United States Patent [19]

McRobert

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[45] **June 19, 1973**

[54] **STORAGE VEHICLE WITH BIN DUMPER**

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[73] Assignee: **FMC Corporation,** San Jose, Calif.

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[21] Appl. No.: **228,023**

[52] **U.S. Cl.** ..... **214/313,** 214/75 R, 214/548, 214/620

[51] **Int. Cl.** **B60p 1/46**

[58] **Field of Search** ..... 214/518, 313, 75 R, 214/75 G, 75 H, 75 T, 314, 620, 750

[56] **References Cited**

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3,561,627	2/1971	Fisher	214/75 G
3,595,414	7/1971	Brown	214/620
2,211,721	8/1940	Gerosa et al.	214/75 R

Primary Examiner—Gerald M. Forlenza
Assistant Examiner—Lawrence J. Oresky
Attorney—F. W. Anderson and A. J. Moore

[57] **ABSTRACT**

A mobile vehicle having a container storage tunnel for storing a plurality of empty or filled containers and transporting them between a pick-up area and a dumping station. The vehicle includes a fork lift unit having a dumping mechanism with a bin clamp thereon for elevating and dumping a product from the bins or containers. The fork lift unit may lift the containers into positions to be stored in the tunnel, to be loaded on a flat bed truck to be dumped. When moved to the dumping position, the dumping mechanism tilts the containers in excess of 90° about pivot points adjacent the ends of the fork lift tines, and the clamp mechanism is activated to positively lock the container to the dumping mechanism during this tilting operation. The empty containers may then be lowered directly onto the ground or the flat bed of a truck, or may be lowered upon a carriage which moves at least several containers into the storage tunnel.

4 Claims, 11 Drawing Figures

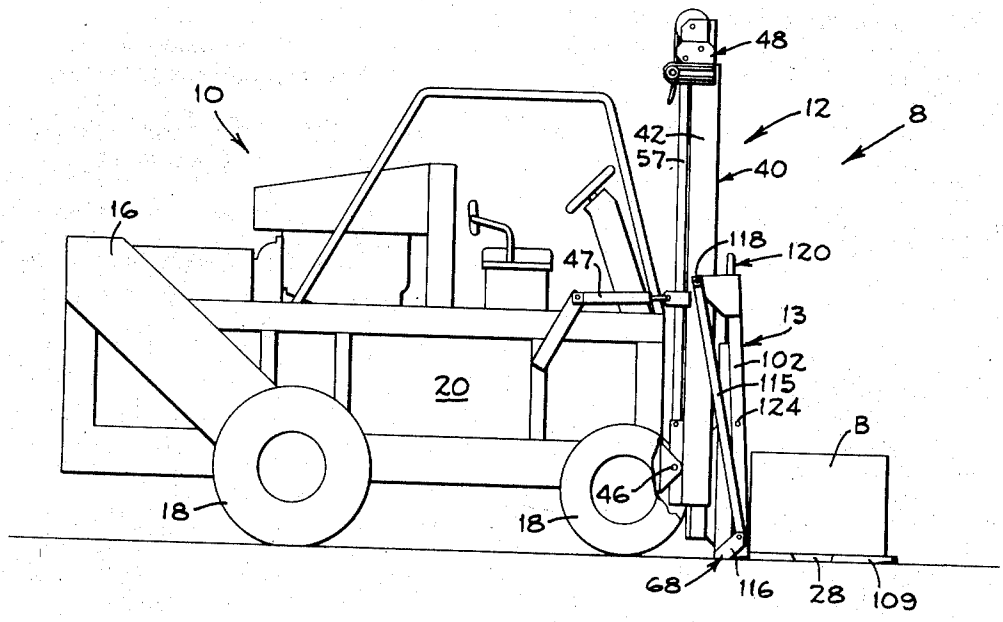


FIG_1

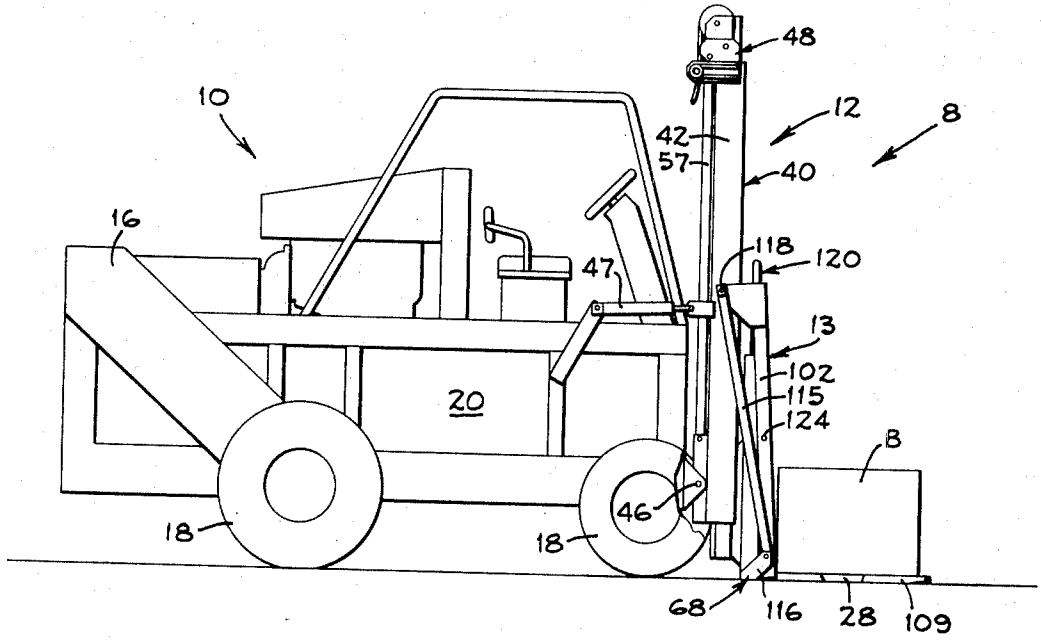

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FIG_2

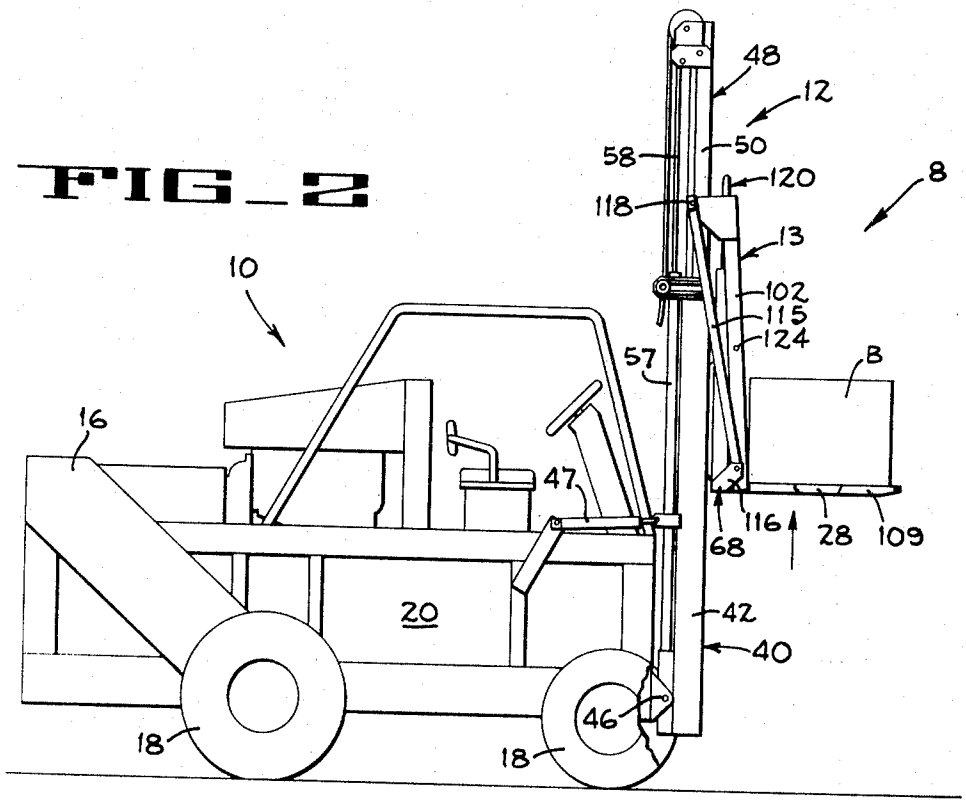

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FIG_3

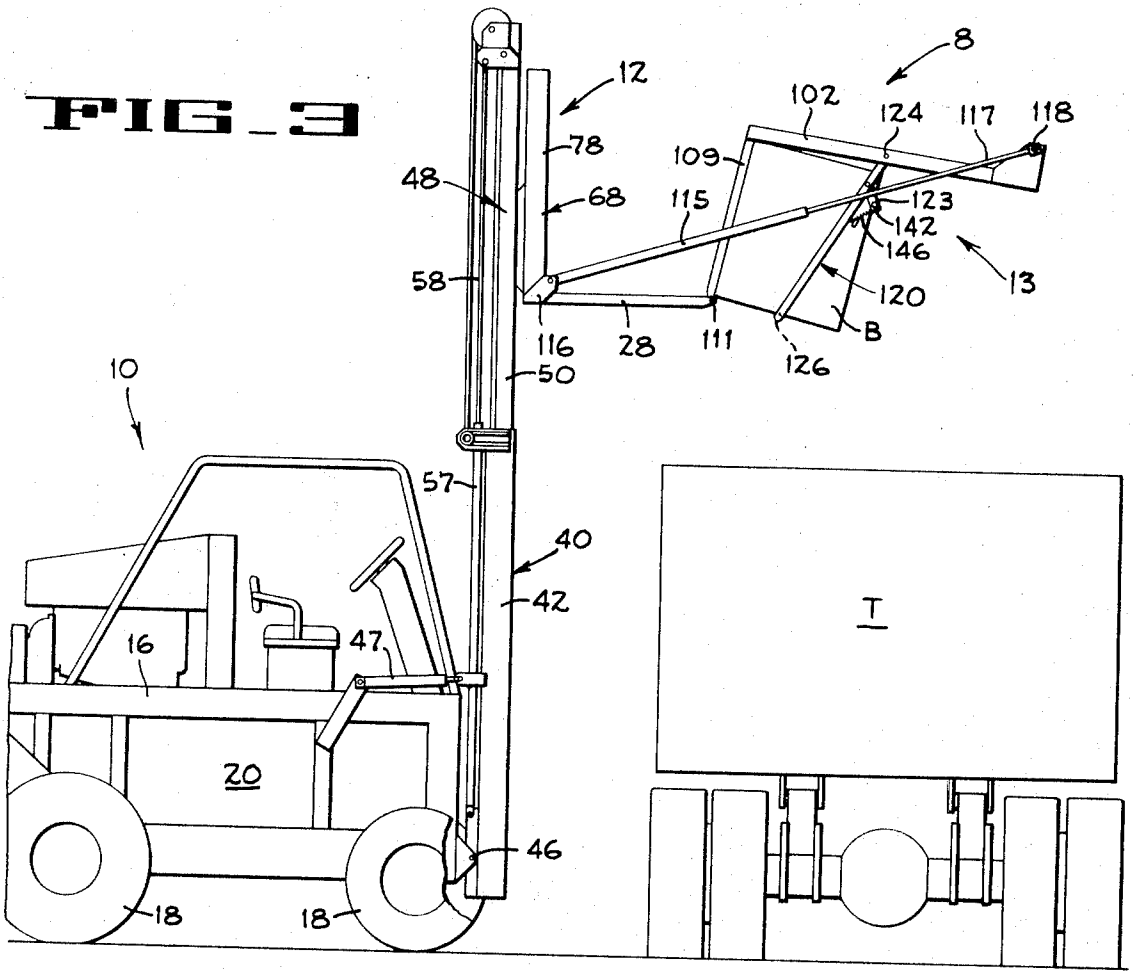

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FIG_4

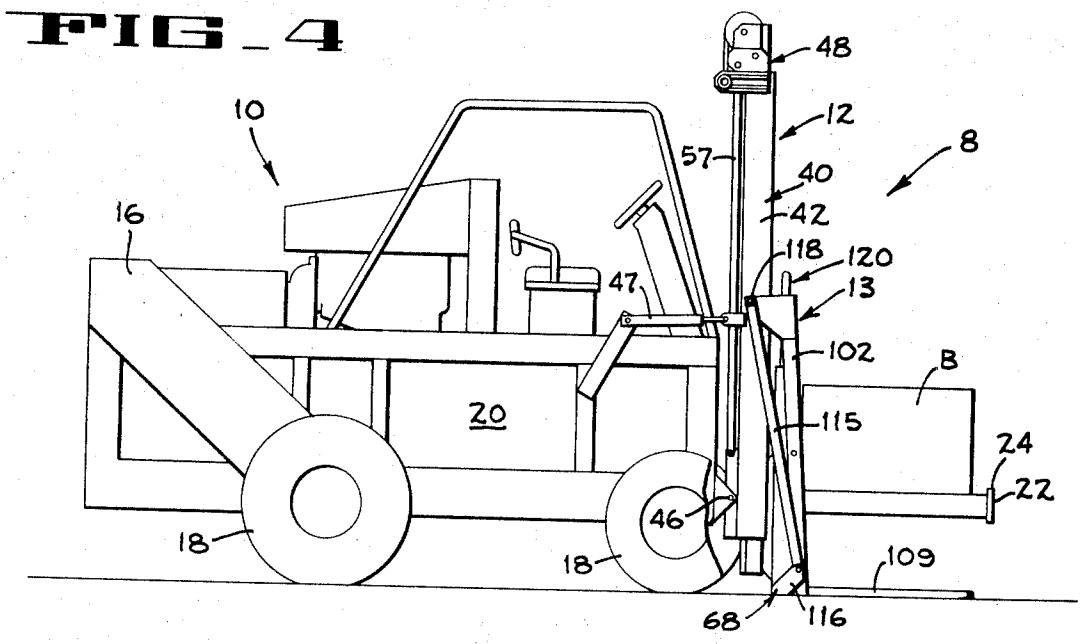

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FIG_5

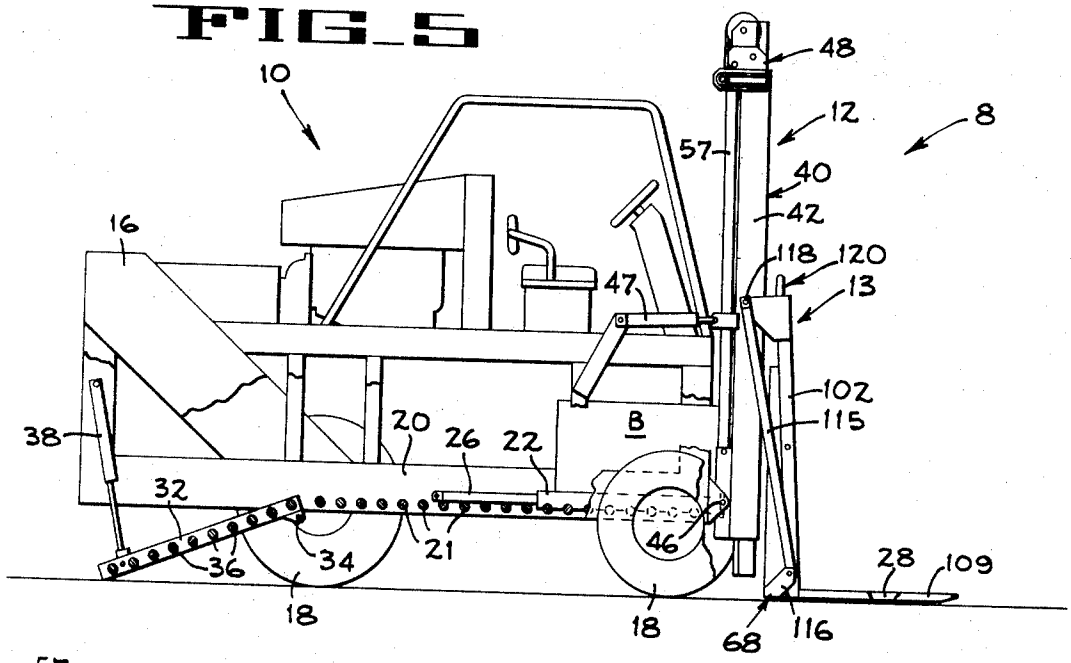

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FIG_7

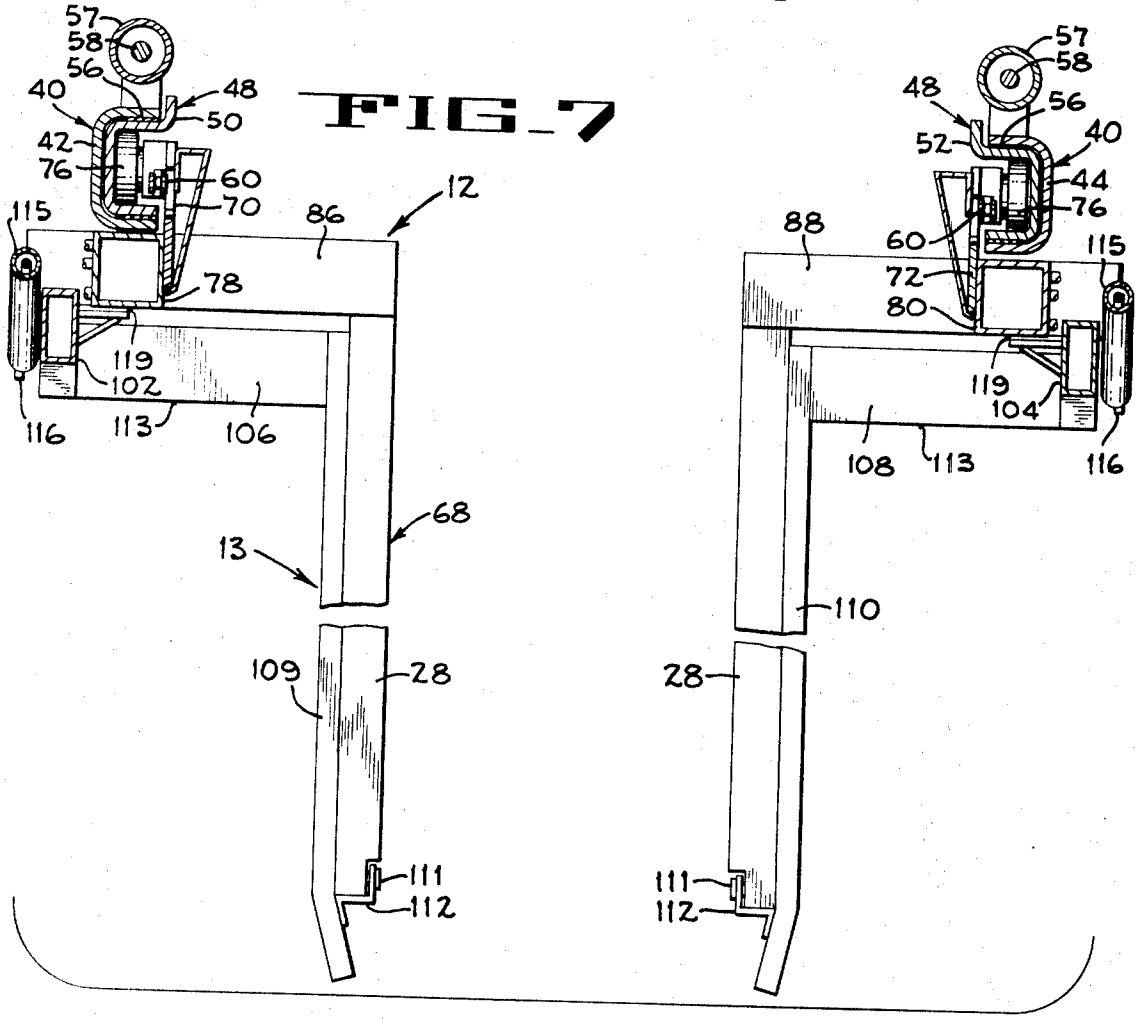

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FIG_6

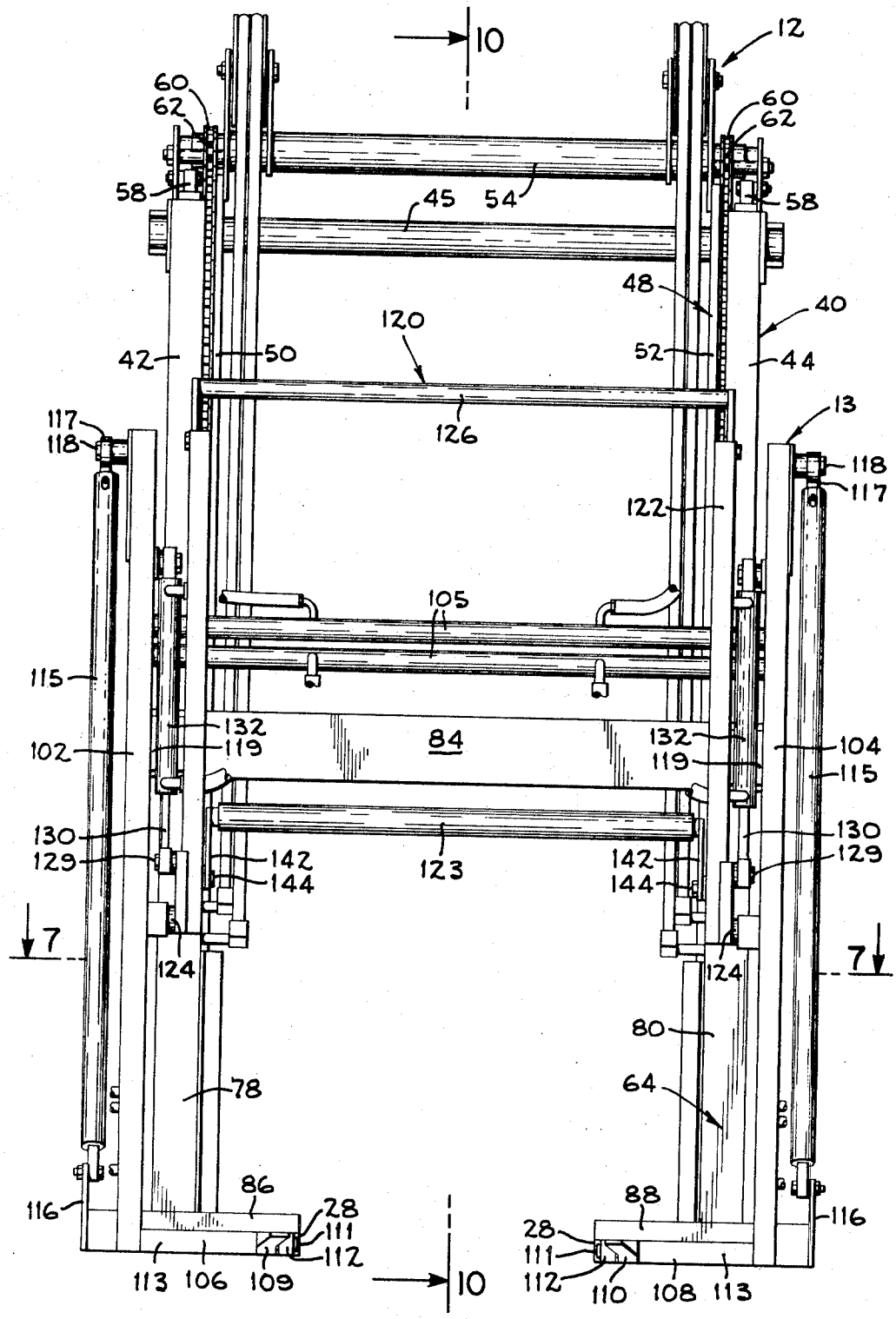

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FIG_8

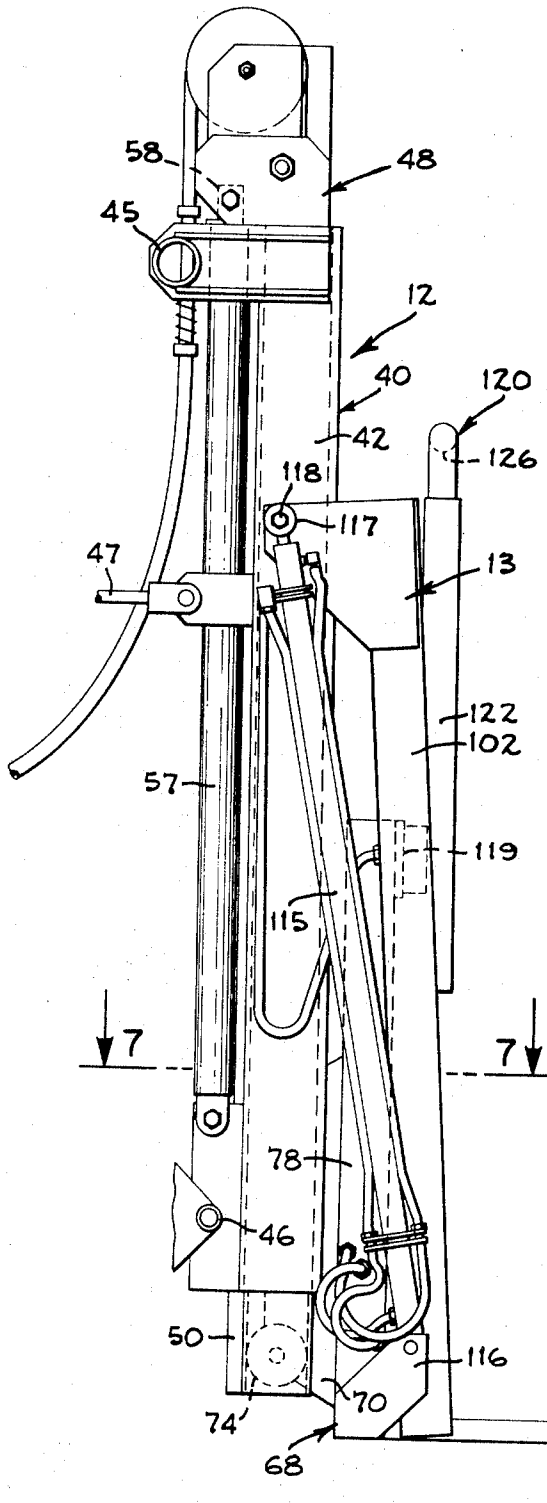

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FIG_9

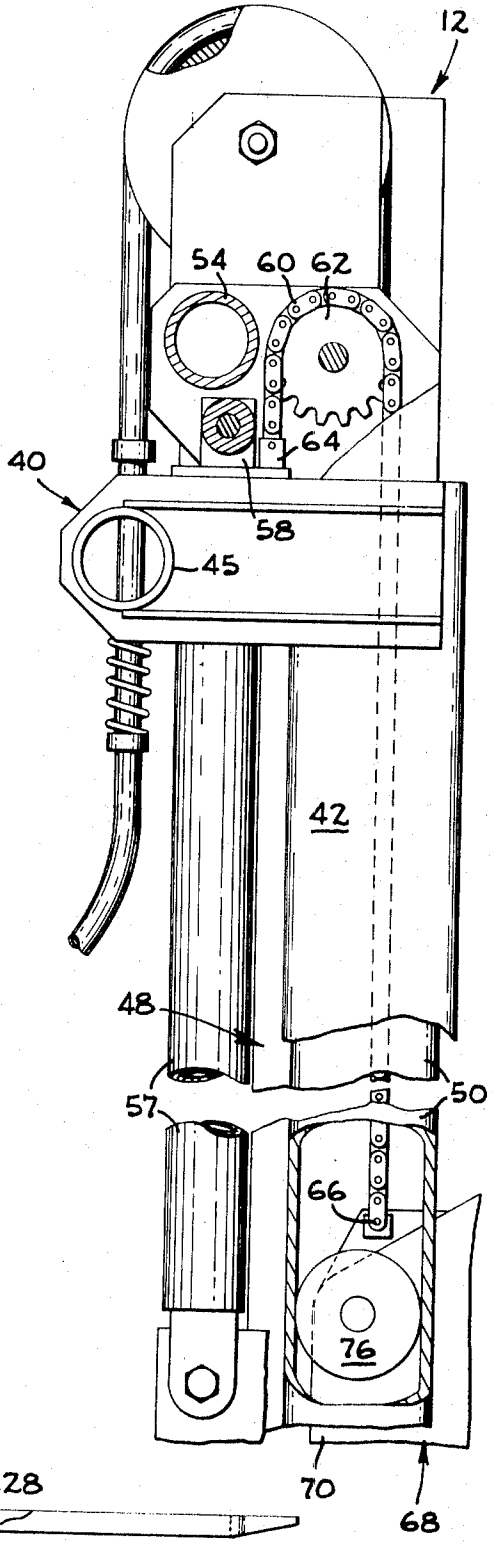

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FIG_10

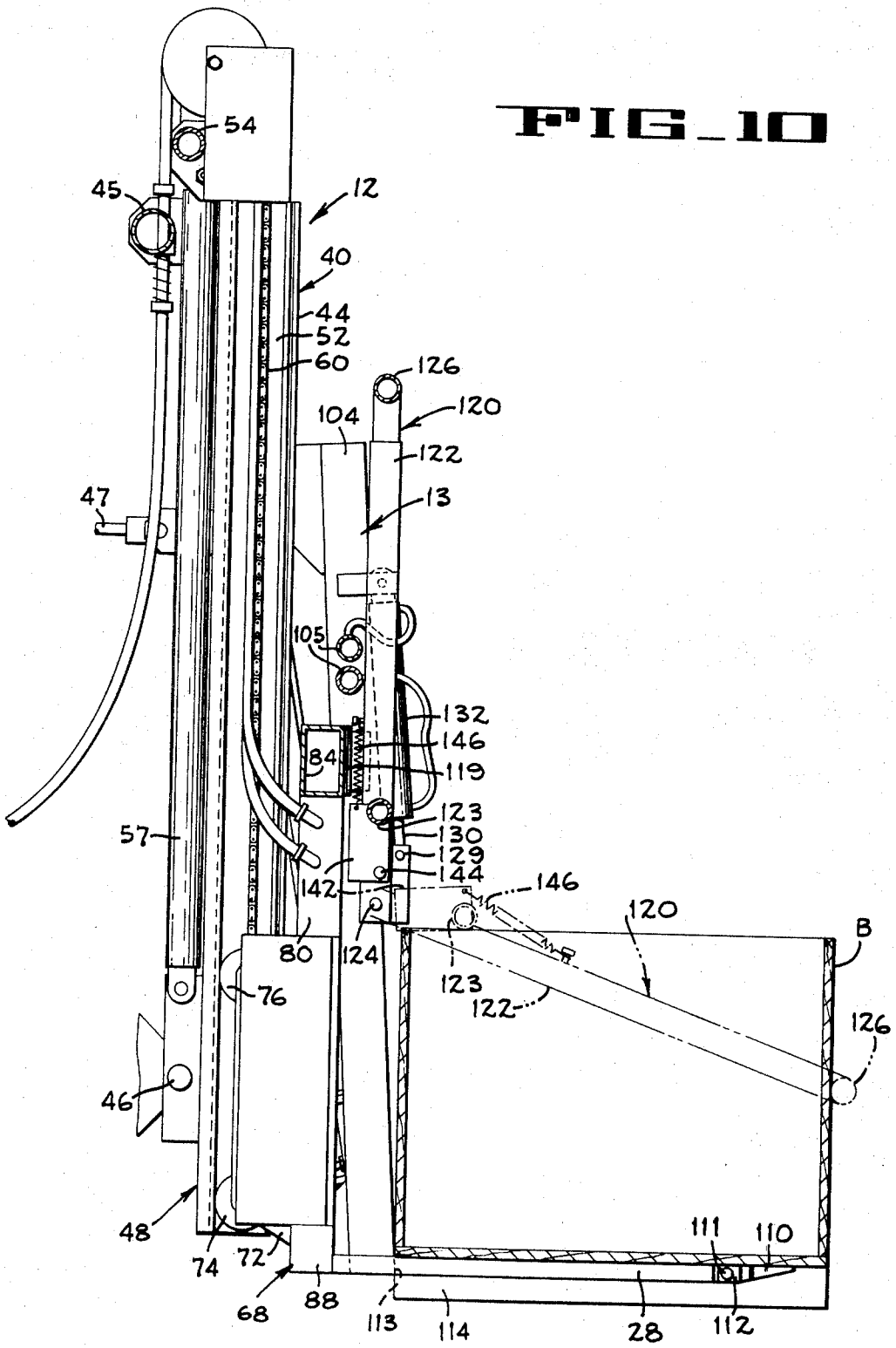
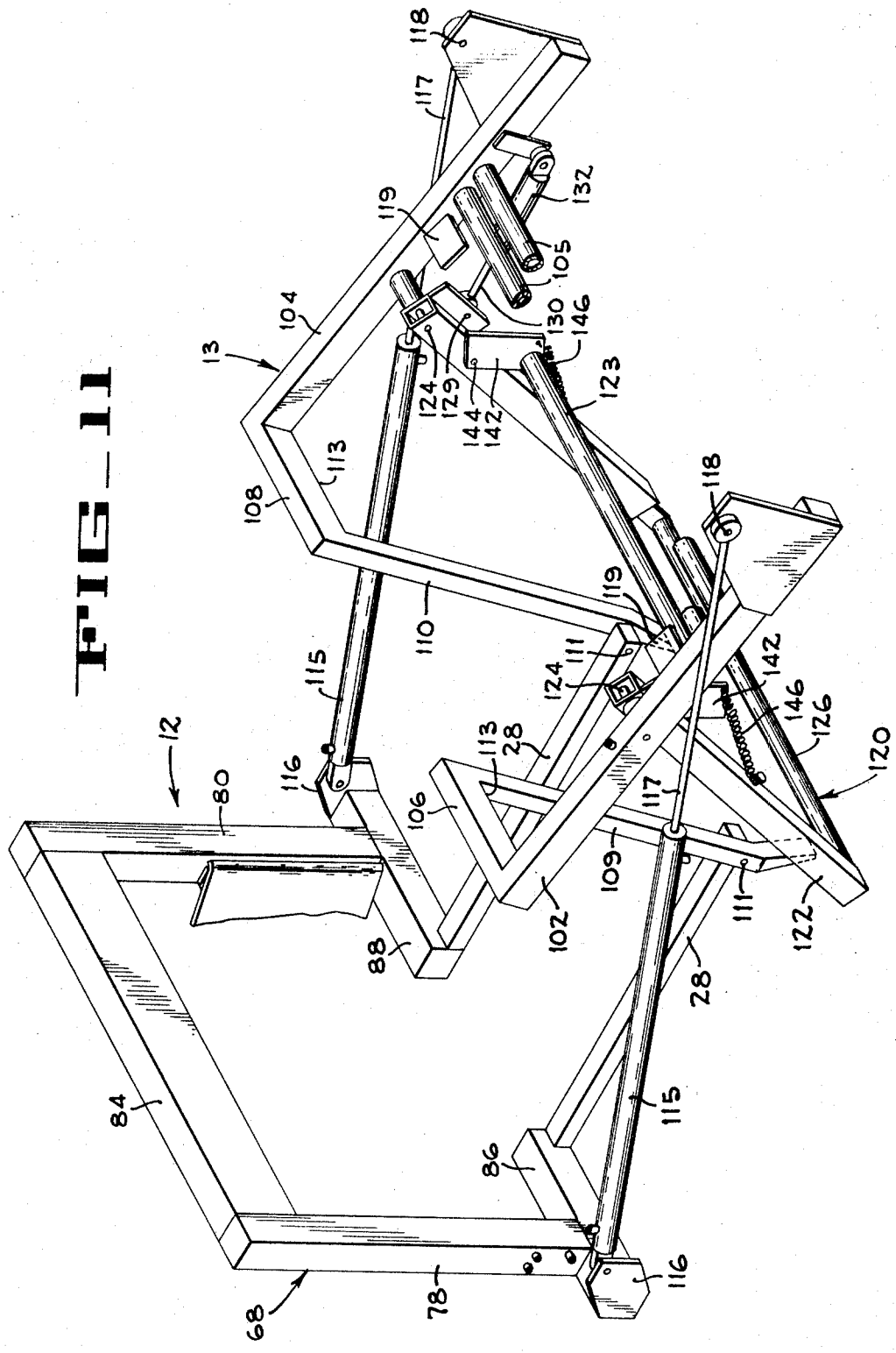

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FIG_11


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STORAGE VEHICLE WITH BIN DUMPER

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention pertains to the load handling art and more particularly relates to a mobile vehicle having a container storage capacity and a container dumping mechanism thereon including a bin supporting clamp mechanism.

2. Description of Prior Art

A mobile vehicle having storage capacity for four large containers or bulk bins used for harvesting crops, such as citrus fruit, nuts and prunes is disclosed in United States Fisher U.S. Pat. No. 3,561,627 which issued on Feb. 9, 1971 and is assigned to the assignee of the present invention. The Fisher apparatus, however, does not include means which will enable the bins to be dumped and must, therefore, rely upon other equipment to perform this dumping function.

Although fork lift vehicles having box dumping mechanisms associated therewith are broadly known in the art as evidenced by United States Pat. No. 2,829,789 which issued to Gerhardt et al. on Apr. 8, 1958, such mechanisms are usually rather complicated and expensive and are not associated with a vehicle having bin storage capacity.

SUMMARY OF THE INVENTION

The mobile bin storage and dumping vehicle of the present invention includes a vertically movable fork lift unit mounted on its forward end which lifts bins from the ground, or from other supporting surfaces, and either stores the bins in a storage tunnel within the vehicle or dumps the products from the bins. When performing the storage operation, the bins are first elevated to a position above the tunnel, a loading carriage is projected forwardly from the floor of the tunnel below the bin, the bin is lowered upon the loading carriage, and the loading carriage is then retracted into the tunnel to position the bin on a roller conveyor floor of the tunnel. Three bins may be picked up from an orchard being harvested and may be loaded directly into the tunnel with at least a fourth bin and preferably a fifth bin stacked on the fourth bin and being carried by the fork lift tines. When handling citrus fruit, each bin conventionally has a 45 × 45 inch square base, and may be either about 30 ½ inches or 25 inches tall. It is to be understood, however, that bins of other sizes may be handled by the apparatus.

The load vehicle may then be driven out of the orchard to a truck loading depot or the like at which time a discharge ramp at the rear end of the tunnel is pivoted downwardly from a closed position to an open position for discharging the three bins inside the tunnel onto the ground as the vehicles moves forward. These bins are then picked up one at a time by the fork lift unit, are gripped by a bin clamping device of the dumping mechanism, and are dumped into a truck by pivoting the bin in excess of 90° about an axis disposed adjacent the free end of the fork lift tines. The clamping mechanism includes a bar of U-shaped construction which is pivoted and hydraulically locked against the forward end of the bin in such a way as to lock a rear edge and the floor of the bin firmly against certain surfaces of the dumping mechanism. The clamping device also includes a hold down bar which engages the upper edges of the bin's side wall at points adjacent the rear wall.

It is, therefore, one object of the present invention to provide a mobile vehicle capable of storing bins, loading and unloading bins, and dumping the product from filled bins into a receiving mechanism while firmly clamping the bin in the dumping mechanism.

Another object is to provide an improved bin gripping and dumping mechanism.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a diagrammatic side elevation of the mobile vehicle of the present invention shown picking up a full bin with the bin clamp in its upper inactive position.

FIG. 2 is a diagrammatic side elevation similar to FIG. 1 but with the bin raised.

FIG. 3 is a diagrammatic side elevation similar to FIG. 1 but illustrating the product in the bin being dumped into a truck.

FIG. 4 is a diagrammatic side elevation illustrating the empty bin being lowered onto the loading carriage which is in its extended position supporting the emptied bin.

FIG. 5 is a diagrammatic side elevation with certain parts in section illustrating the loading carriage retracted with the empty bin disposed in the vehicle storage tunnel, with the fork lift tines in position to pick up another full bin, and with the discharge ramp pivoted to its open position.

FIG. 6 is an enlarged front end view of the apparatus disclosed in FIG. 1 illustrating the fork lift unit and the dumping mechanism with the bin clamp in its inactive raised position.

FIG. 7 is an enlarged horizontal section taken along lines 7—7 of FIGS. 6 and 8 with certain parts being cut away and with the distance between the fork lift tines being greatly reduced.

FIG. 8 is an enlarged side elevation with parts broken away illustrating the bin dumping mechanism in its lowest position.

FIG. 9 is an enlarged side elevation of a portion of FIG. 8 with parts broken away.

FIG. 10 is a vertical section taken substantially along lines 10—10 of FIG. 6 illustrating the bin clamp in its inactive position in solid lines and in its active clamping position in dotted lines, certain parts of the fork lift unit being cut away.

FIG. 11 is a diagrammatic perspective of a portion of the apparatus illustrated in FIG. 10 but with the dumping mechanism being illustrated in the dumping position.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The storage vehicle and bin dumper 8 (FIGS. 1–5) of the present invention includes a mobile vehicle 10 having a fork lift unit 12 and a dumping mechanism 13 thereon. Since the vehicle 10 is quite similar to that disclosed in the aforementioned Fisher U.S. Pat. No. 3,561,627, the disclosure of the Fisher patent is incorporated herein by reference.

In general, the storage vehicle and bin dumper 8 comprises a vehicle frame 16 mounted on four wheels 18 certain ones of which are powered and steered by conventional mechanism. The vehicle includes a storage tunnel 20 capable of supporting three containers or bins B, which tunnel is provided with a floor having spaced freely journaled rollers 21 (FIG. 5) thereon. A loading carriage 22 (FIG. 4) with a raised flange 24 on

its forward end is reciprocated by a hydraulic cylinder **26** (FIG. **5**) between a retracted position within the tunnel **20** and its extended bin supporting position shown in FIG. **4.** When in the extended position, the carriage **22** is disposed between the pair of fork lift tines **28** (FIGS. **6** and **7**), and when the carriage **22** is retracted the flange **24** pulls the bin onto the rollers **21** in the storage tunnel **20.** When it is desired to remove stored bins B from the tunnel **20,** a rear gate **32** (FIG. **5**) pivoted at **34** and having a bin supporting surface of free rollers **36,** is pivotally lowered from its normal horizontal position by hydraulic cylinders **38.**

The fork lift unit **12** (FIGS. **3** and **5–11**) comprises a generally vertically extending outer frame **40** of inverted U-shape having side channel members **42** and **44** (FIGS. **6** and **7**) connected by an upper cross bar **45.** The lower ends of the U-shaped outer frame **40** is pivoted by pins **46** (FIG. **3**) to the forward portion of the vehicle frame **16,** and hydraulic cylinders **47** are connected between the vehicle frame and the outer frame **40** for selectively pivoting the outer frame **40** about the pins **46.**

An inner inverted U-shaped frame **48** includes inner channels **50,52** (FIG. **7**) which are slidably received within the outer frame **40,** are connected at their upper ends by a cross bar **54,** and are connected intermediate their ends by a center cross bar (not shown). Slide plates **56** are secured to the outer channel members **42** and **44** and guide the inner members **50,52** during their reciprocal movement.

In order to impart reciprocal movement to the inner frame **48,** the lower ends of a pair of hydraulic cylinders **57** (FIGS. **3, 7** and **8**) are anchored to the outer frame **40** while the upper ends of their piston rods **58** are anchored to the upper end of the inner frame member **48.** As best shown in FIGS. **6, 9** and **10,** a pair of chains **60** are trained over idler sprockets **62** rotatably mounted on the upper ends of the inner frame **48.** One end of each chain is anchored to the upper end of the outer frame **40** at **64** (FIG. **9**), while the other end of each chain is anchored at **66** to a fork lift tine carrier **68.**

The tine carrier **68** (FIG. **3**) includes a pair of spaced plates **70** and **72** (FIG. **7**) each having a pair of rollers **74** and **76,** respectively, journaled thereon and rotatably received in the inner channel members **50,52.** The plates **70** and **72** are rigidly connected to vertical legs **78** and **80** (FIGS. **7** and **11**) which are connected at their upper ends to a transverse beam **84.** Short, inwardly directed beams **86,88** (FIGS. **6** and **7**) are connected to the lower ends of the legs **78,80** and have the fork lift tines **28** rigid therewith and projecting forwardly therefrom.

The dumping mechanism **13** (FIGS. **3, 6, 7, 8, 10** and **11**) is carried by the fork lift unit **12** and includes a pair of normally vertical side members **102** and **104** which are pivoted from the pick-up position illustrated in FIGS. **6, 7, 8** and **10** to the position illustrated in FIGS. **3** and **11** during dumping. Tubular cross bars **105** interconnect the two members **102** and **104** near their upper ends. Short inwardly projecting arms **106** and **108** (FIGS. **6, 7** and **11**) are rigidly secured to the lower ends of the side members **102** and **104** and have forwardly extending container supporting bars **109** and **110** rigidly secured to their inner ends and projecting forwardly alongside the associated fork lift tines **28.** The forward ends of the bars **109** and **110** are pivotally connected to the fork lift tines **28** adjacent their forward ends by pivot pins **111** and cooperating brackets **112** as best shown in FIGS. **6** and **7.** It will be appreciated that the forward edges **113** of the arms **106** and **108** act as bin abutment surfaces to limit the rearward movement of the bins by engaging the rear end of bin side cleats **114** (FIG. **10**) secured to the bottom surface of each bin.

Hydraulic cylinders **115** are provided in order to pivot the dumping mechanism **13** from its generally horizontal bin supporting position illustrated in FIGS. **6–8** and **10** to its bin dumping position as illustrated in FIGS. **3** and **11.** The lower end of each cylinder **115** is pivoted to an associated bracket **116** (FIGS. **6, 7, 8** and **11**) that is secured to the lower end of the fork lift unit **12.** The piston rod **117** of each cylinder **114** has its upper end pivotally connected at **118** to the upper end of the dumping mechanism **13.** Rubber bumper brackets **119** (FIGS. **7** and **10**) are connected to the side members **102** and **104** and are positioned to engage the legs **78** and **80** of the fork lift unit **12** when the dumping mechanism is in its generally horizontal bin supporting position.

An important feature of the invention is the provision of a bin clamp **120** (FIGS. **10** and **11**) which firmly holds the bin B in the dumping mechanism **13** during the operation of dumping articles, such as fruit, into a truck T (FIG. **3**) or the like without any injury to the bin, and without requiring that the bin be provided with any special anchoring means.

The bin clamp **120** (FIGS. **6, 10** and **11**) comprises a U-shaped bin retainer **122** and a safety bar **123.** The bin retainer **122** is pivoted at **124** to intermediate portions of the side members **102** and **104** of the dumping mechanism **13** and includes a bin engaging clamp bar **126** that is adapted to engage the forward surface of the bin. The bin retainer **122** is pivotally connected at **129** to the piston rods **130** of a pair of hydraulic cylinders **132** which are pivotally connected to the upper portion of the dumping mechanism **13.** The cylinders **132** are controlled by the vehicle's operator to pivot the pin retainer **122** between the inactive vertical position illustrated in solid lines in FIG. **10** to the active bin clamping position illustrated in dotted lines in FIG. **10** and in FIG. **11** wherein a bin B is firmly clamped between the bin supporting surfaces **113** of the arms **106** and **108** and forward clamp bar **126.** It will be noted that the clamp bar **126** engages the entire transverse forward side wall of the bin B near its vertical midpoint thus reinforcing this wall during the dumping operation and reducing strain on the bin.

In order to prevent accidental dislodgement of the bin B from the dumping mechanism **13** during the dumping operation, the safety bar **123** is also provided in the bin clamp **120.** The safety bar **123** is rigidly connected to a pair of arms **142** pivoted to the bin retainer **122** at pivot points **144.** Springs **146** are connected between the arms **142** and the bin retainer **122** and normally hold the safety bar **123** in its inactive position above the bin B as illustrated in solid lines in FIG. **10.** However, whenever the bin retainer **122** is moved to its active clamping position illustrated in FIG. **11,** the springs **146** are tensioned and force the safety bar **123** into firm engagement with the upper rear edge of the bin thus preventing the bin from inadvertently falling from the dumping mechanism **13.**

The operation of the storage vehicle and bin dumper **8** will be described in connection with a harvesting operation and as illustrated in FIGS. 1–5 which illustrate progressive stages of a bin dumping and bin storing operation.

It will first be assumed that a number of filled bins B have been placed on the ground at a loading depot near the truck T to be loaded. During a normal sequence of operations, the operator who has ready access to conventional controls for the vehicle and controls for all hydraulic cylinders, lowers the fork lift unit **12** and drives the vehicle forward to position the fork lift tines **28** under a fruit filled bin B as indicated in FIG. **1.** The tilt cylinders **47** may be used to aid the operator in this operation by tilting the fork lift tines **28** within the range of 7° above or 7° below the horizontal.

The operator then activates the lifting cylinders **57** as illustrated in FIG. **2** to raise the bin B to the loading position wherein a bin may be placed upright upon a flat bed truck, or may be dumped into the open topped body of a dump truck T or the like. During this time, the vehicle **10** may be driven toward the truck T (FIG. **3**), and at the same time the clamp cylinders **132** are actuated to move the bin retainer **122** (FIGS. **10** and **11**) and the safety bar **123** of the bin clamp **120** into their active bin clamping positions illustrated in dotted lines in FIG. **10.** When the operator reaches the dumping location, he activates the dumping cylinders **115** thereby pivoting the dumping mechanism **13** through an arc slightly in excess of **90°** causing the load of fruit in the bin to gravitate into the truck T as illustrated in FIG. **3.** The tilt cylinder **47** may also be activated at this time to aid in dumping the fruit therefrom.

It will be noted that the bin clamp bar **126** of the bin clamp **120** provides firm support for the front wall of the bin B during dumping, and that the safety bar **123** prevents accidental dislodgement of the bin B at this time. Also, by causing the bin to be pivoted at the forward end of the tines **28,** the operator has little difficulty in judging the dumping height. Since the bin being dumped extends a considerable distance forwardly of the chassis of the vehicle **10** ample space is provided between the vehicle chassis and the truck being loaded thereby minimizing the effort and skills required by the operator.

After the product has been dumped from the bin B, the empty bin is returned to its horizontal position, the bin clamp **120** is moved to its inactive raised position, the hydraulic cylinder **26** (FIG. **5**) is activated to move the carriage **22** to its extended FIG. **4** position, and the fork lift unit **12** is lowered to place the bin directly upon the carriage **22.** The carriage **22** is then retracted moving the empty bin B into the tunnel **20.**

The above cycle of operation is repeated until three empty bins B are positioned in the tunnel **20,** and one or more empty bins are carried on the extended fork lift tines **28.** The vehicle with its load of empty bins B is then driven into the orchard being harvested. The empty bins are then lowered to the ground at desired locations by activating the hydraulic cylinders **38** (FIG. **5**) to lower the gate **32** and allow the empty bins to gravitate to the ground.

The operator then closes the gate **32** and collects three full bins placing them in the tunnel **20** by means of the fork lift unit **12** and carriage **22.** If desired, one or two additional full bins may be supported on the fork lift tines **28** before the loaded vehicle is driven out of the orchard to the loading depot. When at the depot, the full bins in the tunnel are lowered onto the ground upon opening of the gate **32** (FIG. **5**). If two bins are supported on the fork lift tines **28** they may be lowered directly onto the ground by the lift unit. The fork lift unit is then operated as previously described to pick up and dump each bin in turn.

It will, of course, be understood that the storage vehicle and bin dumper **8** may be used merely as a fork lift unit for loading or unloading bins, pallets, or the like from flat bed trucks.

From the foregoing description it is apparent that the storage vehicle and bin dumper of the present invention incorporates in one vehicle the two functions of storing a plurality of bins or containers for transportation to and from remote areas, and the function of dumping the articles from the containers into any suitable collecting means. The apparatus also includes a simple but unique bin clamping system on the dumping mechanism that provides additional support to the forward load bearing wall thus extending the life of the bins. The upper rear surface of the bin is also engaged during dumping to prevent accidental dislodgement of the bin.

Although the best mode contemplated for carrying out the present invention has been herein shown and described, it will be apparent that modification and variation may be made without departing from what is regarded to be the subject matter of the invention.

What I claim is:

1. An apparatus for dumping articles from containers having front, side and rear walls and a rear abutment surface comprising: a pair of transversely spaced fork lift tines having free ends, tine supporting means including means for raising and lowering said tines between a pick-up position and a dumping position along a generally vertical path, a dumping mechanism carried by said tine supporting means and having a pair of transversely spaced container supporting bars normally disposed in a horizontal plane, means for pivotally connecting said bars on the tines immediately adjacent the free ends of said tines, said dumping mechanism including a normally upright frame including upright members secured to the other ends of the supporting bars and having a container abutting surface for engaging the rear abutment surface of the container, container clamping means pivotally mounted on said upright frame and including a transversely extending clamp bar, means for pivotally actuating said clamping means for moving said clamp bar between an inactive position spaced from and disposed above the container to an active position engaging the front wall of the container, and means for pivoting said dumping mechanism about the free end of said tines when said clamping mechanism is in its active position to dump articles from the containers, further, said tine supporting means is mounted on a mobile vehicle; said mobile vehicle including a storage tunnel for storing a plurality of containers; said upright frame having an opening above said container abutting surface when said dumping mechanism is in the pick-up position of sufficient size to allow containers to move therethrough, a carriage on said vehicle movable into and out of said generally vertical path of movement of the containers; and power means for moving said carriage into the path of movement of the container as said tine supporting means is lowered from said dumping position toward said pick-

up position to deposit the container on said carriage when extended, and for thereafter retracting said carriage with the container thereon into said storage tunnel.

2. An apparatus according to claim 1 wherein hydraulic means are provided to tilt said tine supporting means through a limited arcuate range from a normally vertical position.

3. Container handling apparatus which comprises a mobile vehicle having a vertically movable fork lift unit thereon provided with transversely spaced longitudinally extending fork lift tines and means for raising and lowering said tines, the improvement comprising a container dumping mechanism on said fork lift unit, a pair of transversely spaced container supporting bars on said unit normally disposed in a horizontal plane and pivotally connected to the free ends of said tines, a pair of normally vertically extending members connected to the other ends of said bars and transversely spaced apart a greater distance than said container supporting bars and said tines, said vertical members including inwardly directed arms having upright container abutting surfaces adjacent the junction of said vertical arms with said horizontal container supporting bars, generally U-shaped container clamping means connected to said members for pivotal movement about a transverse axis disposed above the upper surface of a container supported on said container supporting bars, means for pivoting said clamping means from a position spaced from the container to a position firmly engaging the wall of the container over which articles are dumped, and means for pivoting said dumping mechanism from said normal position to a dumping position while said clamping means firmly clamps the container against said upright container abutting surfaces, further, said vertically extending members are spaced apart a sufficient distance at a position above said container abutting surfaces for allowing dumped containers carried by said dumping mechanism to pass there-through, means defining a container storage tunnel in said mobile vehicle, and carriage means on said vehicle mounted for movement between a retracted position within said tunnel and an extended position in the downward path of movement of empty containers after they have been dumped for intercepting said empty containers and for transferring said empty containers directly into said storage tunnel, and means for moving said carriage between said retracted and said extended positions.

4. A container handling apparatus comprising a mobile self powered steerable vehicle, a container storage tunnel in said vehicle, container discharge means at one end of said tunnel for movement between a container supporting position and a container discharging position, a loading carriage on the other end of said tunnel movable in a generally horizontal plane between a position extending outwardly from said tunnel and a position retracted within said tunnel, means for reciprocating said loading carriage whereby a container can be moved from the forks into the storage tunnel, a fork lift unit mounted on said vehicle adjacent said other end of said tunnel, a pair of fork lift tines on said unit projecting longitudinally outward of said tunnel and spaced a greater distance apart than the width of said loading carriage, means for raising and lowering said tines past the plane of said carriage for lifting a container upwardly to a dumping position past said carriage when said carriage is in its retracted position and for lowering an emptied container onto said carriage when said carriage is in its extended position, a dumping mechanism on said fork lift unit having an upright portion and a generally horizontal container supporting portion with said horizontal portion pivotally connected to the free ends of said tines, means for pivoting said dumping mechanism in excess of 90°, a container clamp pivotally mounted on said dumping mechanism and having a clamping arm pivoted from an inactive position spaced from the container to an active position engaging the wall of the container over which the articles are dumped, and means for moving said clamping arm between its active and inactive positions.

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