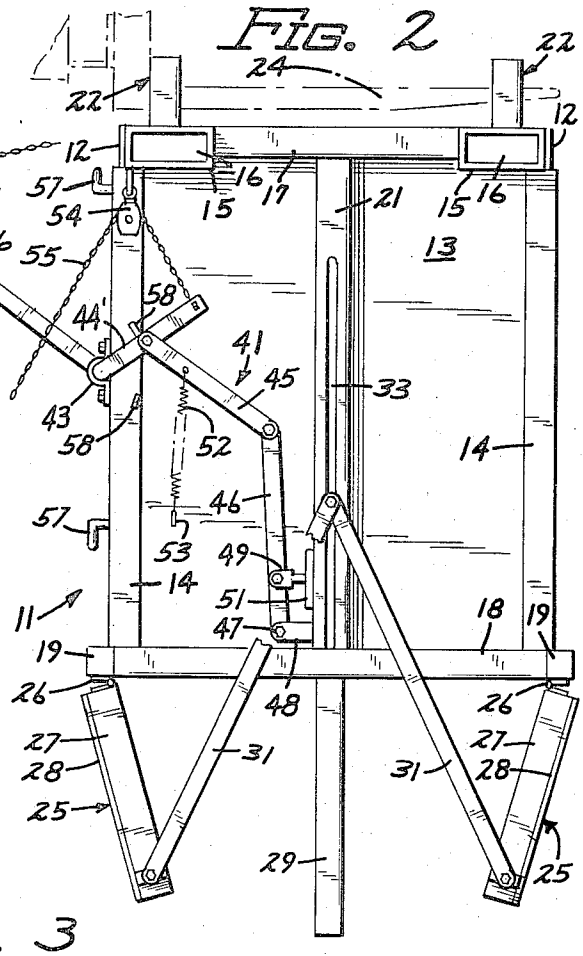

FIG. 3

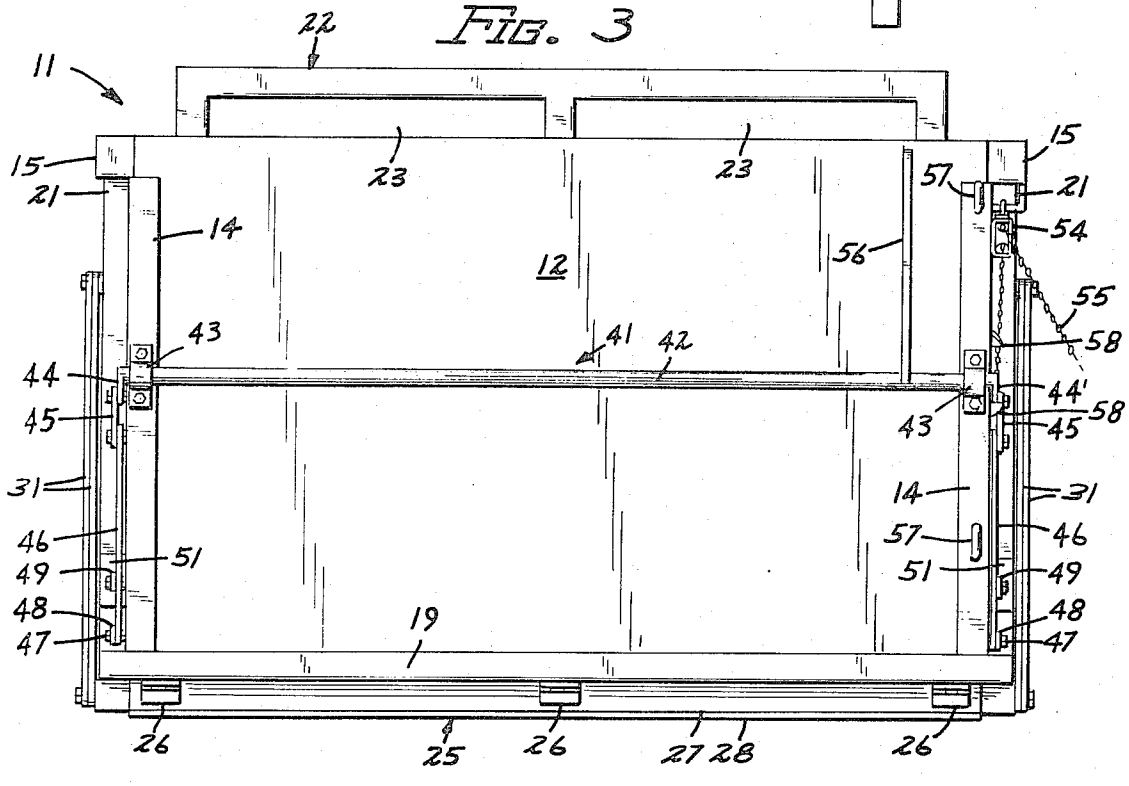

FIG. 4

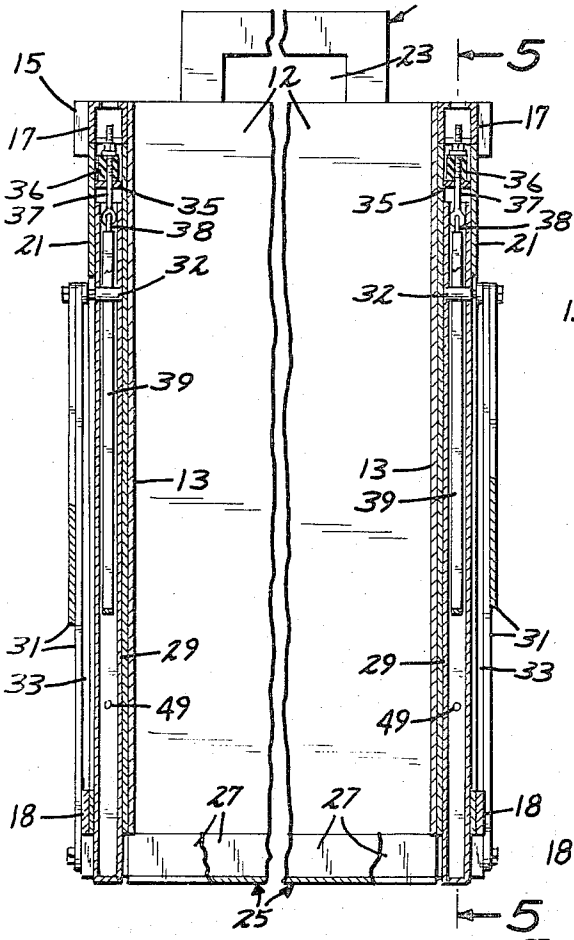

FIG. 5

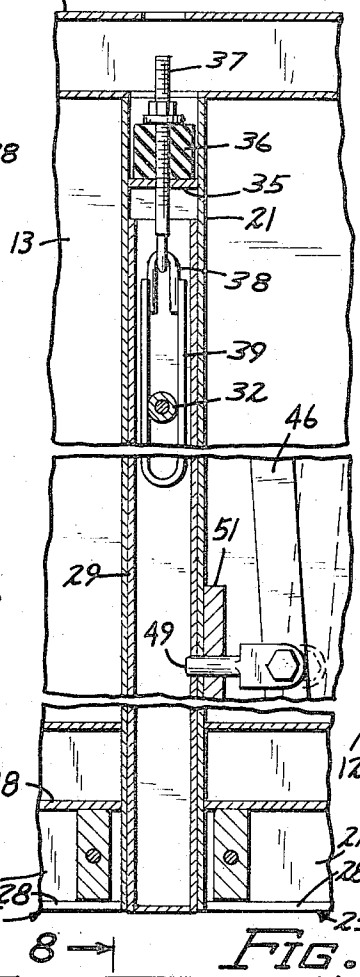

FIG. 8

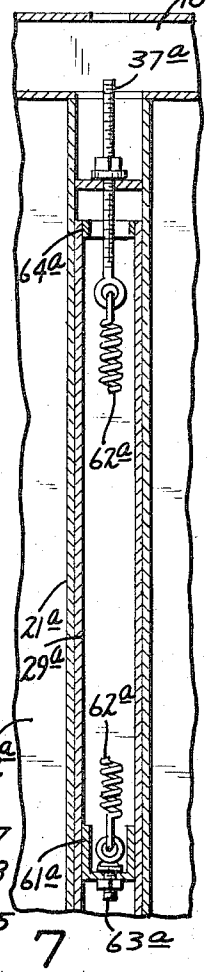

FIG. 6

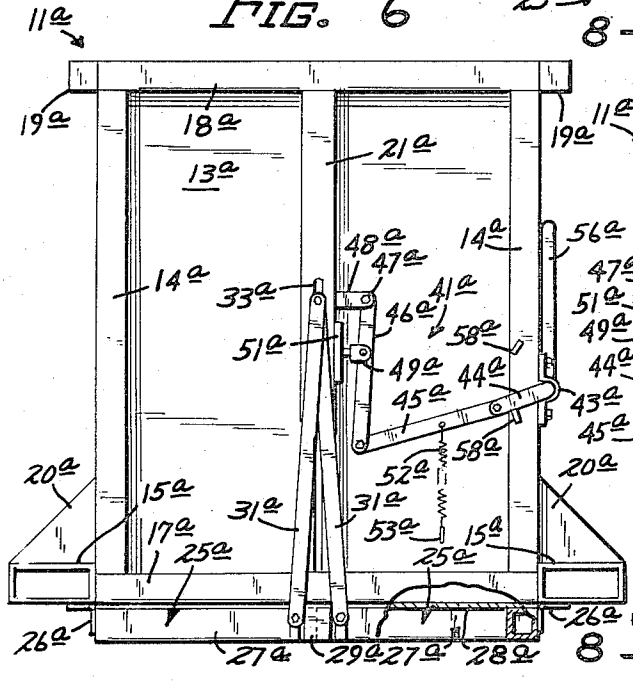

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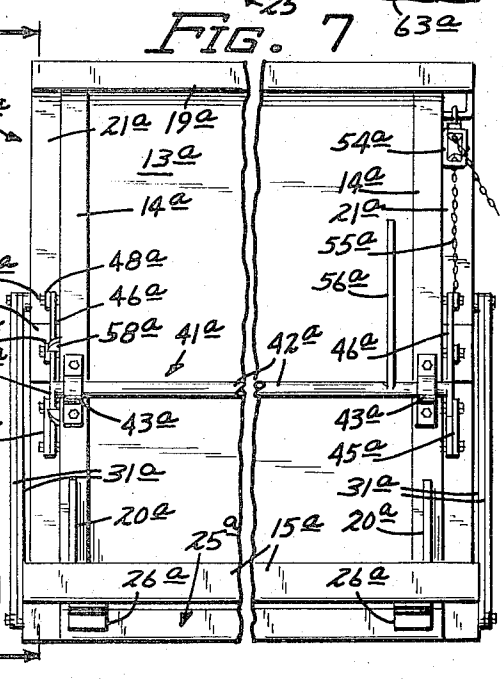
FIG. 7



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DROP BOTTOM CONTAINER

The invention relates generally to drop bottom containers, and is specifically directed to a drop bottom container usable with a fork lift and fully controllable by the fork lift operator without leaving the vehicle.

Drop bottom containers are extremely useful in material conveying applications which are adapted for the elevated discharge of material. One specific example in which drop bottom containers are particularly useful is in industrial areas which requires continuous clean-up. The container is placed in a convenient, accessible location where waste material, refuse and the like can be dumped into the container over a period of time until it is filled. The contents are then transferred by elevating the container over a suitable receptacle and allowing the bottom closure members to swing open and thereby discharge the container contents.

For areas that normally employ fork lifts in their operations, the drop bottom container is easily adapted for cooperation with the lifting bifurcated members of the vehicle. One difficulty that arises with such use, however, is the need for the fork lift operator to get down from his vehicle to actuate the container latching mechanism at the time the contents are to be discharged; or, alternatively, for a second person to be present when the fork lift reaches the discharge area. The problem is compounded by the fact that discharge of the contents occurs only when the container is elevated, thus making it difficult as well as dangerous to reach and actuate the latching mechanism. Further, when the container is heavily loaded with material, the latching mechanism is subjected to extreme binding forces thus making it difficult to be actuated to the release position.

This problem extends to closing of the container, which is usually away from the discharge area. Closing the container requires either that the operator again leave his vehicle, or the availability of a second person to close the container while the operator remains on the vehicle.

Our invention is the result of an endeavor to provide a drop bottom container usable with a fork lift and which can be simply and easily opened and closed by the fork lift operator without leaving the vehicle. This is accomplished with a unique linkage and latching mechanism which guidably controls downward swinging movement of the hinged closure members. The latching mechanism is constructed so that its initial releasing movement is minimal, but with maximum mechanical advantage to overcome binding or shear forces exerted thereon by the container load acting through the bottom closure members. Movement of the latching mechanism then increases progressively until the closure members are released to discharge the container contents.

To close the doors, an elongated guide member is provided which slides vertically relative to the container. The closure members are pivotally connected to the longitudinal guide member by linkage arms in such a manner that the longitudinal member always projects below the closure members in the open position. Consequently, lowering of the container causes the longitudinal guide members to engage the supporting surface, thus carrying the closure members upwardly toward the closed position at which point the latching mechanism retains them in place.

A further problem with existing devices stems from uncontrolled swinging movement of the closure members at the time they are released. Our invention further contemplates resilient means which limit movement of the closure members in a yielding manner to prevent such uncontrolled swinging. The resilient means are adjustable to compensate for changes in their resiliency due to repeated use and resulting wear.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an end elevational view of a drop bottom container embodying the inventive principle, the closure members of said container being shown in a closed position.

FIG. 2 is the end elevational view of FIG. 1 with the closure members released to an open or discharge position;

FIG. 3 is a side elevational view of the drop bottom container with the closure members in their closed position;

FIG. 4 is an enlarged fragmentary sectional view of the container taken along the line 4—4 of FIG. 1;

FIG. 5 is an enlarged fragmentary sectional view taken along the line 5—5 of FIG. 4, showing with particularity the latching mechanism and the means for resiliently limiting swinging movement of the closure members;

FIG. 6 is an end elevational view of an alternative embodiment of the inventive drop bottom container;

FIG. 7 is a fragmentary side elevational view of a drop bottom container of FIG. 6; and

FIG. 8 is an enlarged fragmentary sectional view taken along the line 8—8 of FIG. 7, showing with particularity alternative structure for resiliently limiting swinging movement of the closure members.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

With initial reference to FIGS. 1–3, a drop bottom container embodying the inventive principle is represented generally by the numeral 11. Container 11 is generally rectangular in shape, being formed from two rectangular side plates 12 and end plates 13 welded together at their corners and reinforced by appropriate lengths 14 of angle iron.

The top edge of each end plate 13 is notched at each outer corner to receive elongated tubular members 15 which are rigidly affixed by welding. The elongated members 15 are sized and spaced to define receiving slots 16 for the bifurcated lifting members of a fork lift. Tubular members 17 which are square in cross section are affixed at each end of the container 11 between elongated members 15 for purposes of support, as are similar end members 18 and side members 19 along the bottom edge of the container 11. A square tubular member 21 is vertically affixed on each end plate 13 between the tubular members 17 and 19 for a purpose described in greater detail below.

Lifting frames represented generally by the numeral 22 are formed from the same square tubular stock, one frame 22 being affixed to the top surface of each elongated member 15. As shown in FIG. 3, each of the lifting frames 22 defines two longitudinal lifting slots 23 sized and spaced to receive bifurcated lifting members 24 (FIGS. 1 and 2) of a fork lift.

As described, container **11** is a four sided structure open both at its top and bottom. The bottom is closeable by a pair of closure members or doors **25** each of which runs the length of container **11** and is pivotally connected to the associated side tubular member **19** by hinges **26.** Each of the closure members **25** comprises a rectangular frame **27** formed from square tubular stock and a bottom plate **28** affixed thereto. This particular sturcture enables the container **11** to hold a quantity of liquid in pan fashion, thereby eliminating dripping that might otherwise occur. As best shown in FIG. **1,** the width of the closure members **25** enables them to together effectively close the open bottom of container **11** when moved upwardly to the closed position.

With additional reference to FIG. **4,** a tubular member **29,** also square in cross section, is slidably disposed in each of the vertical tubular members **21.** Each of the closure members **25** is operably connected at each end to the slidable members **29** by a linkage arm **31.** The upper ends of the four linkage arms **31** are pivotally connected to the slidable member **29** by a pin **32** which is guidably movable in a slot **33** formed in the vertical tubular member **21.** Thus, it will be appreciated that up and down movement of the sliding member **29** within the tubular member **21** effects a corresponding opening and closing movement of the closure members **25.** It is also to be observed, as particularly shown in FIG. **2,** that the slidable member **29** projects below the lower most point of closure members **25** in any position but the closed position, at which point these members move into the bottom plane of container **11.**

To prevent uncontrolled downward swinging movement of the closure members **25,** means are included for yieldingly or resiliently resisting movement beyond a predetermined limit point. With additional reference to FIG. **5,** a small square plate **35** is affixed inside the vertical member **21** near its top. A resilient rubber block **36** is disposed on the plate **35** and carries a downwardly projecting, threaded eye-bolt **37.** A U-shaped member **38** hangs from the eye of the bolt **37,** and a length of flat bar stock **39,** formed into an elongated loop, is welded to the respective legs of the U-shaped member **38.** The flat bar stock loop **39** encircles the pivot pin **32,** and, with the aid of the rubber block **36,** acts as a resilient stop for the closure members **25** as they reach their open position by reason of engagement with the pin **32.** The limiting position of the clsure members **25** is adjustable by reason of the threaded nut for eye-bolt **37.**

A latching and linkage mechanism represented generally by the numeral **41** serves to hold the closure members **25** in a closed position and to release these members to discharge contents in container **11.** The mechanism **41** includes operable portions on each end of the container **11** which are interconnected by an elongated shaft **42** rotatably mounted in a pair of bearing members **43.** On that end of container **11** shown in FIG. **1,** a first linkage arm **44** is rigidly affixed to shaft **42** at an obtuse angle. On the opposite end, a linkage arm **44'** is affixed to shaft **42** in the same manner, the linkage arm **44'** differing from the linkage arm **44** in length for a purpose described in further detail below.

Respectively connected in pivotal fashion to each of the linkage arms **44** and **44'** is a second linkage arm **45,** which is in turn pivotally connected to one end of a third linkage arm **46.** The opposite end of linkage arm **46** is connected to a stationary pivot point **47** carried at the end of a short projecting member **48.** Intermediate the ends of third linkage arm **46,** a latch pin **49** is pivotally connected. As best shown in FIG. **5,** a small rectangular plate **51** is welded to the side of each vertical member **21,** and the latch pin **49** cooperates with alignable bores formed in the plate **51,** the vertical member **21** and the slidable member **29.** The length of latch pin **49** is such that, in the release position, it still remains in the bore of plate **51.** A coil spring **52** is connected between a stationary hook **53** on end plate **13** and an intermediate point on second linkage arm **45** to normally bias latching pin **49** into the respective bores.

With reference to FIG. **2,** a pulley **54** is mounted on he container **11** at an upper corner, and a chain **55** passes over the pulley **54** and is connected to the projecting end of linkage arm **44'.** Chain **55** is of sufficient length to extend to the operating area of the fork lift, thus enabling the operator to pull the chain and actuate mechanism **41** to release the closure members **25.** A pair of hooks **57** mounted on one of the corner members **14** permit the chain to be wound up when not in use.

As shown in FIG. **1,** the pivotal connection between linkage arms **44** and **45** occupies a slightly over-center position to assist in maintaining the latch pin **49** in its latch position. When the bore of slidable member **29** aligns itself with the bores of vertical member **21** and plate **51,** which occurs when the closure members **25** are in the closed position, latch pin **49** projects into the aligned bores and serves to hold the closure members **25** in this position. Pulling of the chain **55** draws the linkage arms **45** and **46** away from the vertical member **21** until such point that the latch pin **49** is removed from the bore of slidable member **29** to effect its release as well as the release of closure members **25.** It is to be observed that the pivotal connections between linkage arms **44'** and **45** (and linkage arms **44** and **45**) move radially, and the initial movement thereof from the latch position is predominantly lateral relative to the line of movement of the latch pin **49.** Therefore, this movement has an increasingly greater effect on the retraction of pin **49** from the aligned bores. In other words, there is little initial movement on the part of latch pin **49** for a corresponding larger movement of linkage arm **44'.** Although this initial retractive movement of the latch pin **49** is slight, it is with great mechanical advantage, thus enabling the pin to be retracted with a moderate pull on the chain **55** although the contents of container **11** exert a significant binding or shearing force on the latch pin **49** through the closure members **25,** linkage arms **31,** pivot pin **32** and slidable member **29.**

Further movement of the linkage arm **44'** effects greater and greater movement of its pivot point with linkage arm **45** away from the center line of vertical member **21,** thus accelerating the retractive movement of latch pin **49** once its initial movement has begun. A pair of stops **58** (FIG. **2**) limit movement of linkage arm **44'** in both directions.

Also as shown in FIGS. **1** and **2,** a flag member **56** is rigidly affixed to the shaft **42** in such a manner that it projects outwardly to indicate when the closure members **25** are in the release position. Flag member **56**

may also serve as a manual pull to release the mechanism 41 if necessary.

FIGS. 6–8 represent an alternative embodiment of the inventive drop bottom container. Reference numerals with he additional designation *a* represent like parts of the alternative embodiment. The drop bottom container 11*a* comprises the same side and end plates 12*a* and 13*a*, respectively, but the external supporting frame is modified for different lifting applications. Thus, the end and side tubular members 18*a* and 19*a* extend peripherally around the upper edge of the container 11*a*, whereas the tubular members 17*a* are disposed along the bottom edge. Rectangular tubular members 15*a* are also affixed along the bottom edge of the container 11*a* to provide lower lifting slots for the bifurcated lifting members of a fork lift. Triangular plates 20*a* are commonly affixed to the top surface tubular members 15*a* and each corner member 14*a* to offer reinforcing support during the lifting operation.

The hinges 26*a* are mounted on the lower face of the tubular members 15*a*, and the closure members 25*a* themselves are modified by reversing the position of the rectangular frame 27*a* and bottom plate 28*a*.

The position of the several components of latching and lifting mechanism 41*a* are also reversed, with the latch pin 49*a* disposed at a somewhat higher intermediate point with respect to the vertical tubular member 21*a*. Container 11*a* also includes modified structure for providing the resilient limiting function for the closure members 25*a*, as shown specifically in FIG. 8. This modified structure includes a short square tubular member 61*a* slightly smaller in cross sectional size than the tubular member 29*a* to permit sliding movement therein. A coil spring 62*a* is interconnected between the eye-bolt 37*a* and a second eye-bolt 63*a* affixed to the short tubular member 61*a*. A stop 64*a* for the short tubular member 61*a* is welded to the extreme top end of slidable member 29*a* for engagement with the member 61*a* as the tubular member 29*a* slides downwardly. Thus, with release of the closure members 25*a*, tubular member 29*a* is carried downwardly therewith until the stop member 64*a* engages the short tubular member 61*a*. At this point, further downward movement on the part of closure members 25*a* is resiliently limited by the spring 62*a*. The position of eye-bolt 37*a* is adjustable by the nut associated therewith to effect the proper opening position of closure members 25*a*, and also to compensate for changes in the spring 62*a* occurring from repeated use.

Operation of the containers 11 and 11*a* is essentially the same, and will be described only with respect to container 11 as set forth in FIGS. 1–5. With the container 11 resting on a supporting surface with the closure members 25 in their closed position as shown in FIG. 1, material may be dumped therein until filled or at such time it is desired to discharge the material. If a fork lift is used to transport the container 11, its bifurcated lifting members 24 are either inserted transversely through the slots 23 defined by lifting frame 22, or longitudinally through the slots 16 defined by tubular members 15. The length of chain 55 is placed in an accessible position to the fork lift operator, and the container 11 is then lifted by the fork lift and transported to a desirable discharge area. The container contents are discharged by pulling the chain 55, which retracts the latch pin 49 from the bore in sliding tubular member 29. As pointed out above, this retracting movement initially begins with maximum mechanical advantage and relatively little movement, followed by progressively increased movement on the part of latch pin 49 until release of the tublar member 29 is effected. At this point, closure members 25 are released and swing downwardly until pivot pin 32 engages the bar stock loop 39. Further downward movement of the closure members 25 is resiliently limited by the rubber block 36, thus preventing uncontrolled and undesired swinging movements by the closure members 25. Flag member 56 moves to the position shown in FIG. 2 indicating that container 11 is in a discharge state.

After the contents of container 11 have been fully discharged, the container 11 is lowered toward the supporting surface. The slidable tubular member 29 initially engages the ground with such lowering movement, thus causing the closure members 25 to swing upwardly to their closed position. As the container reaches the supporting surface, the bore in tubular member 29 becomes aligned with the bores in plate 51 and the bias of coil spring 52 causes latch pin 49 to be projected into the latching position. Container 11 is at this point ready to be refilled, and the fork lift can then be removed and used for other purposes.

We claim:

1. In a drop bottom container having at least one closure member pivotally connected thereto for movement between open and closed positions and disposed to support at least a portion of the container load in the closed position, the improvement comprising:
   a. latching means movable between latch and release positions for releasably holding the closure member in said closed position, the latching means being subjected to container load forces when in said latch position;
   b. and control means for moving the latching means from the latch position to the release position at a progressive rate of speed and with decreasing mechanical advantage.

2. The structure defined by claim 1, wherein the latching means has a predetermined line of movement between said latch and release positions, and the control means comprises:
   a. a linkage member having one end pivotally mounted to the container, the free end being so disposed relative to the latching means when in the latched position that rotational movement of said free end is initially predominantly lateral with respect to the line of latching means movement;
   b. and means operatively connecting the linkage member to the latching means.

3. The structure defined by claim 2, wherein the connecting means comprises:
   a. a second linkage member having one end pivotally mounted on the container, the latching means being operably connected to the second linkage member at a point spaced from its pivotal mounting;
   b. and a third linkage member pivotally connecting the first named linkage member to the second linkage member.

4. The structure defined by claim 3, wherein the pivotal connection between the first and third linkage member is disposed in an over center position with the latching means in said latch position.

5. The structure defined by claim 1, and further comprising means for biasing the latching means toward the latch position.

6. The structure defined by claim 1, wherein:

a. the closure member is pivotally connected to an elongated member vertically movable relative to a guide member carried by the container, the elongated and guide members each having an aperture forming therein, the apertures being alignable when the closure member is in its closed position;

b. and the latching means comprises a latch pin retractably insertable into said aligned apertures.

7. The structure defined by claim 1, and further comprising means for manually operating the control means.

8. The structure defined by claim 1 which further comprises:

a. an elongated member carried by the container and guidably movable relative thereto:

b. and linkage means operably connecting the elongated member with the closure member;

c. said elongated member projecting below the closure member in its open position for engagement by a supporting surface as the container is lowered toward said surface to move the closure member to its closed position with said lowering movement.

9. A drop bottom container comprising:

a. a liftable container having an open bottom and adapted to receive material and to discharge material in a position elevated from a supporting surface;

b. a closure member hingeably connected to the container to open and close said open bottom;

c. an elongated member carried by the container and guidably movable relative thereto;

d. linkage means operably connecting the elongated member with the closure member;

e. and resilient limiting means cooperably disposed between the elongated member and the container to resiliently and yieldingly restrain downward movement of the closure member upon reaching a predetermined open position.

10. The structure defined by claim 9, wherein the container further comprises a vertically disposed, tubular guide member, the elongated member being slidably disposed in the guide member.

11. The drop bottom container defined by claim 10, wherein

a. an aperture is formed in each of the elongated and guide members, the apertures being disposed for alignment when the closure member is in its closed position;

b. and the releasably latching means comprises a latch pin insertable into the aligned apertures.

12. The drop bottom container defined by claim 19, wherein the guide member has an elongated slot formed therein, and the linkage means comprises a linkage member pivotally connected to the closure member and to the elongated member through said elongated slot.

13. The structure defined by claim 10, wherein the elongated member is tubular, and the limiting means comprises:

a. a first stop member slidably disposed within the elongated member;

b. a second stop member affixed to the elongated member proximate its top and abuttably engageable with the first stop member;

c. and spring means connected to the container above the second stop member and to the first stop member.

14. The structure defined by claim 13, wherein the spring means comprises a coil spring the upper end of which is adjustably connected to a support plate disposed within and affixed to the tubular guide member.

15. The structure defined by claim 10, wherein the elongated member is tubular, and the limiting means comprises:

a. a transverse stop member disposed within and affixed to the elongated member;

b. an elongated loop of material disposed within the elongated member and encircling the transverse stop member;

c. and means for resiliently connecting the elongated loop to the container at a point above the elongated member.

16. The structure defined by claim 15, wherein the resilient connecting means comprises:

a. a support plate disposed within and affixed to the tubular guide member proximate its top;

b. a thickness of resilient material carried on top of the support plate;

c. a threaded bolt having one end supportably connected to the elongated loop, the other end projecting through the support plate and thickness of resilient material;

d. and a nut adjustably disposed on the threaded bolt above the resilient material.

17. The structure defined by claim 15, wherein:

a. the guide member has an elongated slot formed therein;

b. and the connecting means comprises a linkage member pivotally connected to the closure member and to the elongated member through said elongated slot;

c. the pivotal connection between the linkage and elongated members comprising said transverse stop member.

18. The drop bottom container defined by claim 9, wherein the container further comprises support means defining at least two horizontally disposed, parallel slots sized and spaced to receive the bifurcated members of a fork lift.

19. The drop bottom container defined by claim 18, wherein the container is rectangular in shape, and the support means defines two such pairs of slots relatively perpendicularly disposed to permit lifting of the container by a fork lift from any side thereof.

20. The drop bottom container defined by claim 9, wherein the closure member is constructed in pan fashion to hold a predetermined quantity of liquid.

21. The structure defined by claim 9, wherein the elongated member projects below the closure member in its open position for engagement by the supporting surface as the container is lowered toward said surface to move the closure member to its closed position with said lowering movement.

* * * * *