

[54] NON-STOP REFUSE COLLECTION
CONTAINER3,016,157 1/1962 Brisson 214/302
3,529,743 9/1970 Ehrbar et al. 206/519[76] Inventor: Marcel G. Stragier, 8201 Monterey
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FOREIGN PATENTS OR APPLICATIONS

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[21] Appl. No.: 490,515

Related U.S. Application Data

[60] Division of Ser. No. 364,708, May 29, 1973, Pat. No.
3,878,953, which is a continuation of Ser. No.
199,813, Nov. 17, 1971, abandoned, which is a
division of Ser. No. 15,421, March 2, 1970,
abandoned.

Primary Examiner—Robert J. Spar

Assistant Examiner—Lawrence J. Oresky

[52] U.S. Cl. 214/313; 206/519; 214/302;
220/264[51] Int. Cl.² B65F 3/02[58] Field of Search 214/302, 303, 304, 313,
214/147 G; 294/69, 73; 220/263, 264; 206/519

[57] ABSTRACT

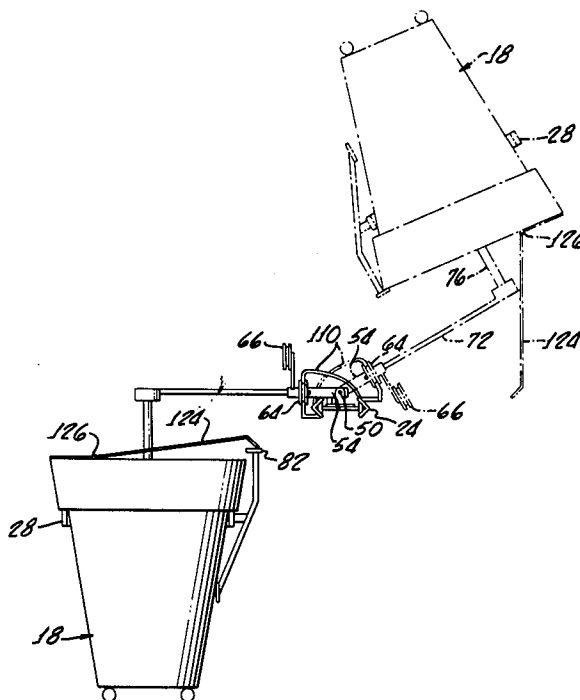
A device designed to be mounted on the side of a garbage pick-up vehicle and adapted to engage and invert refuse containers to transfer the contents thereof into the bed of said vehicle while the vehicle is in motion, allowing the vehicle to collect garbage placed along a roadway in a non-stop operation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

[56] References Cited

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4 Claims, 9 Drawing Figures



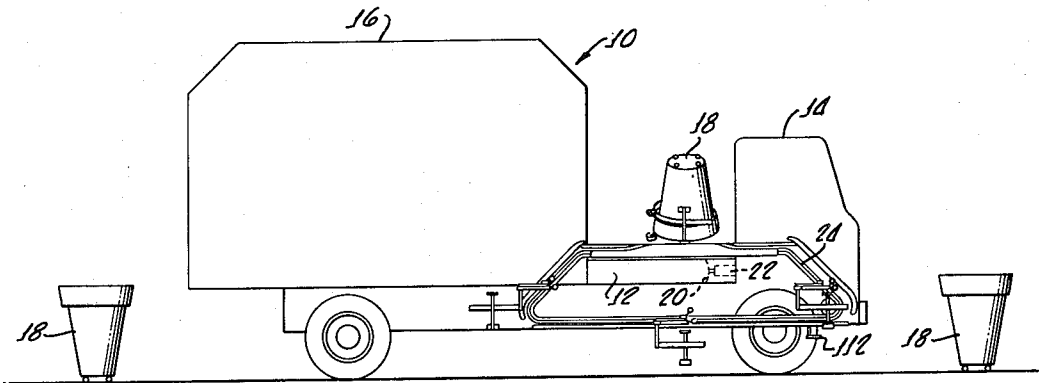


FIG. 1.

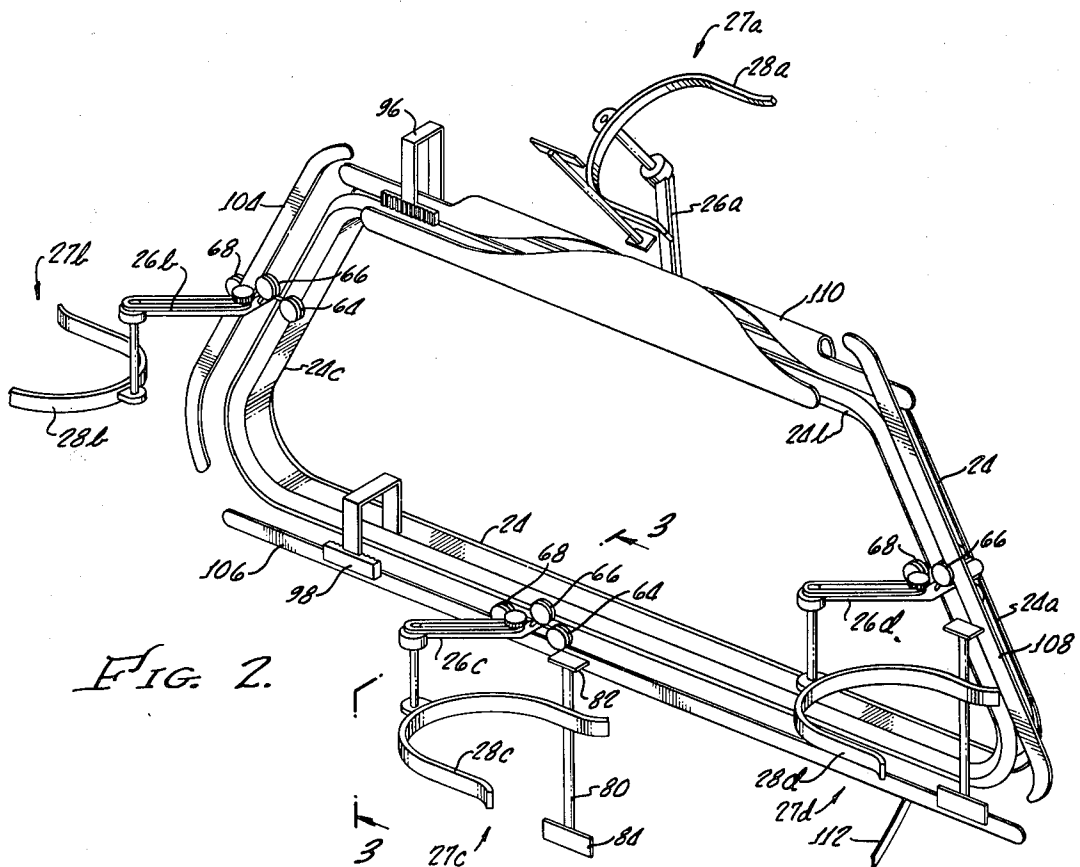
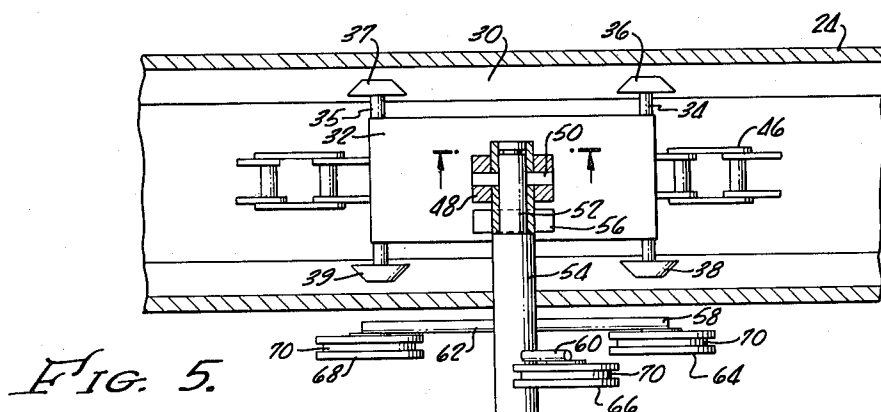
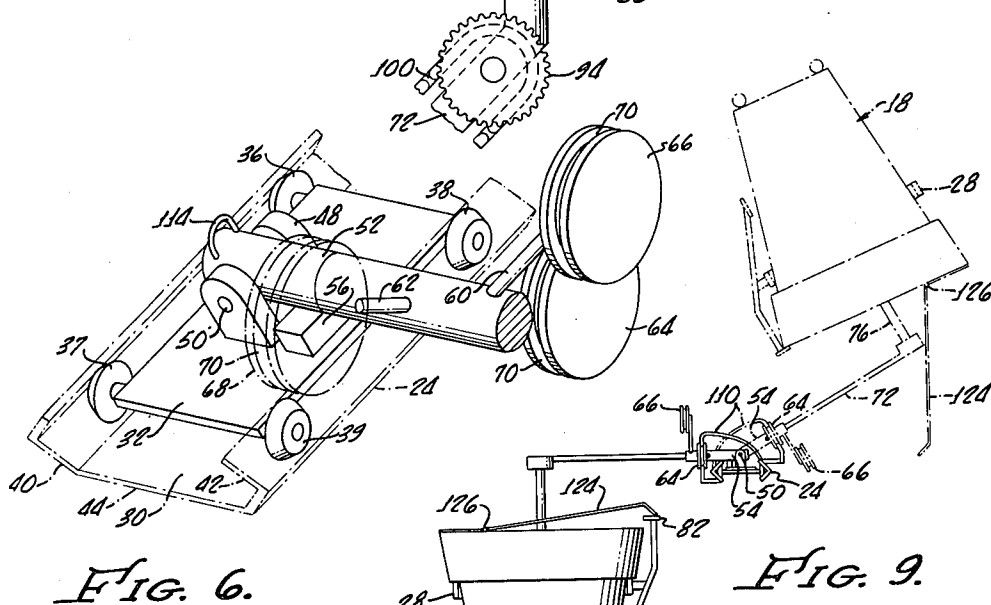
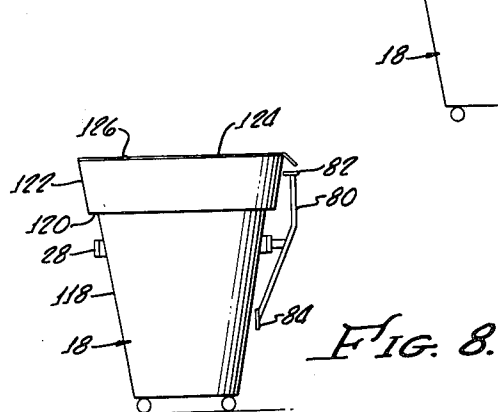
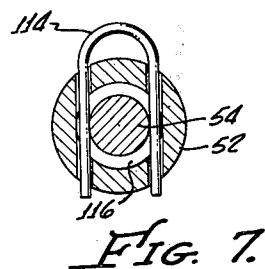


FIG. 2.



NON-STOP REFUSE COLLECTION CONTAINER

CROSS REFERENCE TO RELATED APPLICATIONS

This is a division of co-pending application Ser. No. 364,708, filed May 29, 1973, now U.S. Pat. No. 3,878,953 issued Apr. 22, 1975 which in turn is a continuation of Ser. No. 199,813 filed Nov. 17, 1971, now abandoned, which is in turn a division of 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 except 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 24a, an upper horizontal leg 24b, a rear inclined leg 24c, and a lower horizontal leg 24d, each of these legs being connected to the adjacent legs by curved corner sections. Four container engaging means 26a, 26b, 26c and 26d are attached to the track 24 and designed to be driven around the trapezoidal track 24 in unison. These container engaging means 26a through 26d are spaced equidistant along the track 24 and are shown in FIG. 2 in positions 27a through 27d respectively along that path of the track. Each of the container engaging means 26 includes a U-shaped arm 28a through 28d 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 26a through 26d is identical and therefore the following discussion of the container engaging means 26c in reference to FIGS. 3 through 6 is representative of each of the container engaging means 26a through 26d. The container engaging means 26b includes a U-shaped arm 28b which is identical with the U-shaped arms 28a, c and d, although only a portion of this U-shaped arm 28b is shown for convenience of illustration. The container engaging means 26c includes a cart 30 which comprises 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 guides shown in FIG. 2 will therefore be ex-

plained. Beginning first with a guide 104 adjacent the rear trapezoidal leg 24c, 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 28b rests in a horizontal plane. As the cart supporting the arm 54 proceeds down the leg 24c, 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 24d 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 28c 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 24d of the track 24 until it reaches the forward leg 24a 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 28d 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 28d in a horizontal plane. The cart 30 proceeds along the leg 24a of the track 24 until it reaches the leg 24b of the track 24, at which time the roller 66 becomes disengaged from the guide 108 and the rollers 64 and 68 become 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 28a about the pin 50, the guide 110 rotates the U-shaped arm 28a about the axis of the leg 24b 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 28a 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 24b, 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 24b, 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 28d of FIG. 2 which is at the forward leg 24a of the track 24 to engage and lift portable refuse containers, while the U-shaped arm which is at the rear leg 24c of the track 24 is rotated to allow disengagement of the arm, such as the arm 28b, from the portable refuse container 18 as the vehicle 10 proceeds along the roadway.

Motion of each of the arms 28a through 28d 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 28a through 28d moves to the next successive position 27a through 27d 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 track 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 engagement, 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 moves 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 moves 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. In combination, a refuse container and a refuse collection vehicle said refuse collection vehicle comprising:

an arm;

means on said arm for engaging said container;

means for moving said arm toward said container to engage said container when at a standing upright position on a roadway, without manual lifting or manual moving of said container;

means for moving said arm from a lowered position to a raised position for lifting the container from said standing upright position, and inverting the container to dump its contents into the vehicle without manual handling of said container; and said container comprising:

7

a lower body section of tapered configuration extending for the major portion of the height of the container for storing refuse, and when in said standing upright position in a roadway having its upper, larger end at a height above the height of said arm on said refuse collection vehicle when said vehicle is positioned adjacent said container on the roadway and said arm is in its lowered position;
 an upper body section above said lower body section, and having a substantial height, the cross-section of said upper body section being at its lower end substantially larger than the cross-section of the upper end of the lower body section;
 a generally horizontal shoulder integrally connecting the upper end of the lower body section to the lower end of the upper body section said shoulder

8

strengthening said container to withstand the forces of engagement with the arm; and
 a lid hinged to said upper body section and adapted to automatically open by the force of gravity when said container is inverted.

2. In combination, a refuse container and a refuse collection vehicle as defined in claim 1, wherein said container has wheels mounted thereon for rolling it on the road surface to said upright standing position.

3. The combination as described in claim 2 wherein said upper and lower body sections are of inverted truncated conical configuration.

4. In combination, a refuse container and a refuse collection vehicle as defined in claim 1, said cover extending substantially beyond said upper body section.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 3,923,174
DATED : December 2, 1975
INVENTOR(S) : Marcel G. Stragier

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below

Change the title to REFUSE COLLECTION VEHICLE AND CONTAINER
Col. 4, line 33, after "become" insert --engaged--

Signed and Sealed this

twenty-third Day of March 1976

[SEAL]

Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents and Trademarks