United States Patent [19]

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[45] **Feb. 26, 1974**

[54] **NON-STOP REFUSE COLLECTION SYSTEM**

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[21] Appl. No.: **199,756**

Related U.S. Application Data

[63] Continuation of Ser. No. 15,421, March 2, 1970, abandoned.

[52] **U.S. Cl.** **214/302,** 214/308, 198/179

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

[58] **Field of Search** 214/42, 77, 302, 303, 308; 53/391

[56] **References Cited**

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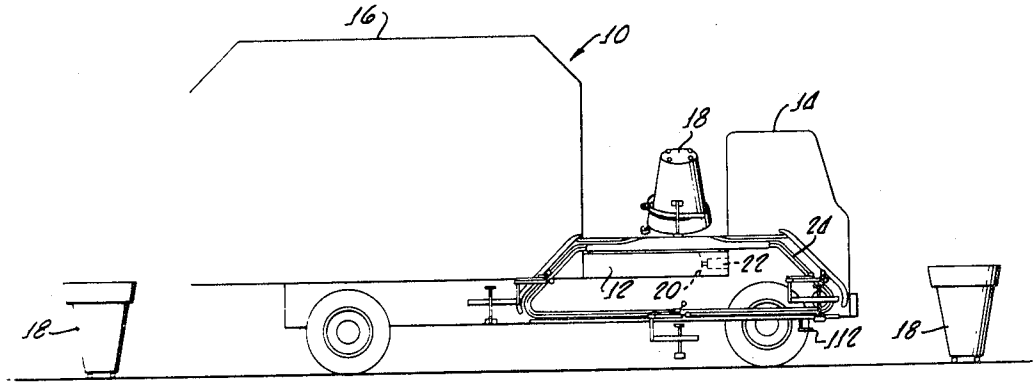
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[57] **ABSTRACT**

A device designed to be mounted on the side of a garbage pick-up vehicle and adapted to engage and invert refuse containers to transfer the contents thereof into the bed of said vehicle while the vehicle is in motion, allowing the vehicle to collect garbage placed along a roadway in a non-stop operation without manual handling.

24 Claims, 9 Drawing Figures



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SHEET 1 OF 3

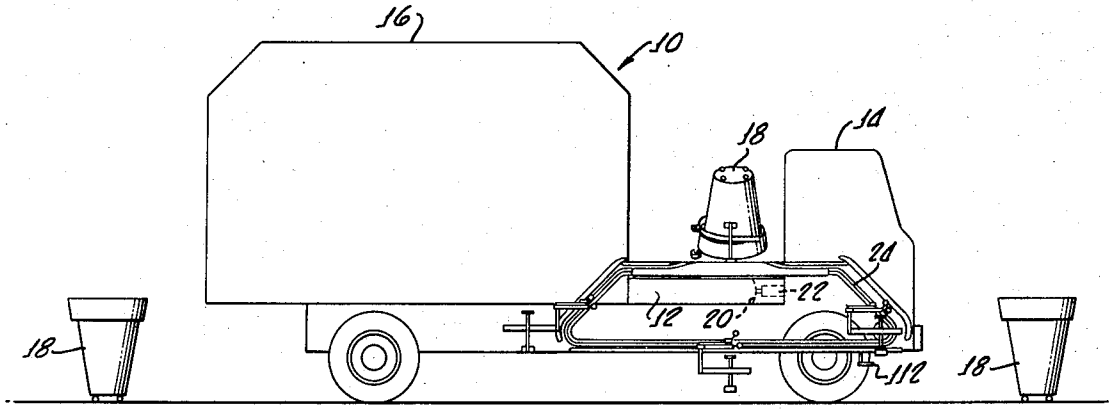


FIG. 1.

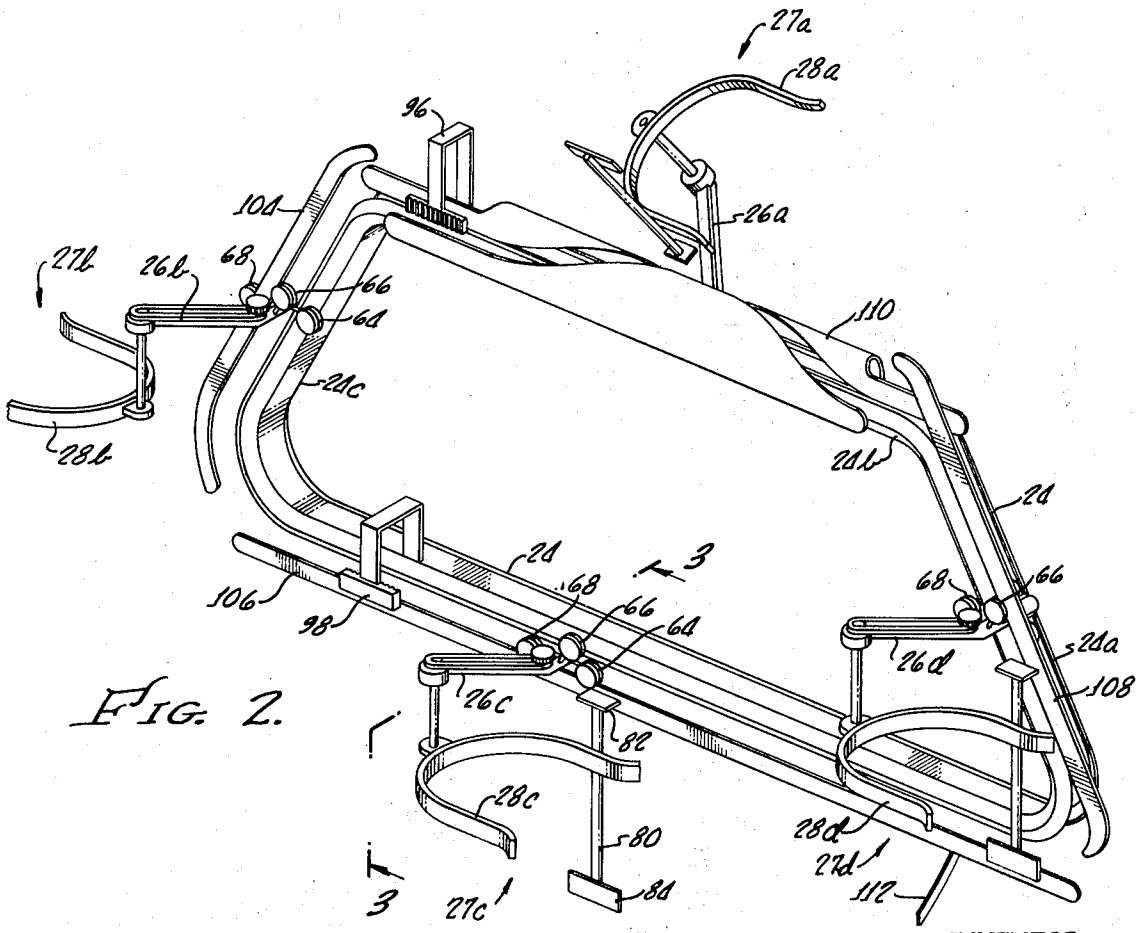
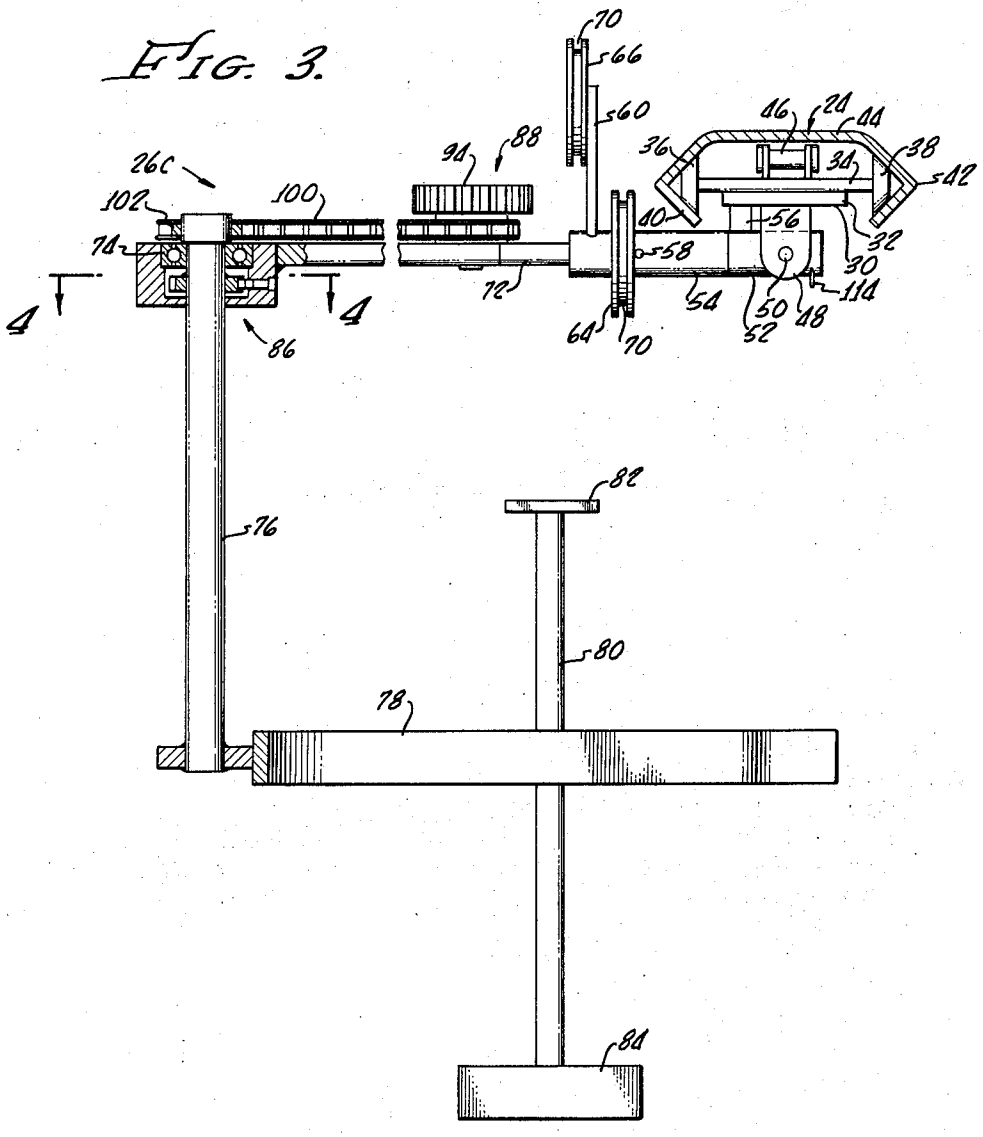


FIG. 2.

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FIG. 3.



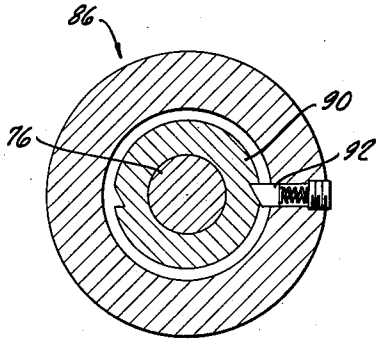


FIG. 4.

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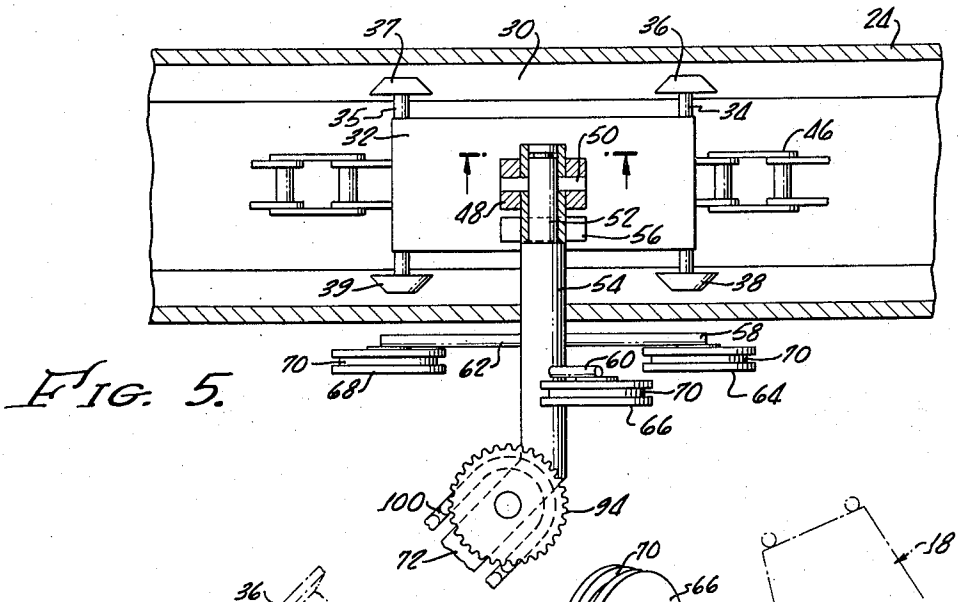


FIG. 5.

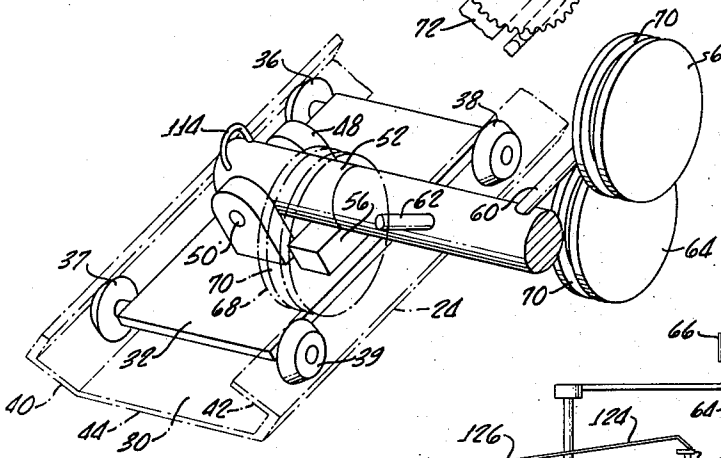
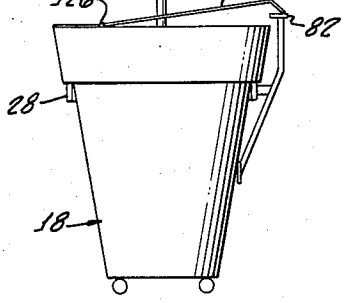


FIG. 6.



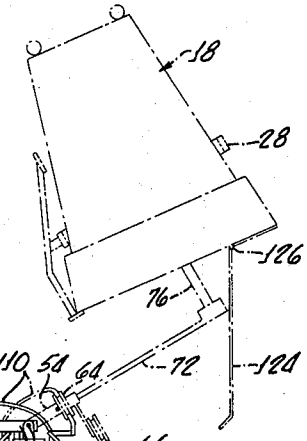


FIG. 9.

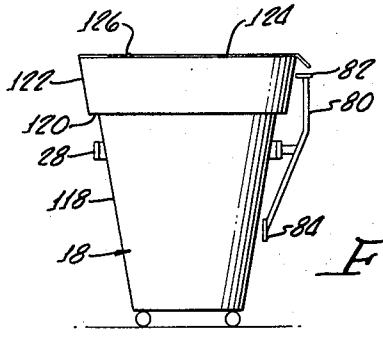


FIG. 8.

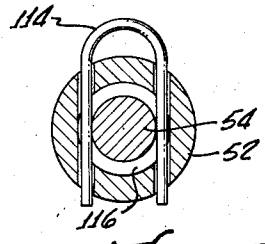


FIG. 7.

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NON-STOP REFUSE COLLECTION SYSTEM

RELATED APPLICATION

This is a continuation of application, Ser. No. 15,421, filed Mar. 2, 1970, now abandoned.

BACKGROUND OF THE INVENTION

Refuse collection through industrial and residential areas has in the past been an extremely inefficient process requiring a substantial amount of manual handling of refuse containers. The most common method used in the prior art to transfer refuse into a refuse collection vehicle has been the manual lifting and inverting of the refuse containers above a bin or opening located on the vehicle. These vehicles often incorporate mechanisms for moving the refuse from this bin to the interior of the body of the vehicle and tightly compacting the refuse within the vehicle. Various systems have also been developed for mechanically lifting the refuse containers and inverting them above the collection bin on the vehicle. Each of these prior art mechanisms, however, required stopping the vehicle and generally required the manual insertion of the portable refuse container onto the lifting mechanism of the vehicle and manual removal of the refuse containers from the vehicle after the refuse has been transferred. Therefore, even with these improvements, the prior art vehicles were limited to a slow progression along a roadway where the portable containers were located and often required personnel in addition to the vehicle driver for manually manipulating the portable containers.

BRIEF DESCRIPTION OF THE INVENTION

The present invention, on the other hand, is directed toward an apparatus and process which totally automates the transfer of refuse from refuse containers to a refuse collection vehicle, eliminating all manual manipulation of the containers. The equipment requires no personnel escept a vehicle driver who directs the vehicle along the roadway adjacent to the refuse containers. The equipment, which is designed to be attached to common side-loading refuse collection vehicles, automatically engages the containers and, by circulating these containers around a track on the side of the vehicle, inverts the containers above the refuse collection bin on the vehicle and then replaces the containers along side the roadway, all of these operations occurring while the vehicle is in motion.

These and other advantages of the present invention are best described in reference to the drawings in which:

FIG. **1** is an overall side elevation view of the refuse collection vehicle operating on a roadway along the side of which portable refuse containers are placed.

FIG. **2** is a detailed perspective view of the apparatus which is attached to the side of the vehicle shown in FIG. **1** and designed for manipulating the portable refuse containers.

FIG. **3** is a sectional view of the apparatus shown in FIG. **2** taken along the lines of **3—3,** but with the refuse receiving arm rotated inward to face the vehicle, for ease of illustration.

FIG. **4** is a sectional view of the arm rotating mechanism shown in FIG. **3** taken along the line **4—4.**

FIG. **5** is a plan view of the cart which supports the container engaging arm situated in the supporting track shown in FIG. **2.**

FIG. **6** is a prospective view of this cart within the track to further detail the structure thereof.

FIG. **7** is a sectional view of the means for coupling the container engaging arm to the cart shown in FIG. **5** and is taken along lines **7—7** of FIG. **5.**

FIG. **8** is an elevation view of the container designed to be engaged by the apparatus shown in FIG. **1,** and showing the position of one of the arms of the apparatus shown in FIG. **2** as it engages the container.

FIG. **9** is an elevation view of a container after engagement by the arm of FIG. **2** and showing the apparatus by which said container is inverted. The inverted container is shown in dashed lines in this figure.

DETAILED DESCRIPTION OF THE INVENTION

Referring to FIG. **1,** the preferred embodiment of the present invention is designed to be mounted in a vertical plane at the side of a refuse collection vehicle **10** which is adapted to receiving refuse in a receiving bin **12** which is located between the cab **14** and the truck body **16.** The receiving bin **12** is adapted to receiving refuse which is dumped therein from containers such as the portable containers **18.** Advantageously, a transfer means such as the blade **20** shown in dashed lines in FIG. **1** activated by a hydraulic cylinder **22,** may be utilized to transfer refuse from the receiving bin **12** to the interior of the body **16** of the vehicle **10.** A driver operates the vehicle from the cab **14** and therefore the apparatus is advantageously mounted so that the forward portions thereof are adjacent the cab **14** and may be visually monitored by the driver.

Referring now to FIGS. **1** and **2,** the major subassemblies of the apparatus will be described. A track **24** is situated in a vertical plane along the side of the vehicle **10** and is formed generally in the shape of a trapezoid having a forward inclined leg **24***a*, an upper horizontal leg **24***b*, a rear inclined leg **24***c*, and a lower horizontal leg **24***d*, each of these legs being connected to the adjacent legs by curved corner sections. Four container engaging means **26***a*, **26***b*, **26***c* and **26***d* are attached to the track **24** and designed to be driven around the trapezoidal track **24** in unison. These container engaging means **26***a* through **26***d* are spaced equidistant along the track **24** and are shown in FIG. **2** in positions **27***a* through **27***d* respectively along that path of the track. Each of the container engaging means **26** includes a U-shaped arm **28***a* through **28***d* which is designed to receive a portable container **18** as the vehicle **10** is driven adjacent to the container **18.**

The structure of each of the container engaging means **26***a* through **26***d* is identical and therefore the following discussion of the container engaging means **26***c* in reference to FIGS. **3** through **6** is representative of each of the container engaging means **26***a* through **26***d*. The container engaging means **26***c* includes a cart **30** which comprised a bed **32** on which are rotatably mounted a pair of axles **34** and **35,** said axles carrying at their extremities a pair of truncated conical wheels **36** through **39** which are designed to run within the track **24,** which track includes two V-shaped sections **40** and **42,** one leg of which is connected to a cross member **44.** The cart **30** will therefore run within the track **24** and the motion of the cart **30** will be defined by the path of the track **24.** The cart **30** is additionally

connected to a chain **46** which is utilized to drive the cart **30** around the track **24.** Supported from the cart **30** is a clevice **48** which extends perpendicular to the plane of the cart **30.** This clevice is drilled to support a pin **50** on which is rotatably mounted a bushing **52** in which a supporting arm **54** is in turn rotatably mounted. The arm **54** can therefore rotate about one axis within the bushing **52** and about a perpendicular axis about the pin **50.** The latter motion, i.e. the motion about the pin **50,** is limited by a stop **56** which is mounted on the cart **30** and which abuts the outside of the bushing **52.**

Attached to the outer extremity of the arm **54** are three radius arms **58, 60** and **62.** Each of these arms carries a perpendicular axle not shown in FIG. **3** on which is rotatably mounted a wheel **64, 66** and **68.** These wheels are adapted to rotate about an axle which is attached to the arms **58** through **62** about an axis parallel to the axis of the bushing **52.** Each of these wheels **64** through **68** has an arcuate groove **70** in its outer surface. This groove designed to engage guides as described below. Rigidly attached to the arm **54** and extending at an angle therefrom is an arm **72** which carries at its outer extremity a bearing **74** in which is rotatably mounted a vertical drop arm **76,** this arm **76** being therefore rotatable in an axis which is perpendicular to both the axis of the bushing **52** and the axis of the pin **50.** Rigidly mounted to the drop arm **76** is a U-shaped container receiving member **78** which is shown in FIG. **3** in section through a line separating the arms of the U. Attached to one of the arms of the U-shaped member **78** is a vertical extension member **80** which carries at its upper extremity a container top engaging means **82** and at its lower extremity a container side engaging means **84.**

In order to control the rotation of the drop arm **76** within the bearing **74,** a ratchet mechanism **86** and a drive mechanism **88** is utilized. The ratchet mechanism, as best seen in FIG. **4,** includes a ratchet **90** and a spring driven Pawl **92.** The ratchet **90** has a circular surface except for two detent positions, one of which serves to maintain the U-shaped arm **78** so that the opening of the U is in the direction of travel of the vehicle **10.** The second detent position holds the U-shaped arm **78** in a position rotated 180° so that the arm **78** has its opening facing the rear of the vehicle **10.** The driving means **88** includes a gear **94** which is driven by two rack gears **96** and **98** as shown in FIG. **2.** Each of these gears **96** and **98** is designed to rotate the pinion gear **94** to drive a chain **100** which in turn drives a sprocket **102** through 180°. This sprocket **102** is rigidly attached to the drop arm **76** and therefore rotates the drop arm **76** through 180° between successive detent positions of the ratchet mechanism **86** each time one of the racks **96** and **98** is adjacent the pinion gear **94.**

Referring specifically to FIG. **2,** a series of guides are shown which are intended to engage the rollers **64** through **68** to maintain the proper rotary position of the arm **54** within the bushing **52.** It will be noted from FIGS. **3, 5** and **6** that the rollers **64** and **68** are in the same plane, while the roller **66** is in a parallel plane further removed from the bushing **52.** The functioning of each of the guides shown in FIG. **2** will therefore be explained. Beginning first with a guide **104** adjacent the rear trapezoidal leg **24***c*, it can be seen that, as the cart **30** proceeds down this portion of the track **24,** the weight of the U-shaped arm tends to rotate the arm **54** counterclockwise within the bushing **52.** The guide **104** is positioned in the plane such that it will engage the rollers **66,** and this engagement will limit counterclockwise rotation of the arm **54** so that the U-shaped arm **28***b* rests in a horizontal plane. As the cart supporting the arm **54** proceeds down the leg **24***c*, a position will be reached at which the rollers **64** and **68** will engage another guide **106** and the roller **66** will disengage the guide **104.** The engagement of the rollers **64** and **68** with the guide **106** will maintain the U-shaped arm in a horizontal plane. As the cart **30** proceeds along the lower horizontal leg **24***d* of the track **24,** the pinion gear **94** proceeds past the rack gear **98** to rotate the U-shaped arm to a position as shown at **28***c* with the opening of the U-shaped arm facing in the direction of progress of the vehicle. The cart **30** will proceed along the leg **24***d* of the track **24** until it reaches the forward leg **24***a* at which point the rollers **64** and **68** disengage from the guide **106** and the roller **66** becomes engaged with a guide **108.** Since the weight of the U-shaped arm **28**d is now ahead of the bushing **52,** the arm **54** tends to rotate in a clockwise direction within the bushing **52.** The engagement of the roller **66** with the guide **108** limits this clockwise rotation to maintain the U-shaped arm **28**d in a horizontal plane. The cart **30** proceeds along the leg **24***a* of the track **24** until it reaches the leg **24***b* of the track **24,** at which time the roller **66** becomes disengaged from the guide **108** and the rollers **64** and **68** become engaged on two sides within a tubular guide member **110.** This tubular guide member **110** serves not only to limit rotation of the arm **54** within the bushing **52,** but also to raise the arm **54** about the pin **50,** therefore controlling motion about this second axis. By so guiding the arm **28***a* about the pin **50,** the guide **110** rotates the U-shaped arm **28***a* about the axis of the leg **24***b* of the track **24** so that the U-shaped arm **28** is inverted and positioned behind the plane of the track **24.** This is the position at which the container **18** which is maintained within the U-shaped arm **28***a* is inverted so that the refuse contained therein will drop into the receiving bin **12** of the vehicle **10.** As the cart **30** proceeds further along the leg **24***b*, the guide **110** rotates the arm **54** about the pin **50** to return the U-shaped arm **28** to its normal position in front of the plane of the track **24.** As the cart proceeds still further along the leg **24***b*, the pinion gear **94** engages with the rack gear **96** to rotate the U-shaped arm **28** so that it opens toward the rear of the vehicle **10.** As will be explained below, the rotation of the drop arm **76** within the bearing **74** by the action of the rack gears **96** and **98** on the pinion gear **94,** serves to allow the U-shaped arms such as the arm **28***d* of FIG. **2** which is at the forward leg **24***a* of the track **24** to engage and lift portable refuse containers, while the U-shaped arm which is at the rear leg **24***c* of the track **24** is rotated to allow disengagement of the arm, such as the arm **28***b*, from the portable refuse container **18** as the vehicle **10** proceeds along the roadway.

Motion of each of the arms **28***a* through **28***d* is intermittent and is controlled by a motor (not shown) which drives the chain **46** around the track **24.** At each successive intermittent motion, each of the U-shaped arms **28***a* through **28***d* moves to the next successive position **27***a* through **27***d* along the track as shown in FIG. **2** and comes to rest in that position. However, as the arm which is in the position **27***d* engages a container, this container will operate a lever arm **112** which will begin the intermittent operation of the motor to translate

each of the U-shaped arms **28***a* through **28***d* one quarter of the way around the trace **24** to the next position. This operation allows the vehicle **10** to pick up portable refuse containers **18** which are not evenly spaced along the roadway, and also allows the arm which is in position **27***a* to maintain the portable container **18** in an inverted position over the refuse bin **12** for a period of time.

Since it is often necessary to jolt the container when it is in its inverted position within the U-shaped arm, such as the arm **28***a* in FIG. **2**, the guide **110** is preferably formed so that it abruptly inverts the U-shaped arm **28***a* as the cart **30** is driven to its final intermittent position. This is accomplished by making the guiding surfaces of the guide **110** sufficiently abrupt to rapidly rotate the arm **54** about the pin **50**, as shown in FIG. **3**.

In order to maintain the arm **54** in a horizontal axis while the cart **30** is proceeding along the forward and rear trapezoidal legs **24***a* and **24***c* of the track **24**, the stop **56** as shown in FIG. **3–5** is incorporated on the cart **30** so that the bushing **52** will abut the stop **56**. As can be seen in FIG. **2**, when the cart is inverted as it proceeds along the leg **24***d* of the track **24**, both of the rollers **64** and **68** are engaged with the guide **106**, and this engagement alone serves to maintain the arm **54** along a horizontal axis.

Referring specifically to FIG. **7**, a U-shaped pin **114** is utilized to maintain the axial position of the arm **54** within the bushing **52**. To facilitate this engatement, the arm **54** contains an annular groove **116** and the bushing **52** is drilled in two places so that the pin **114**, when inserted through the drilled holes within the bushing **52**, will engage the groove **116** of the arm **54**, allowing the arm **54** to rotate, but maintaining the axial position thereof. This connection allows easy removal of each of the U-shaped arms with its associated mechanism from the bushing **52** and the cart **30** by the simple removal of the U-shaped pin members **114**, so that the U-shaped arms **28***a* through **28***d* may be removed from the vehicle while the vehicle is in transport to and from a dumping site.

Referring now to FIGS. **8** and **9**, the structure of a specific portable refuse container adapted to be engaged by the mechanism described above will be explained. The refuse container **18** has a truncated conical base section **118** terminating in an annular ridge **120** at the base of an upper truncated conical section **122**. The U-shaped arm **28** is intended to engage the base section **118** as the vehicle **10** approaches the container. It should be understood that the engaging arm **28** is in the position of the arm **28***d* shown in FIG. **2**, and that the arm **28** is below the ridge **120** of the container **18**, so that minor variances in the relative height of the vehicle **10** and the container **18** do not prevent engagement of the arm **28** with the base portion **118** of the container **18**. Likewise, the vehicle lid engaging means **82**, which is supported from the vertical arm **80**, is positioned below a lid **124** which is hinged at a point **126** from the container **18**. As the portable refuse container **18** enters the U-shaped arm **28**, it also engages the lever **112**, as shown in FIG. **2**, and the cart **30** which supports the arm **28** proceeds up the forward leg **24***a* of the track **24** raising the U-shaped arm **28** to a height which will raise the container **18** from the roadway. In this position, the container **18** is supported by the U-shaped arm **28** as shown in FIG. **9**, and the lid engaging means **82** partially raises the lid **124** to assure that it is free to pivot about the point **126**. As the U-shaped arm **28** proceeds along the upper guide **24***b*, as shown in FIG. **2**, the guide **110**, as shown in FIGS. **2** and **9**, engages the rollers **64** and **68** to rotate the arm **54** about the pin **50** so that the container **18** is inverted to the position shown in dashed lines in FIG. **9**. When the container **18** is so inverted, the weight of the lid **124** causes this lid to pivot open about the point **126**, and refuse within the container **118** is therefore free to fall from the container **18** into the receiving bin **12** of the vehicle **10**. It should be understood, on viewing the dotted line drawing of FIG. **9**, that the drop arm **76** and the arm **72** are positioned behind the container **18**, and the refuse within the container **18** will therefore not fall on this mechanism.

To operate this equipment, the driver directs the vehicle along the roadway, and, by watching the arm which is presently in position **27***d* (FIG. **2**), steers the vehicle to engage a container **18** with the arm **28***d*. As the vehicle moves past the position at which the container **18** was located, the apparatus, due to actuation of the lever **112** by the container **18**, moves this newly engaged container to an inverted position above the receiving bin **12** (position **27***a*, FIG. **2**). The arm moves up the inclined portion **24***a* of the track at a rate such that its rearward component of velocity is about the same as the forward velocity of the vehicle and thus the arm moves vertically to engage the lifting offset **120** of the container and the container is lifted without being dragged along the ground. Simultaneously, the arm **28**b, which is engaged with an emptied container **18**, is moved from the inverted position **27***a* (FIG. **2**) to position **27***b* at the rear, disengaging its container **18** in the process of moving down the leg **24***c* of the track **24**. The arm moved down the inclined portion **24***c* of the track at a rate such that its rearward component of velocity is about the same as the forward velocity of the vehicle and thus the arm moved vertically down to release the container without dragging it along the ground. Thus, a full container is engaged at position **27***d*, and an empty container is disengaged at point **27***b*. The speed of the arm movement along the track advantageously can be coordinated with the vehicle velocity so that the container **18** which is lifted onto the mechanism is replaced with an empty container **18** at substantially the same spot. The only personnel required for this operation is the vehicle **10** driver, and the vehicle may proceed, without stopping, along the roadway, engaging and disengaging containers as it moves.

What is claimed is:

1. An apparatus for transferring refuse from containers situated along a roadway to a refuse collection vehicle which is operator-driven along said roadway comprising:

refuse receiving means mounted on said vehicle;

means mounted on said vehicle for engaging said containers while said vehicle is continuously moving along said roadway and inverting said containers above said refuse receiving means while said vehicle is moving;

means mounted on said vehicle for replacing said portable containers along said roadway; and

means mounted on said vehicle for periodically removing refuse from said refuse receiving means to the interior of the body of said vehicle.

2. An apparatus for transferring refuse from containers situated along a roadway to a refuse collection vehi-

cle which is operator-driven along said roadway, comprising refuse receiving means mounted on said vehicle; means mounted on said vehicle for engaging said containers while said vehicle is continuously moving along said roadway and inverting said containers above said refuse receiving means while said vehicle is moving; and means mounted on said vehicle for replacing said portable containers along said roadway, wherein said engaging and inverting means comprises:

a U-shaped arm;

means for guiding said arm along a path relative said vehicle so that the open end of said U-shaped arm is oriented in the direction of motion of said vehicle, and said U-shaped arm will receive said container while said vehicle is in motion and will lift and invert said containers while said vehicle is in motion;

means mounted on said vehicle for detecting the presence of one of said containers in a position for lifting by said arm; and

means responsive to said detecting means for moving said arm along said guiding means.

3. An apparatus as defined in claim **2** additionally comprising:

an abrupt discontinuity in said guiding means, at a position along said guiding means where said U-shaped arm is inverted, for jolting said container.

4. An apparatus as defined in claim **2** wherein said replacing means comprises:

means for guiding said U-shaped arm further along said path relative to said vehicle with the open end of said U-shaped arm oriented in a direction opposite that of the motion of said vehicle, and for lowering said U-shaped arm so that said containers engage said roadway in an erect position.

5. An apparatus for transferring refuse from containers situated along a roadway into a refuse collection vehicle which is continuously driven by an operator along said roadway, which comprises:

container engaging means mounted at a first position on said vehicle which allows said engaging means to engage said containers due solely to operator-orientation of said vehicle during said continuous driving, said engaging means being operable to invert said containers; and which engaging means comprise a plurality of lifting arms, each arm adapted to lift one of said containers, said arms guided along a path on said vehicle to move past said first station, and vertically to a second position at which said containers are inverted; and

means mounted on said vehicle for receiving refuse from said containers when said containers are inverted.

6. The apparatus defined in claim **5** additionally comprising:

means for replacing said containers along said roadway, said means mounted on said vehicle, and comprising:

means for guiding said lifting arms further along said path to a third station, and

means for rotating said arms between said second and third stations allow said arms to disengage said containers when said containers contact said roadway.

7. The apparatus defined in claim **6** wherein said path comprises a closed loop generally in a vertical plane at one side of said vehicle, and wherein said first station is forward of said third station on the side of said vehicle, said first and third stations each being below said second station.

8. The apparatus defined in claim **6** further comprising:

means for rotating said arms between said third and said first stations to allow said arms to engage said containers as said vehicle is driven along said roadway.

9. The apparatus defined in claim **8** wherein said plurality of arms comprises four arms, each of which is disengagable from said means for guiding when said arms are not in use.

10. An apparatus for transferring refuse from portable containers situated along the side of a roadway to a refuse collection vehicle which is driver-oriented along said roadway and which has a cab in which said driver is located and a body in which refuse is collected and stored, comprising:

a refuse receiving bin, mounted on said vehicle between said cab and said body, said bin accessible from outside said vehicle for placing refuse on said vehicle;

a packing mechanism for transferring refuse from said bin to said body, and for compacting said refuse in said body;

a track mounted on one side of said vehicle, said track lying in a vertical plane and forming a closed loop on the side of said vehicle, a portion of said track situated adjacent said bin;

four carriage members adapted to be driven around said track, said carriage members being equally spaced along said closed loop;

means for driving said carriage members around said track;

an arm, mounted on said vehicle, and operable to energize said driving means when said vehicle is in a position to engage one of said portable containers;

four U-shaped arms, each removably mounted on a respective one of said carriage members, each adapted to engage one of said portable containers when said portable containers are inserted into the open end of said U-shaped arm;

pinion gears, mounted on each of said U-shaped arms, said gears, where rotated, adapted to change the orientation about a vertical axis of said U-shaped arms; and

a series of rack gears, mounted on said track, engagable with said pinion gears, adapted to rotate said pinion gears and said U-shaped arms so that said U-shaped arms, when at the forward extremity of said closed loop, are oriented in the direction of motion of said vehicle, and when at the rear extremity of said closed loop, are oriented in the opposite direction, so that said U-shaped arms will engage said portable containers at the forward extremity of said closed loop and disengage said containers at the rear extremity of said loop.

11. An apparatus as defined in claim **10** additionally comprising:

pivot means, connecting said U-shaped arms to said carriage members, said pivot means allowing said U-shaped arms to rotate about the axis of said track; and

camming means mounted on said track, said camming means causing said U-shaped arms to pivot about said pivot means at a position along said

track adjacent said bin to invert said U-shaped arms.

12. An apparatus as defined in claim **11** wherein said U-shaped arms engage and disengage said portable containers as said carriage members are driven upward and downward, respectively, along said track, so that said U-shaped arms will properly engage and disengage said containers when the relative height of said vehicle and said containers varies.

13. An apparatus as defined in claim **12** wherein the motion of said carriage members along said track is intermittent, so that containers remain statically inverted over said bin for a period of time, allowing removal of said refuse into said bin.

14. An apparatus for transferring refuse from containers situated along a roadway to a refuse collection vehicle which is operator-driven in a first direction along said roadway, comprising:

refuse receiving means mounted on said vehicle;

means mounted on said vehicle facing said first direction for engaging said containers responsive to movement of said vehicle in said first direction;

means mounted on said vehicle for lifting and inverting said containers over said refuse receiving means; and

means mounted on said vehicle for reversing the orientation of said engaging means to face opposite said first direction for replacing said containers along said roadway responsive to further movement of said vehicle in said first direction.

15. An apparatus as defined in claim **14** wherein said means for engaging said containers comprise means having a forward directed opening suitable to engage said containers when translated forward horizontally relative to said containers, which opening is rearwardly directed when said engaging means is reversed to disengage said containers when translated forward horizontally relative to said containers.

16. An apparatus as defined in claim **15** in which said means having a forward directed opening suitable to engage said containers comprise a rigid U-shaped arm.

17. An apparatus as defined in claim **14** wherein said containers are situated along the side of said roadway, and said engaging means are mounted on the side of said vehicle so that these means operate as said vehicle is driven along side said containers.

18. An apparatus as defined in claim **16** wherein said reversing means comprise means for rotating said U-shaped arm to an opposite orientation so as to facilitate replacing of said containers along said roadway.

19. An apparatus for transferring refuse from containers situated along a roadway to a refuse collection vehicle, comprising:

refuse receiving means mounted on said vehicle;

means mounted on said vehicle for engaging said containers when said engaging means are translated in a first direction relative to the container;

means mounted on said vehicle for inverting said containers above said refuse receiving means; and

means mounted on said vehicle for rotating said engaging means about a vertical axis so that said containers may be disengaged solely by translating said engaging means in said first direction.

20. An apparatus as defined in claim **19** wherein said means for engaging said containers comprise a U-shaped arm disposed in a horizontal plane such that the opening of said U-shaped arm is initially oriented in a forward direction relative to the orientation of said vehicle.

21. An apparatus as defined in claim **20** wherein said means for rotating said engaging means additionally comprise means for rotating said engaging means 180 degrees until said opening of said U-shaped arm is oriented in a rearward direction so that said containers may be disengaged by translating said engaging means forward.

22. An apparatus for transferring refuse from containers situated along a roadway to a refuse collection vehicle, comprising:

refuse receiving means mounted on said vehicle;

means mounted on said vehicle for engaging a first one of said containers when said engaging means are translated forward relative to the orientation of said vehicle;

means mounted on said vehicle for inverting said engaging means and first container above said refuse receiving means;

rotating means mounted on said vehicle for rotating said engaging means 180 degrees about a vertical axis so that said first container may be disengaged by translating said engaging means forward; and for rotating said engaging means 180 degrees about a vertical axis after disengagement of said first container from said engaging means so that a second and succeeding ones of said containers may successively be engaged, inverted and disengaged when said engaging means are translated forward.

23. The apparatus defined in claim **22** wherein said container engaging means comprise a U-shaped arm disposed in a horizontal plane.

24. An apparatus for transferring refuse from containers situated along a roadway to a refuse collection vehicle which is operator-driven along said roadway, comprising:

refuse receiving means mounted on said vehicle;

means mounted on said vehicle for engaging said containers while said vehicle is continuously moving along said roadway, said engaging means comprising a U-shaped arm in which the open end of said U-shaped arm is oriented in the direction of motion of said vehicle so as to engage said containers;

means mounted on said vehicle for inverting said containers above said refuse receiving means while said vehicle is moving;

means mounted on said vehicle for reversing by 180 degrees the orientation of said container engaging means after said engaging means engage said containers; and

means mounted on said vehicle for replacing said containers along said roadway after said reversing means have reversed the orientation of said engaging means said replacing means comprising said U-shaped arm in which said open end of said U-shaped arm is oriented opposite to the direction of motion of said vehicle.

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