

[54] **REFUSE VEHICLE WITH A  
SEMI-AUTOMATED REFUSE CONTAINER  
PICK-UP AND UNLOADING DEVICE**

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

[58] Field of Search ..... 214/83.3, 1 BC, 77 R, 151, 214/132, 133, 147 G, 302, 303, 312, 313, 314

[56] **References Cited**  
**UNITED STATES PATENTS**

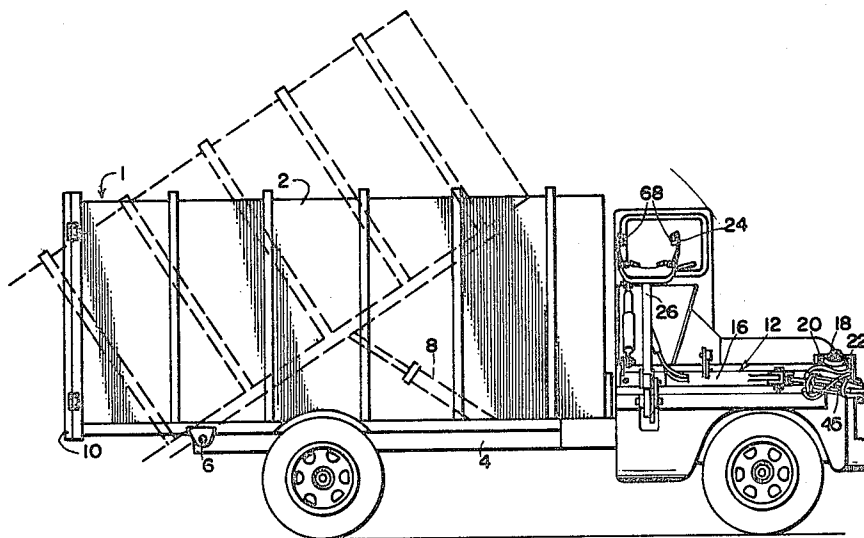
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[57] **ABSTRACT**

This invention relates to a garbage and refuse vehicle which has a continuous compacting system, which compacting system is supplied with garbage or refuse by a semi-automated pick-up device which picks up the container, unloads the contents thereof into a hopper of the compacting system, and moves the refuse container back to the same position it originally occupied, without manual manipulation of the refuse container while it is being picked up, unloaded and positioned on a rack, on the terrain, or the like. Provision is made for handling either round or polygonal containers, the handling of which container may be controlled, by one operator, from the cab of the vehicle. The device may be made as an attachment to a existing garbage or refuse vehicle, or it may be made of unitary construction therewith. The container may be dumped by cam action, or by action of a motor.

**13 Claims, 16 Drawing Figures**



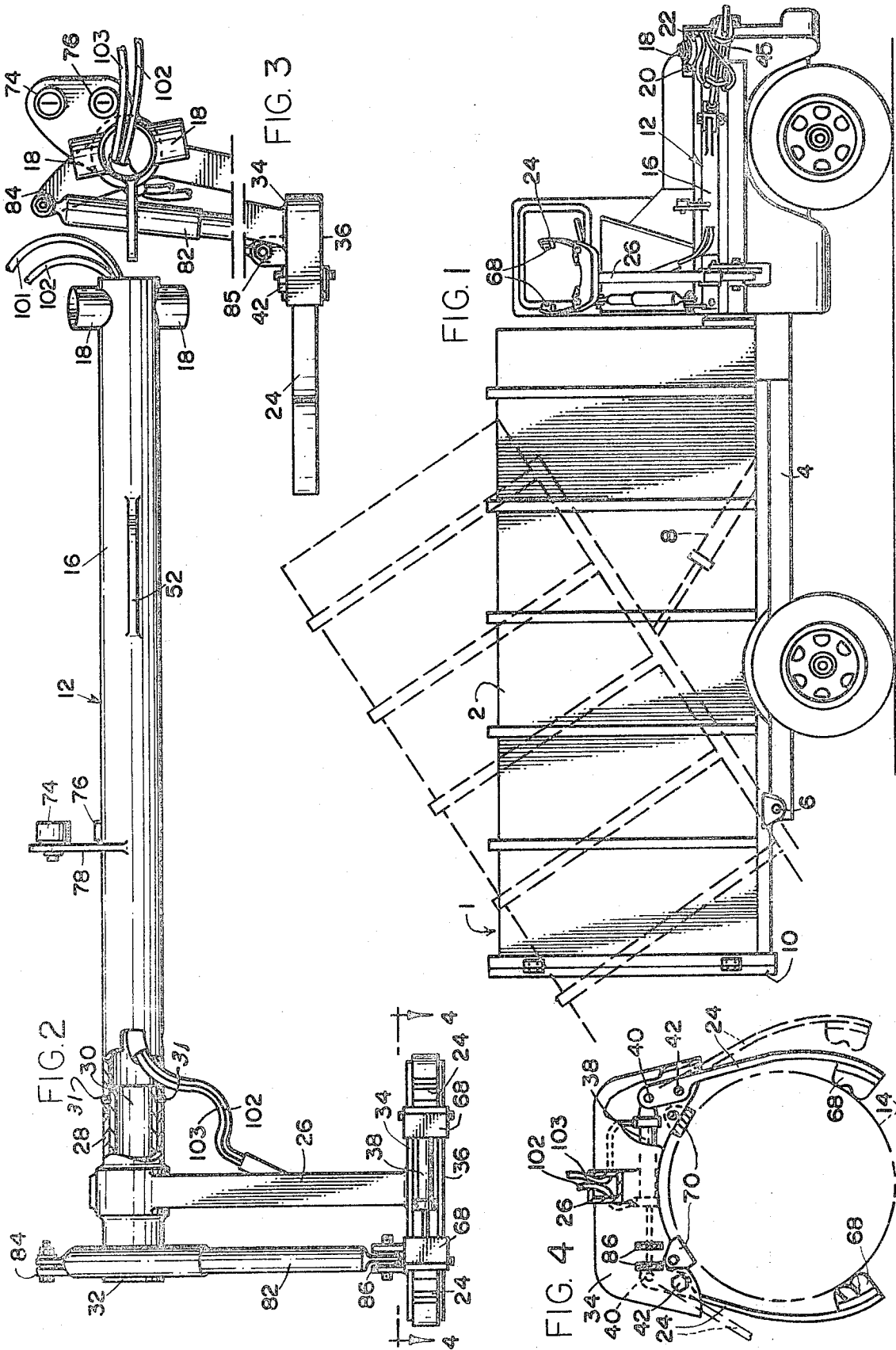


FIG. 5

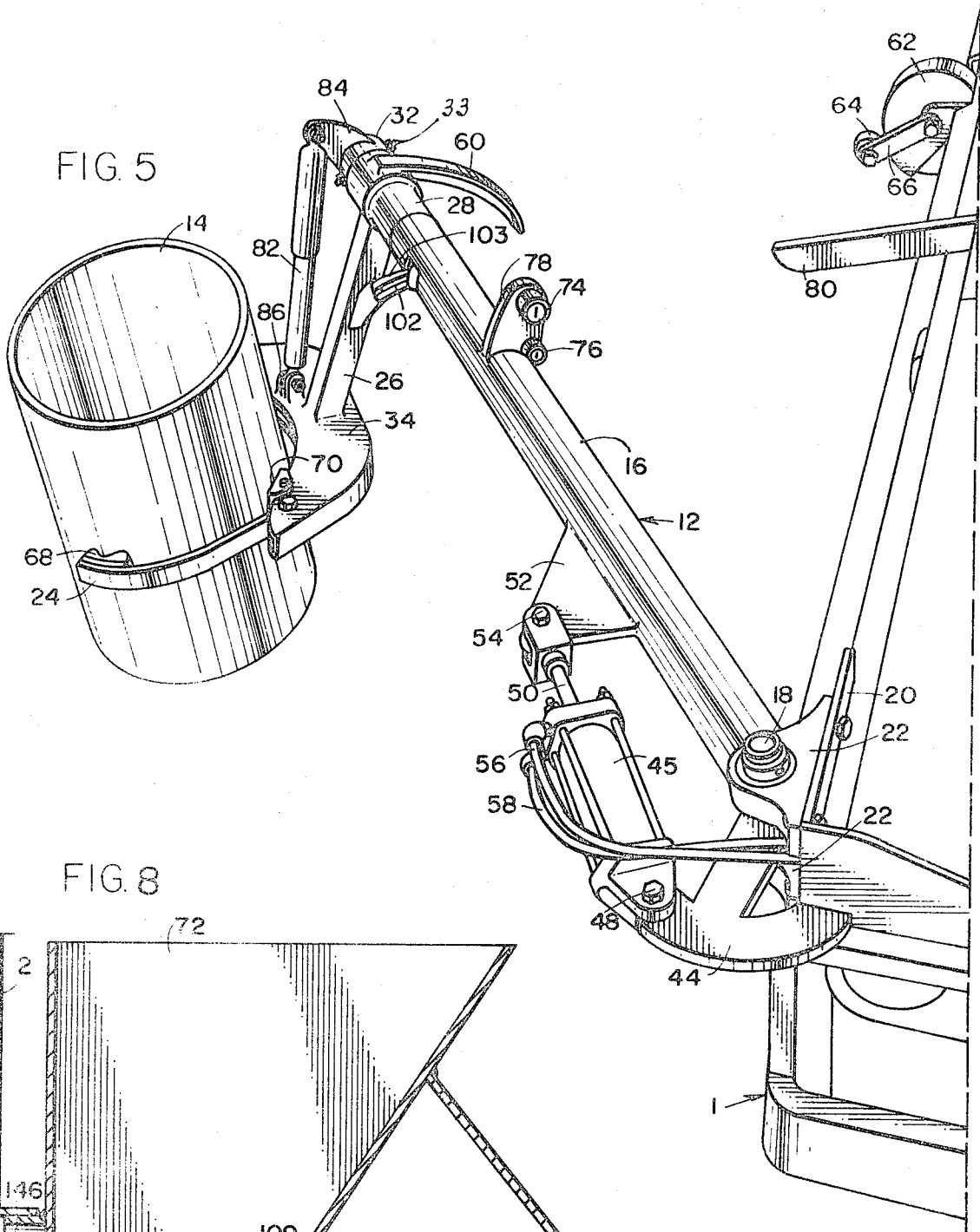
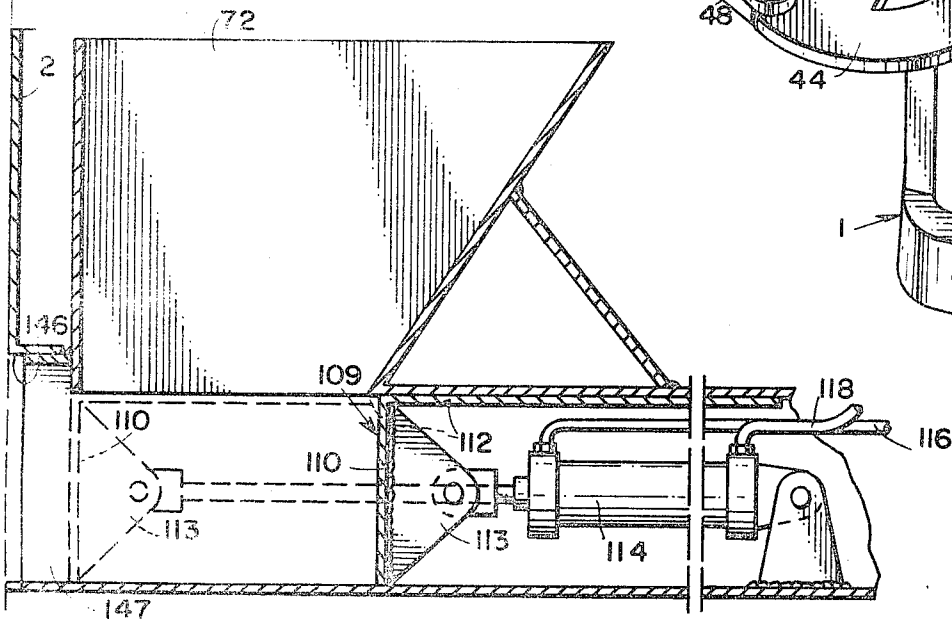


FIG. 8



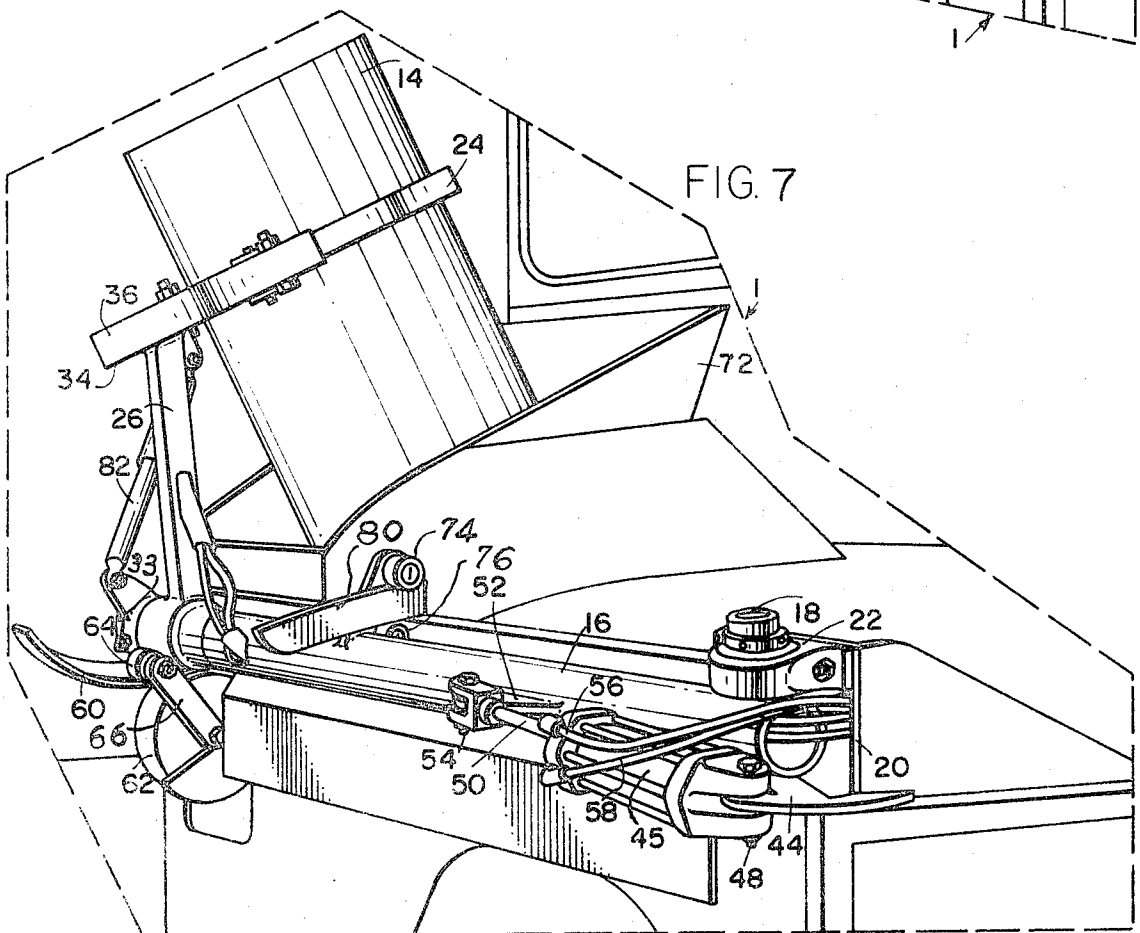
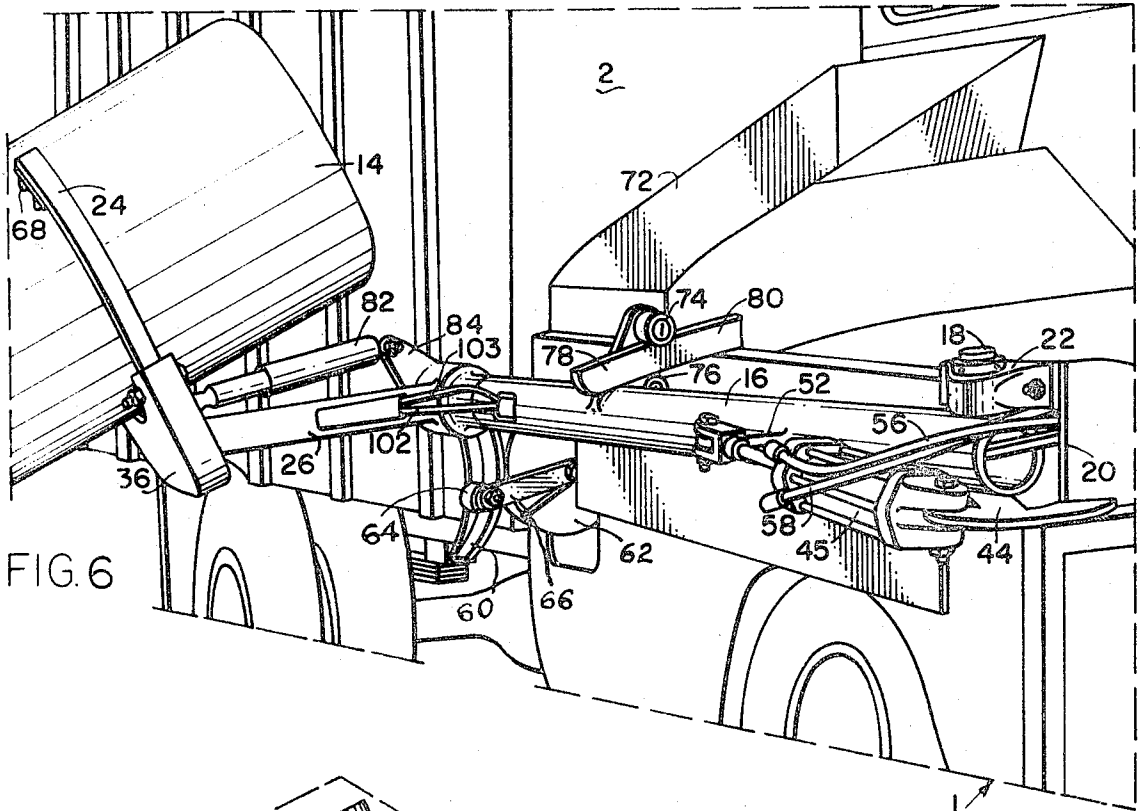


FIG 9

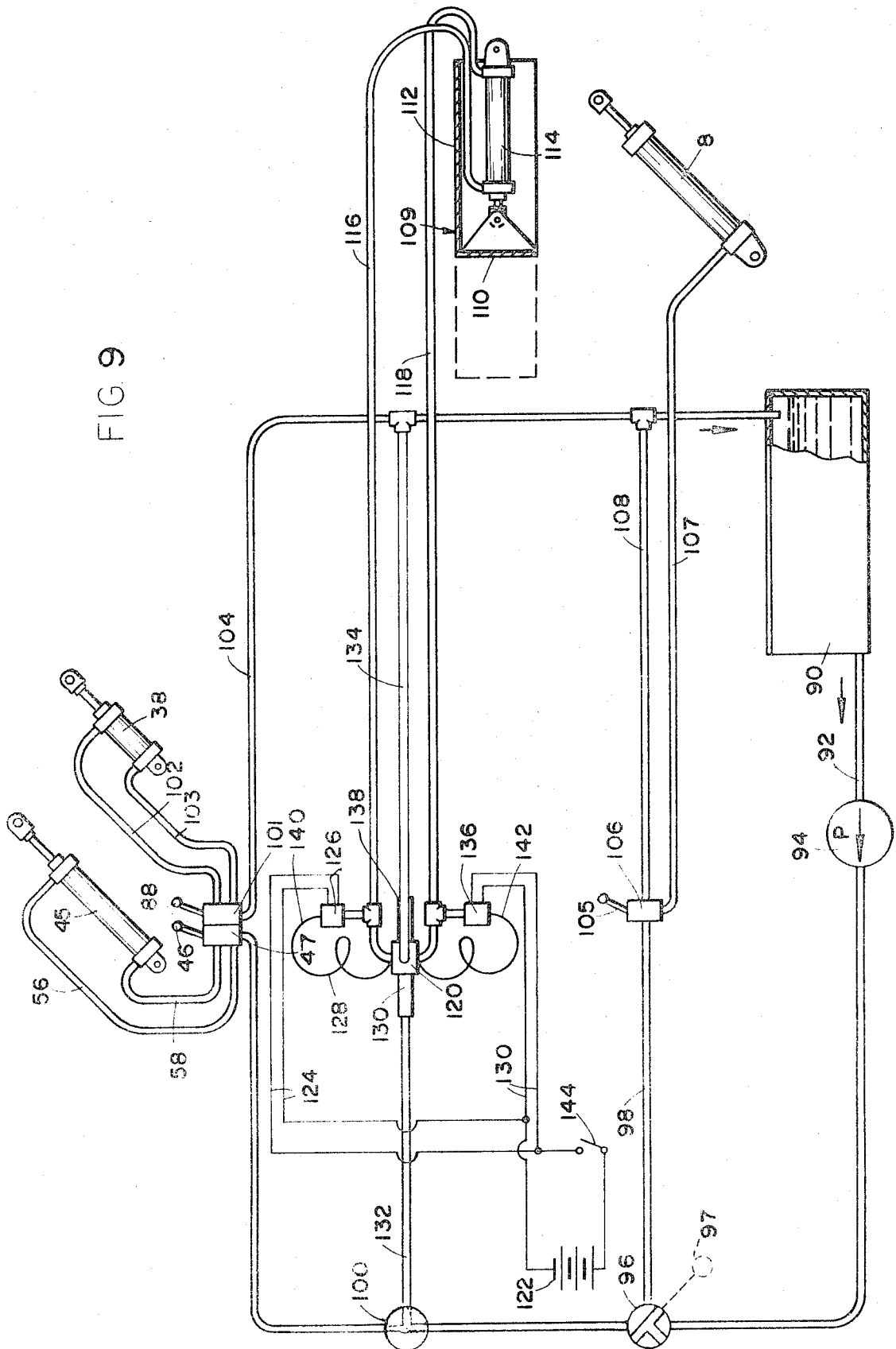


FIG. 10

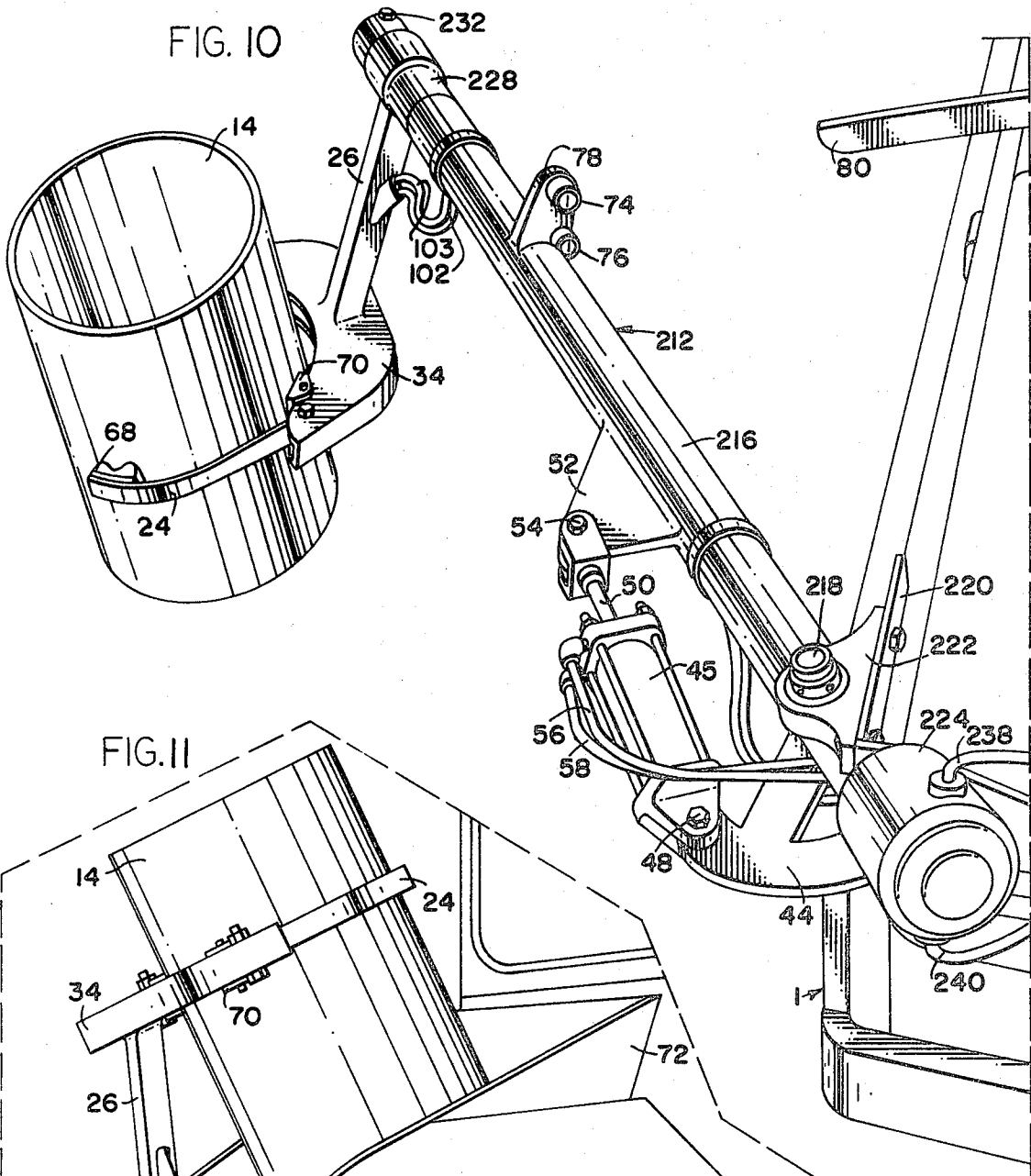
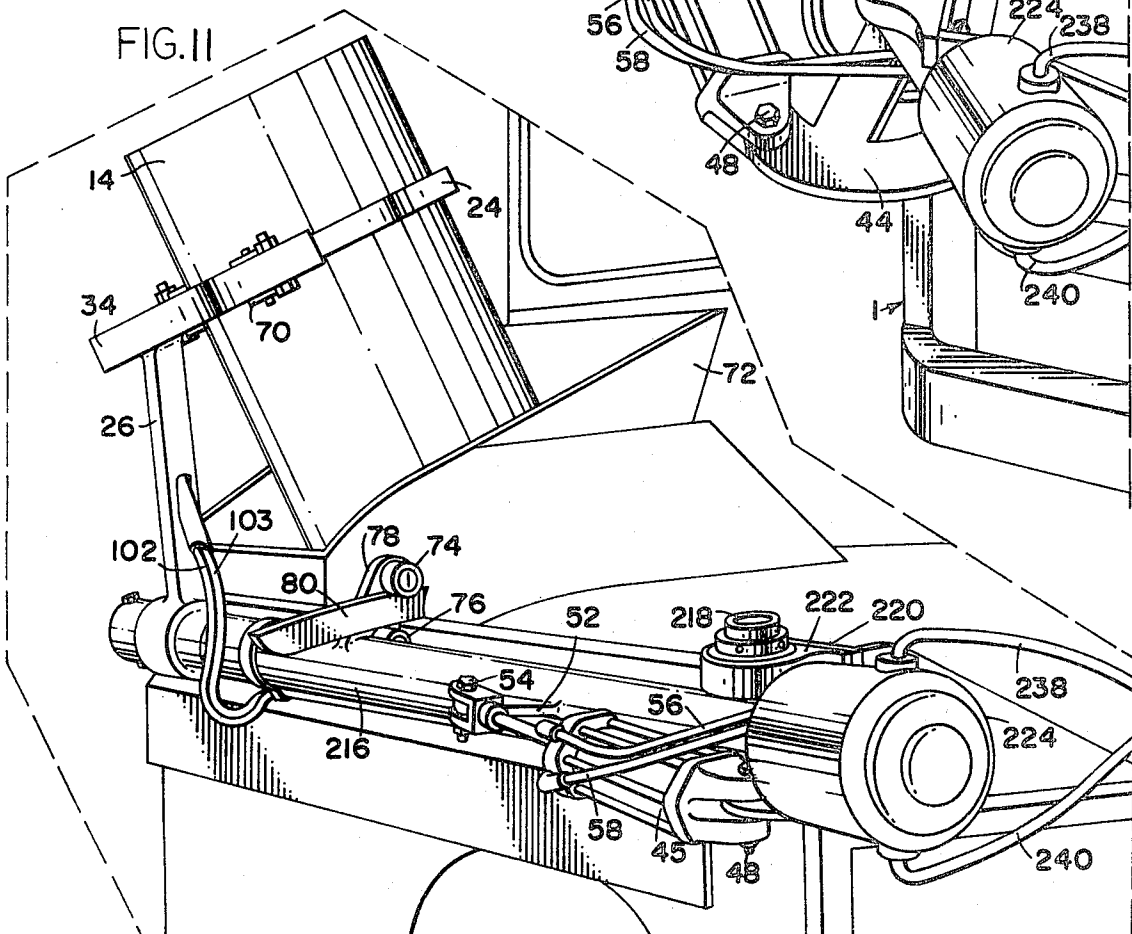
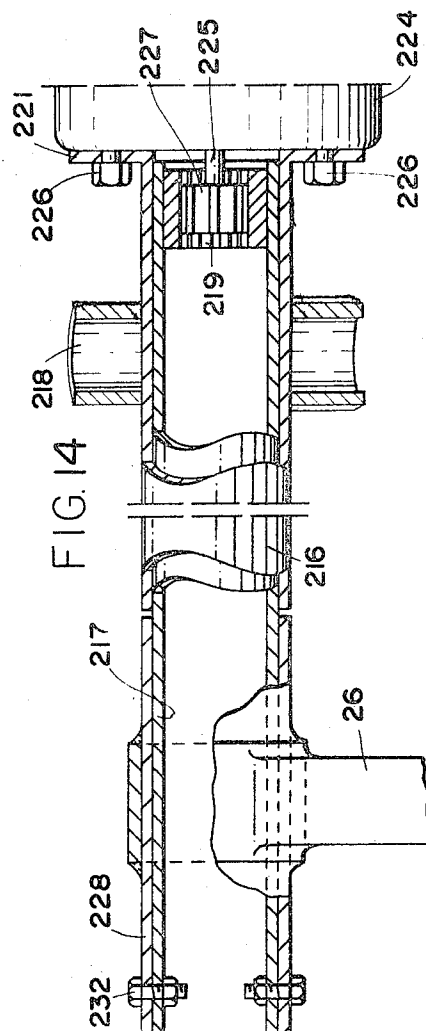
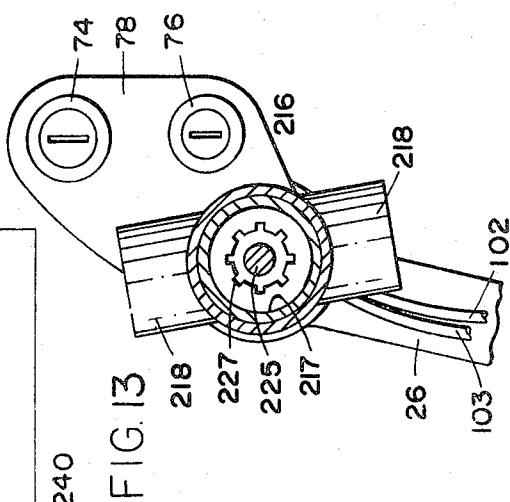
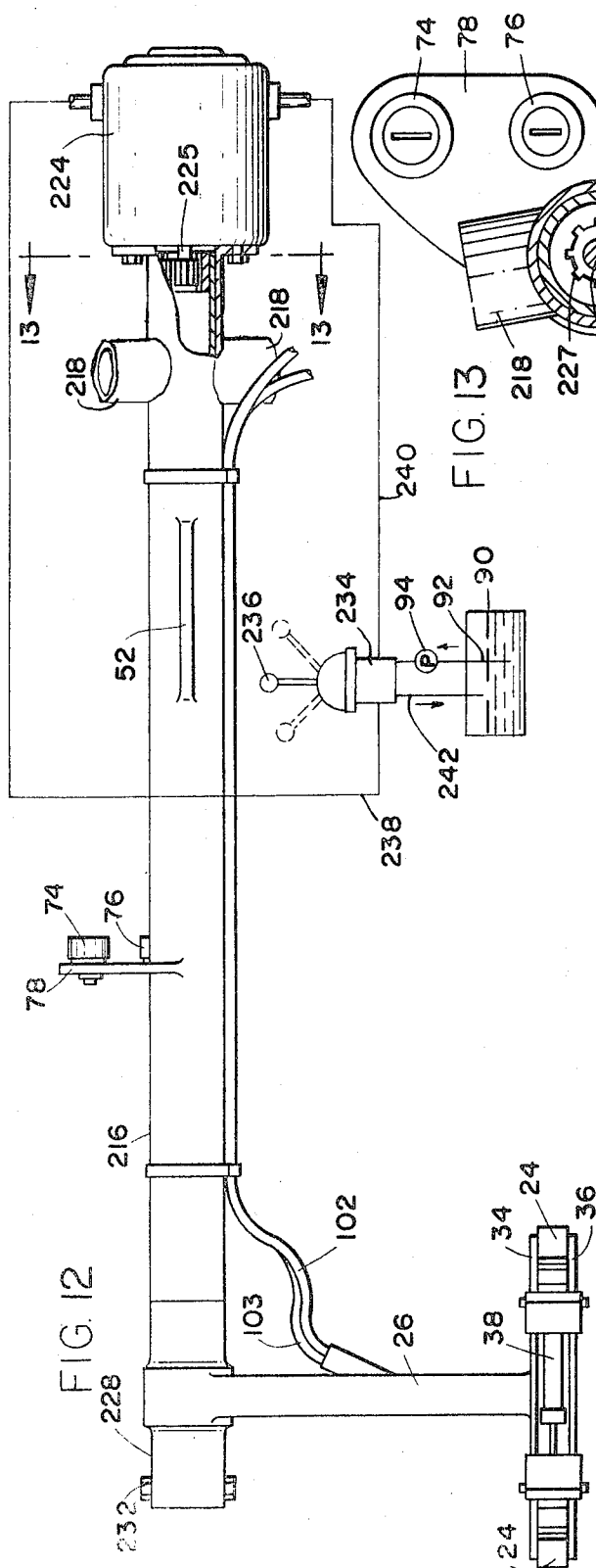
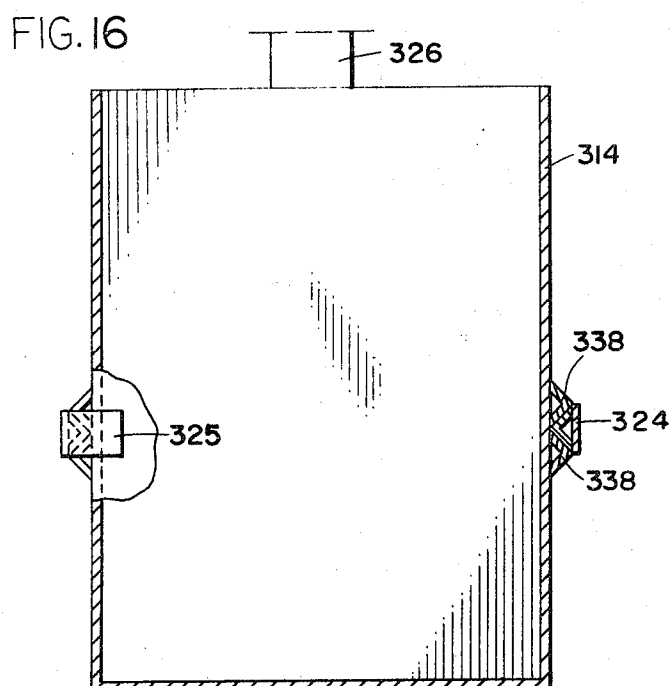
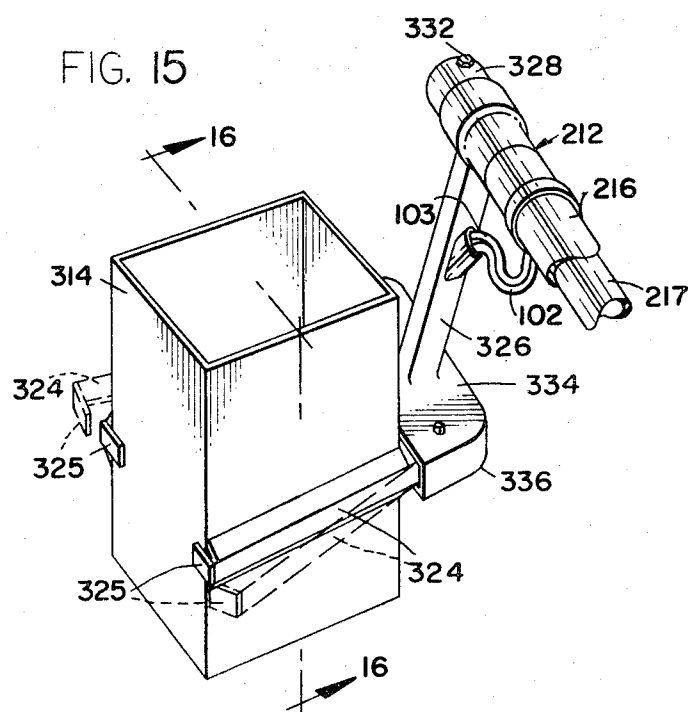


FIG. II









# REFUSE VEHICLE WITH A SEMI-AUTOMATED REFUSE CONTAINER PICK-UP AND UNLOADING DEVICE

## BACKGROUND OF THE INVENTION

The present invention relates to a garbage or refuse pick-up vehicle which has an outwardly extending, swinging boom thereon, which boom is adapted to pick up a garbage or refuse container, move the container to a position above a hopper on the vehicle body, dump the material from the container into the hopper, and return the container to the position it originally occupied.

The garbage or refuse pick-up vehicle has a compactor which reciprocates below the hopper to move the garbage and refuse into the body of the vehicle in a substantially continuous manner, until the vehicle body is filled, whereupon, the vehicle is moved to a suitable place of disposal. The body of the vehicle is then elevated, by means of a fluid actuated jack or the like, so that the material within the body is dumped therefrom.

Control means is provided within the operator compartment of the vehicle, by which the operator can move the boom outwardly, which boom is actuated by a first fluid actuated cylinder. The boom has an arcuately movable lever thereon, which outwardly extending boom, lever and clamping arms are guided into the proper position so a second fluid actuated cylinder may be used to actuate the arms in such manner that the container is clamped between the arms to enable it to be handled thereby.

A body to receive the garbage is provided on the vehicle. When the refuse body of the vehicle is filled, the vehicle is transported to the place of discharge, the body elevated by a hydraulic ram, to such degree as to discharge the contents therefrom.

## OBJECTS OF THE INVENTION

An object of the invention is to provide a vehicle, having a boom and arm arrangement thereon, for picking up refuse containers and for discharging the contents thereof into the body of the vehicle, and returning the refuse container to the original position, or such other position as may be desired.

Another object of the invention is to provide a vehicle with a fluid actuated mechanism to pick up refuse container, which pick-up mechanism is operated by remote control from the cab of the vehicle, so that the refuse containers can be picked up, the contents discharged into a compartment of the vehicle, and the container returned to the original setting, without manual manipulation.

Still another object of the invention is to provide a boom attachment for a refuse hauling vehicle, which boom is fluid actuated and is semi-automatic to pick up a refuse container, while maintaining the container in upright position, lift it to a position above a hopper on the vehicle, rotate the boom and a lever thereon so as to direct the contents of the container into the hopper and return the container to the original position.

A further object of the invention is to provide a boom for attachment to the refuse vehicle, which boom is mounted on an angulated axis so as to swing the refuse container upwardly above the refuse receiving hopper to discharge the refuse thereinto.

Yet another object of the invention is to provide a cam and lever mechanism on the boom, which cam will engage an actuator mechanism on the body of the vehicle so as to direct the contents of the container into the hopper on the body of the vehicle.

Still another object of the invention is to provide shock absorbing means intermediate the boom, on the refuse vehicle, and an arcuately movable lever which is pivoted to arms which engage the refuse container, thereby to absorb the shock between the lever and the boom.

Yet another object of the invention is to provide arms for gripping a refuse container of uniform configuration.

Another object of the invention is to provide a gripping mechanism which will grip a substantially cylindrical container.

Still another object of the invention is to provide a gripping mechanism for a refuse container which will grip a polygonal container having abutments thereon.

A further object of the invention is to provide a gripping mechanism for a refuse vehicle, which will grip a container that is rectangular in cross section which has abutments thereon.

Yet a further object of the invention is to provide a vehicle mounted refuse container pick-up, discharge and relocation mechanism which will handle the container without manual manipulation of the container.

Still another object of the invention is to provide a fluid actuated, refuse handling system which is remotely controlled from a central location, such as the cab of the vehicle, to enable one operator to expeditiously control the entire system.

Yet a further object of the invention is to provide a boom for attachment to a side of a refuse vehicle, which boom has a motor mounted thereon to rotate a lever on which gripping arms are pivoted, which arms engage a refuse container.

## SUMMARY OF THE INVENTION

The present invention provides a refuse receiving body on a vehicle, which has a mechanism thereon to perform the pick-up of the refuse container, the discharge of the contents thereof, and positioning the container in its original location, which operations are performed without manual handling of the container. The operator of the vehicle may operate a boom or booms, which attach to the vehicle on a side thereof, or one on each side thereof, to reach outward from the side of the vehicle to engage the refuse container between a pair of arms, which will enable the refuse container to be lifted, in an upright position, until the container is over a hopper or body portion of the refuse carrying vehicle, then the container is inverted to discharge the contents thereof into the hopper in which a compactor is located, or into the vehicle body.

The boom is moved about an angulated axis by a first fluid actuated cylinder, preferably a hydraulically actuated cylinder, which moves the boom outwardly into close proximity to a refuse container, whereupon, a pair of free floating arms, one connected to each end of a second hydraulically actuated cylinder-plunger assembly, to engage the refuse container. After the arms grip the container, a cam, which is mounted on the lever on which the arms are also mounted, is moved by the boom into contact with a roller, in this the pre-

ferred form of the invention. The cam will engage the roller, which is mounted on the vehicle body, and as the boom moves upward toward the vehicle body, the lever and arms carrying the refuse container are moved to a position above the hopper to direct the contents of the refuse container thereinto. The operator controls the movement of the boom by the manipulation of a fluid control valve to actuate the first fluid actuated cylinder. The operator opens and closes the arms, with respect to the refuse container, by operating a valve to control fluid to the second fluid actuated cylinder-plunger assembly, so as to frictionally engage the arms with the refuse container or to disengage the arms therefrom.

The refuse compactor is positioned at the forward end of the refuse vehicle body, and has a third fluid actuated cylinder-plunger assembly which is operated continuously during the dumping operation of refuse into the hopper. After the refuse body is filled to the desired extent, the vehicle is taken to a place of disposal, and with the body being pivoted to the vehicle frame, the body is elevated by a fourth fluid actuated cylinder-plunger assembly which is pivotally connected to the body and to the frame.

#### BRIEF DESCRIPTION OF THE DRAWINGS

With the above objects in mind and others which will become manifest as the description proceeds, reference is to be had to the accompanying drawings, in which like reference characters designate like parts in the several views thereof, in which:

FIG. 1 is a side elevational view of a garbage or refuse vehicle, showing the body thereof in full outline in one position, and in dashed outline in a raised position, showing a boom pivotally attached to a side of the vehicle for picking up refuse containers, discharging the contents thereof and returning the container to the original position;

FIG. 2 is an enlarged elevational view of the boom and the refuse container clamping device, shown apart from the vehicle, with parts being broken away, and parts being shown in section to bring out the details of construction;

FIG. 3 is an end elevational view of the device as shown in FIG. 2, with parts broken away and with parts shortened to show more clearly the angulated axis about which the boom operates;

FIG. 4 is a sectional view taken on the line 4—4 of FIG. 2, looking in the direction indicated by the arrows;

FIG. 5 is a perspective view taken from an end, a side and above the boom, showing the refuse container pick-up arms engaged on a refuse container, and showing a portion of the vehicle to which the boom is attached;

FIG. 6 is a perspective view taken from a side and front of the vehicle, the boom being in an intermediate position between the pick-up and the discharge positions, and showing the portion of the vehicle having a hopper thereon, and showing the boom attached to the vehicle;

FIG. 7 is a view showing the boom at the inner-most position, and showing the refuse container in position to discharge the contents thereof into the hopper, only that portion of the vehicle to which the boom and the hopper are attached being shown;

FIG. 8 is a fragmentary, longitudinal sectional view through the hopper, with parts being broken away, and with parts being shown as shortened to bring out the details of construction of the hopper, the reciprocating compressor element and the fluid actuated cylinder which operates the refuse compressor element;

FIG. 9 is a diagrammatic view of the fluid actuating system, the electrical system of the form of the invention as shown in FIGS. 1 through 8, with the fluid actuating system being shown as a hydraulic system;

FIG. 10 is a perspective view showing an end, side and top of a modified form of the invention, showing a motor as attached in operative relation to the boom, showing a refuse container as engaged by the arms to pick up the container, which motor rotates the refuse container through an arcuate movement to discharge the contents of the refuse container into the hopper, and showing the portion of the vehicle to which the boom is attached;

FIG. 11 is a fragmentary view of a portion of the vehicle showing a refuse receiving hopper thereon, and showing the boom of the form of the invention as shown in FIG. 10 in the most inward position, and showing a lever on the boom which has the refuse container clamped thereon in position to discharge the refuse into the hopper;

FIG. 12 is an enlarged, side elevational view of the boom as shown in FIGS. 10 and 11, shown apart from the vehicle, and showing the clamping arms in the most inward position, with parts being broken away to show the manner of attachment of the motor to the boom, and showing, diagrammatically, the hydraulic system for the reversible motor;

FIG. 13 is a sectional view taken on the line 13—13 of FIG. 12, looking in the direction indicated by the arrows;

FIG. 14 is a fragmentary, longitudinal sectional view through a boom, as shown in FIG. 12, with parts being broken away and with parts being shortened and parts being shown in elevation to bring out the details of construction;

FIG. 15 is a fragmentary perspective view taken from an end, the top and a side of a third form of the invention, with the end portion of the boom as shown in FIGS. 12, 13 and 14, and showing a lever with clamping arms thereon clamping a polygonal container, which container is rectangular in cross section, which container is shown in full outline clamped between the arms, which arms are shown in full outline; the released position being shown in dashed outline;

FIG. 16 is a sectional view taken on the line 16—16 of FIG. 15, looking in the direction indicated by the arrows, with parts being broken away and with parts shown in elevation to bring out the details of construction.

#### DESCRIPTION OF THE PREFERRED EMBODIMENT

With more detailed reference to the drawings, the numeral 1 designates generally a refuse collection vehicle having a body 2, which body is mounted on a wheeled frame 4, so as to move over the terrain. The body 2 is pivotally mounted on pivot axis 6, near the rear of the body 2 and the frame 4. A cylinder-plunger assembly 8 is pivotally interconnected with the frame 4 and the lower portion of the body 2, so the body may be elevated from the position shown in full outline in

FIG. 1 to that shown in dashed outline therein, for the discharge of refuse from the body 2, when the rear closure 10, of the body 2 is open. The refuse vehicle having a dumping body, as shown in FIG. 1 is in general use and the present invention may be readily adapted for use therewith, however, the present invention is adaptable for use with other type vehicle bodies, which vehicle and vehicle body form no part of the invention except as used in combination therewith.

The present vehicle is shown, as a matter of illustration, in order to make the disclosure complete. over the

The present semi-automated device for picking up a refuse container, unloading the container and repositioning the container in the same location which it originally occupied is designated generally by the numeral 12 and is mounted near the forward end of the vehicle 1, and in the present instance, is shown to be mounted on the right side of the vehicle, however, it is to be understood that the refuse container pick-up device may be mounted on either side of the vehicle, or the vehicle may have such device mounted on each side thereof, so either an operator or two operators may pick up refuse containers, as indicated at 14 FIG. 5, by the manipulation of controls in the operator area, which usually is within the cab of the vehicle 1.

The semi-automated refuse container pick-up, unloading and repositioning device has a boom 16, which boom has stub shafts 18 secured thereto, near the inner end thereof, which shafts extend into bearings 22. The bearings 22 are secured to a support member 20 on the vehicle 1, near the forward end thereof FIGS. 1 and 5. The shafts 18 journaled in shaft bearings 22 at an angle, as will best be seen in FIGS. 2 and 3, so as to enable the boom 16 to swing outwardly and downwardly from a position as shown in FIG. 1 to the position as shown in FIG. 5, so that the arms 24, on the lower end of lever 26 will engage the refuse container 14 at the desired position, when the container is seated on the terrain or on a rack.

The lever 26 extends upward and is fixidly secured to a sleeve 28, which sleeve is journaled on an outwardly extending hollow shaft 30, which shaft is secured, as by welding 31, to the outer end of boom 16, FIG. 2. A set collar or ring 32 is secured to the outer end of the hollow shaft 30 by bolts 33 so as to retain the sleeve 28 against longitudinal movement, while allowing free arcuate movement thereof. The lower end of the arm 26 has upper and lower plates 34 and 36 respectively which are spaced apart to receive a cylinder-plunger assembly 38 therebetween. The cylinder-plunger assembly 38 is pivotally connected to the inner end of the respective arms 24 by pivot pins 40, which enables the cylinder-plunger assembly 38 to shift from side to side, so as to align with and engage refuse container 14. Each arm 24 has a pivot member 42 passing therethrough and through the plates 34 and 36 so as to pivotally mount the arms therebetween.

An apertured plate 44 is secured to the mounting member 20 which mounting member is secured to the body of the vehicle 1. The plate 44 has a double acting fluid cylinder 45 pivotally connected thereto which has conduits 56 and 58 connected thereto as will best be seen in FIG. 9, by a pivot member 48. A four-way valve 47 has a control lever 46 thereon to selectively direct hydraulic fluid from conduit 92 either to conduit 56 or conduit 58 and direct the discharge from cylinder 45 through the valve 47 into conduit 104 which leads to

reservoir 90. The plunger 50 of the cylinder-plunger assembly is pivotally connected to an apertured lug 52 by a pivot pin 54, which lug is secured to the boom 16 as by welding. The double acting cylinder-plunger assembly 45 and 50 moves the boom outwardly and downwardly from the position as shown in FIG. 1, by hydraulic pressure applied to fluid conduits 56 and 58 to a position substantially as shown in FIG. 5 to engage a refuse container 14. As the boom 16 moves downwardly and outwardly, an arcuate cam 60, which is secured to arcuately movable sleeve 28, moves off of roller cam engaging member 62, which cam 60 is held in engaged position for a portion of the travel of the boom 16 by a roller 64 which is mounted on a lever 66, the pivot axis of which lever is coaxial with roller cam engaging member 62, which moves the arms 24 which are to receive the refuse container 14 in substantially horizontal position, as shown in FIGS. 2 and 3, and with the arms 24 spread apart or in open position, the arms will pass on each side of the refuse container 14 and elastomer friction blocks 68 and 70 near the ends of the respective arms 24 will engage the container, so when fluid pressure is exerted on cylinder-plunger assembly 38 to extend the plunger thereof outwardly, the refuse container is tightly gripped to enable the container with the refuse therein to be moved to a position approaching the hopper 72, on the body of the vehicle, whereupon, guide rollers 74 and 76, mounted on an upstanding lug 78 which is secured to the boom 16, engage a guide bar 80 so as to stabilize the boom 16, and by further movement, the arcuate cam member 60 engages between rollers 62 and 64, whereupon, further outward movement of plunger 50 causes the refuse container to move over the hopper 52, and in this position, the container is substantially inverted, as shown in FIG. 7. The arcuate cam member 60, with rollers 62 and 64 form a tipping means to invert the refuse container, when moved to the upper-most position and to tip the refuse container back into upright position when the boom 16 is moved outward. After the refuse from the container has been discharged into the hopper 72, the reverse procedure is carried out, that is the boom 16 is moved outward and the weight of the container 14, the lever 26, and the arms 24 shifts over the center of gravity until the cam 60 disengages from rollers 62 and 64 to cause the refuse container to shift over the center of gravity and to move into an upright position, however, the shock is minimized by a shock absorber 82, which is pivoted to an apertured arm 84 on the set collar 32 and to apertured lugs 86 on plate 34.

The continued movement of the boom 16 outwardly and downwardly will cause the refuse container 14 to be moved into the place it originally occupied on the terrain or on a rack. Whereupon, by manipulation of valve operating lever 88, fluid under pressure is directed from reservoir 90 through conduit 92, through pump 94 and through valves 96 and 100. When these valves are in the desired positions, fluid is directed into valve 101 to direct fluid into conduits 102 or 103 and out through the other of the conduits to actuate cylinder-plunger assembly 38 to selectively cause a gripping of arms 24 on refuse container 14 or the release of the arms therefrom. The cylinder of cylinder-plunger assembly 38 is a double acting cylinder which discharges fluid, such as hydraulic fluid, through valve 101 and into return conduit 104 which leads to reservoir 90. By shifting the lever 88 of valve 101, the plunger of cylin-

der-plunger assembly 38, will move in the opposite direction to cause the arms 24 to be spread apart to enable the release of the refuse container 14.

A three-way valve 96, having a control lever 97 thereon, may be, if desired, provided in conduit 92, which valve, when in one position, directs fluid through conduit 92 to valve 100. The valve 100 is a divider valve to divide a proportionate amount of hydraulic fluid into one conduit and another amount of hydraulic fluid into a second conduit, as for instance, if may be desirable to direct one-fourth the fluid into conduit 132 and three-fourths of the fluid may be directed through conduit 92 to valves 47 and 101. When the valve 96 is in another position, the conduit 92 which leads to valve 100 and direct fluid into conduit 98 leading to three-way valve 106, which is a three-position valve and is operable by a lever 105, which valve, when in one position, directs fluid under pressure through conduit 107 into single acting hydraulic cylinder 8 to elevate the body 2 from a horizontal position, shown in full outline in FIG. 1 to an angulated position as shown in dashed outline therein, when in another position the valve closes conduit 98 and directs fluid from hydraulic cylinder 8 into conduit 108 leading to discharge conduit 104 and reservoir 90. The valve 106 has a third position, by manipulating lever 105 to block both conduits 98 and 108 to hold the plunger of hydraulic cylinder plunger assembly 8 in any desired position. If desired, valve 106 may be used to the exclusion of valve 96. The normal weight of body 2 will cause the plunger of the cylinder-plunger assembly 8 to move inward so as to permit the body to return to the horizontal position.

At the lower end of the hopper 72 is a compactor plate 110, which has a shield 112 attached thereto and extending outward therefrom, as will best be seen in FIGS. 8 and 9, which shield 112 closes the lower end of the hopper, when the compactor plate 110 is in the position indicated in dashed outline in FIGS. 8 and 9, and opens the lower end of the hopper, when in the position as indicated in full lines therein. The compactor plate 110 has apertured lugs 113 thereon to which the plunger of cylinder-plunger assembly 114 is pivotally connected. The cylinder of cylinder-plunger assembly 114 is a double acting cylinder and has conduits 116 and 118 connected thereto and to solenoid operated, four-way flow control valve 120, which valve is solenoid actuated by a source of electricity, as indicated at 122. In the present instance this source of electricity is a battery, with a circuit 124 leading to pressure switch 126, which pressure switch has an electrical conductor 128 connected thereto and to a solenoid 130, so upon closing pressure switch 126, the solenoid 130 will move the valve 120 in one direction to direct hydraulic fluid from conduit 132 into one of the conduits 116 or 118, with the fluid flowing through the other of the conduits into and through the four-way valve 120 to be exhausted into conduit 134 and thence into conduit 104 leading to the reservoir 90.

Upon the plunger of the cylinder-plunger assembly 114 reaching the end of the stroke, a pressure is built up in the conduit 116, which will cause the pressure switch 126 to open and simultaneously, the contacts in pressure switch 136 will close to cause solenoid 138 to move the four-way valve 120 into another position, to direct hydraulic fluid into conduit 118 while the hydraulic fluid is being exhausted from conduit 116. Elec-

trical connectors 140 and 142 are interconnected with the pressure switches 126 and 136 and to the solenoids 130 and 138 to cause the proper sequencing of the valve 120 so as to direct hydraulic fluid alternately to the ends of cylinder-plunger assembly 114 to operate the compactor plate 110 continuously, so long as refuse is being dumped into the hopper 72.

The compactor plate 110 moves across the lower end of the hopper 72 so as to push the refuse through an opening 146 in the lower part of the body 2 until the body is filled with refuse. When it is desired to discontinue the operation, the compactor, designated generally at 190, a switch 144 is moved to the "off" position, which nullifies further movement of solenoids 130 and 138 of the solenoid valve 120.

### OPERATION

The valve control levers 46, 88 and 105 and switch 144 are located in an area accessible to the operator, such as in the cab of the vehicle. When it is desired to pick up a refuse container 14, with the boom in the position on the vehicle as shown in FIG. 1, and with the body 2 in horizontal position, the operator drives the vehicle a predetermined distance outward from the refuse container, then by manipulation of valve handle 46, the plunger 50 is retracted by the hydraulic cylinder 45, which will cause the boom to move outward, and in so doing, the cam 60, which is positioned between roller 62 and roller 64, will roll downward on roller 62, with the roller 64 holding the cam in contact relation with the roller 62 until the cam 60 is moved off of rollers 62 and 64 and the rollers 74 and 76 have moved off of the guide bar 80, whereupon, the shock absorber 82 minimizes the transition of the lever 42 and arms 24 from an upstanding position to a substantially downwardly depending position, and with the valve lever 88 moved to a position to move the plunger of the cylinder-plunger assembly 38 inward, the arms 24 are spread apart to move the plate 34 and elastomer blocks 68 and 70 into frictional contact relation with the outer surface of the refuse container 14. When the container is filled with refuse, and with the lever 88 moved to the position to cause the plunger of the cylinder-plunger assembly 114 to reciprocate, the boom is swung inward by manipulation of valve lever 46 until the end of the arcuate cam 60 moves to a position above roller 64 to engage roller 62 and with the continued movement of the boom 16 inward, by the outward movement of the plunger 50, the rollers 74 and 76 roll onto guide bar 80, and as the plunger continues to push the boom inward, the arcuate cam roller 64 maintains the cam in contact relation therewith through the steps as shown in FIG. 6, until the lever 26 is substantially in a vertical position, which will position the refuse container 14 in inverted relation over the hopper 72 and with the plunger of the cylinder-plunger assembly 114 reciprocating, as shown in FIGS. 8 and 9, the refuse dumped into the hopper 72 will be pushed through opening 146 into the closed body 2 of the refuse vehicle.

The plunger of cylinder-plunger assembly 114 has a compactor plate 110 on the end thereof, which operates in the lower part of the compartment of the hopper 72 and moves the refuse into the body 2, as the plate 110 is reciprocated by the plunger. A shield 112 is attached to plate 110 and closes the opening in the lower part of the hopper 72 as the compactor plate 110 moves the refuse into the body 2. However, as the com-

pactor plate 110 is retracted, the refuse on top of the shield 112 will move downward ahead of the compactor plate 110 so the operation is substantially continuous throughout the dumping operation of the refuse container 14.

When the refuse has been discharged from the container 14, the valve lever 46 is reversed, which will cause pressure to be applied to the plunger end of the hydraulic cylinder 45 to withdraw the plunger into the cylinder, thereby causing the boom 16 to move outward and downward, with the cam 60 being guided on roller 62, the shock absorber 82 permits the refuse container to level out in an upright position, whereby the boom is moved outward until the refuse container is in the same location it originally occupied. By manipulation of lever 88 in the opposite direction, the plunger of the cylinder-plunger assembly 38 is drawn inward to move the arms 24 outward, as indicated in dashed outline in FIG. 4, and with the arms 24 in substantially horizontal position, as shown in FIGS. 2 and 3, the boom is moved toward the vehicle, and a second and subsequent refuse containers may be picked up and handled in the manner as hereinbefore described. When the dumping operation into the hopper has been completed and the refuse has been compacted into the body 2, the switch 144 is moved to open position until second and subsequent operations are had.

When the refuse body becomes filled, the vehicle is taken to a place of disposal, and the valve 96 is moved into a position to direct hydraulic fluid under pressure through valve 96, one port of which may be aligned with conduit 92 and one port therein may be aligned with conduit 98, whereupon, hydraulic fluid is directed to valve 106, and with the lever 105 in position to direct hydraulic fluid from conduit 98 into conduit 107, the body 2 is elevated from the position as shown in full outline in FIG. 1 to the position shown in dashed outline therein, and with the closure 10 open, the material within the body 2 will be discharged from the rear end thereof. When the body 2 is raised, the opening 146 in the body, which is complementary with the discharge neck 147, will permit the body to move upward with the movement of the hopper, and with the body 2 moved back into the position as shown in FIG. 8, the opening 146 in the body becomes aligned with the neck 147 so as to insure that no refuse will be spilled.

#### DESCRIPTION OF THE SECOND FORM OF INVENTION

The second form of the invention is shown in FIGS. 10 through 14 and operates in substantially the same manner as the above described form of the invention, except, the boom assembly designated generally at 212 has an outer tubular boom member 216 which has outwardly extending stub shafts 218 secured thereto on opposite sides of the outer tubular boom member. The pivot axis of the boom is angulated with respect to the vertical, so that the boom will move outwardly and downwardly as indicated in FIGS. 10, 12 and 13. A mounting plate 220 is mounted on the vehicle near the forward end thereof, on which plate bearings 222 are mounted, as will best be seen in FIGS. 11 and 12. The outer tubular boom member 216 has an inner tubular member 217 therein which inner tubular member has a splined fitting 219 secured to the inner tubular member 217 as by welding. A flange 221 is on the end of outer tubular member 216 adjacent the stub shafts 218

so as to enable a motor 224 to be bolted thereto by means of bolts 226. The motor 224 is shown to be fluid actuated, such as a hydraulic motor, however, the motor may be air operated or it may be electrical. The motor operates through an arc of less than one revolution. The purpose and function of this motor will be more fully brought out hereinafter.

The boom is moved outwardly and downwardly and inwardly and upwardly by the fluid actuated cylinder 45, in the same manner as the above described form of the invention, and, for the sake of brevity, the description with respect to the control and operation of the hydraulic cylinder 45 and plunger 50 will be referred to the aforementioned form of the invention, except in the present form of the invention, the motor 224 performs the function of rotating the inner tubular member or sleeve 217 to which sleeve 228 is attached, by means of bolts 232. The arcuate movement of motor 224 causes the inner tubular member 217 to rotate when at the upper-most position, which forms a tipping means to invert the refuse container 14, as shown in the form of the invention in FIGS. 10 through 14, and the tipping of the container 314 in the form of the invention as shown in FIGS. 15 and 16, when the boom 216 is moved outwardly the refuse container is tipped from the inverted position to the upright position and moved to the same place in which it was originally located. The lever 26 is attached to sleeve 228, which lever is the same lever as described in the aforementioned form of the invention, except the shock absorber is dispensed with in the present form of the invention, and performs substantially in the same manner. The lever is attached to plate 34 and has plate 36 a spaced distance therebelow, which plates have a free floating cylinder 38 therebetween which is pivotally connected to the inner ends of the arms 24, which arms are pivotally connected to plates 34 and 36 by means of pins 42 which pass therethrough, as described for the first form of the invention.

The motor 224 is preferably a hydraulic motor which is driven by fluid pressure, as by the pump 94, and withdraws hydraulic fluid from the reservoir 90 and directs the hydraulic fluid through conduit 92 into a variable pressure, reversing valve 234, the fluid from which valve is directed in the desired direction by moving lever 236 in either direction from the center position, so as to drive the motor 224 in either direction. When the valve lever 236 is in the center position, all ports therein are closed and no fluid will flow there-through. However, when the lever is moved to the right, the motor 224 will rotate in one direction, and when the valve is moved to the left, the motor will rotate in the opposite direction. Furthermore, the pressure is variable in either direction. With the motor 224 thus connected to the outer tubular boom member 216 and with the boom mounted on bearings 222, to prevent rotation thereof, the motor 224 will rotate the shaft 225 to which a spline element 227 is secured, which spline element interengages spline 219 which is fixedly secured to the inner tubular member 217. In this manner hydraulic fluid is directed out through a conduit 238 to motor 224 and back through conduit 240 to be discharged outward through conduit 242 into reservoir 90, or, with the valve lever 236 moved to the opposite position the direction of the flow will be reversed and rotation of the motor shaft 225 will be reversed to control the movement of lever 26 to enable

the picking up of a refuse container 14, when the arms 24 are in the position as shown in FIGS. 10 and 12. When the boom 216 is moved inward, the rollers 74 and 76 will engage outwardly extending bar 80, the motor 224 rotates shaft 225 and the inner tubular sleeve 217 from the position as shown in FIG. 10 to that shown in FIG. 11 to discharge the refuse into hopper 72, as will best be seen in FIG. 11.

With the compactor plate 110 moving the refuse into the body 2, the mechanism operates in the same manner as for the aforementioned form of the invention.

When the refuse has been discharged from the container 14, the motor 224 rotates the inner tubular sleeve 217 about the axis thereof so that the refuse container 14 will be in upright position and the boom 216 is swung outward by the retraction of plunger 50 into the cylinder 45, in the manner set out for the first form of the invention. The operation of this form of the invention is the same as for the first form of the invention, except the valve 234 is operated by lever 236 to operate the motor 224.

### THIRD FORM OF THE INVENTION

The third form of the invention discloses a refuse container which is rectangular in cross section and may be used with either of the aforementioned booms. However, for purposes of illustration, this modification of the refuse container engaging arms has been shown as being used with the form of the invention as shown in FIGS. 10 through 14.

The boom is designated generally by the numeral 212, and has an outer tubular sleeve 216 and an inner tubular sleeve 217. A sleeve 328 is attached to the outer end of the inner sleeve 217 by bolts 332. The sleeve 328 has a downwardly extending lever 326 secured thereto as by welding, and the lever is secured to the open face of plate 334 in a manner similar to that of lever 26 being secured to the plate 34, in the first form of the invention. However, the present plate 334 has a straight face thereacross to complementally receive rectangular refuse container 314. The refuse container 314 has angulated members 338 secured to opposite sides thereof so as to form a V-groove therebetween, which groove is preferably formed at 90 degrees and receives angle member arms 324 within the groove, as will best be seen in FIG. 16, to hold the arms against movement longitudinally of the refuse container 314. Each of the arms 324 has a plate 325 on the outer end thereof to prevent outward lateral movement of the refuse container 314, when the arms 324 are gripping the container, as shown in full outline in FIGS. 15 and 16.

A cylinder plunger assembly, such as shown at 38, in the first form of the invention, connects to the arms in a manner similar to that shown in FIG. 4 of the first form of the invention, and the arms 324 pivotally connect with plates 334 and 336 in a manner similar to that shown for the first form of the invention. The operation of this form of the invention may be carried out as the first and second forms of the invention, depending on which boom the lever 326 is attached to, therefore, for the sake of brevity, the operation will not be repeated, but with reservations to amplify the operation in accordance with the aforementioned disclosure, in event it becomes necessary to provide proper antecedent basis for claims for this form of the invention either in this application or in any divisional or continuation applica-

tions which may need to be filed, in order that the invention be fully protected.

What is claimed is:

1. A semi-automated refuse vehicle, having a refuse receptacle, which vehicle comprises;
  - a. a wheeled frame,
  - b. a substantially closed refuse body mounted on said wheeled frame,
  - c. a source of fluid under pressure,
  - d. a boom pivotally mounted on a side of said wheeled frame and being adapted to extend along a side of said frame, when in one position, which boom is mounted to move about a transverse axis, which axis is angularly inclined less than 90 degrees relative to the horizontal, so as said boom moves outwardly, the outer end thereof will be moved downwardly to engage a refuse container and, as the outer end of the boom moves inwardly, the outer end thereof will be moved upwardly to enable refuse to be discharged from the refuse container into a refuse receiving receptacle at a higher elevation,
    1. a first fluid actuated cylinder-plunger assembly connected to said boom and to said frame to move said boom relative thereto,
    2. conduit means leading from said source of fluid under pressure to the cylinder of said first fluid actuated cylinder-plunger assembly,
    3. valve means within said conduit to selectively direct fluid under pressure to one end of said first fluid actuated cylinder, when said valve is in one position, to move the plunger thereof in one direction and to direct fluid to the opposite end of said cylinder to move the plunger thereof in the opposite direction, when said valve is in another position, so as to move said boom selectively outwardly and inwardly,
  - e. a pair of refuse container engaging arms on said boom near the outer end thereof,
  - f. a second fluid actuated cylinder-plunger assembly mounted near the outer end of said boom and having one end thereof connected to said boom, the other end of said second fluid actuated cylinder-plunger assembly being connected to at least one of said arms to cause relative movement therebetween to grip the refuse container,
  4. valve means, which, when in one position, directs fluid into one end of said second fluid actuated cylinder and directs fluid outward from the opposite end thereof to move at least one of said arms relative to said boom to engage the refuse container and said valve means, when moved to another position, directs fluid into the opposite end of said second fluid actuated cylinder, and out through the other end thereof to disengage said arms from the refuse container,
  - g. tipping means associated with said boom to move said arms about the longitudinal axis of said boom to invert the refuse container, when said boom is in the inner-most position.
2. A semi-automated refuse vehicle as defined in claim 1; wherein
  - a. said second fluid actuated cylinder-plunger assembly is free floating and pivotally connects between the inner ends of said arms.
3. A semi-automated refuse vehicle as defined in claim 1; wherein



- a. a sleeve is journaled on said boom near the outer end thereof,
- b. a lever is fixedly secured to said sleeve and extends outwardly therefrom,
- c. said pair of refuse container engaging arms are pivotally mounted on said lever so as to be substantially horizontal when said boom is in the outermost position,
- d. said lever being arcuately movable about the axis of said boom,
- e. said arms being pivotally mounted near the outer end of said lever so as to be approximately horizontal when said boom is in another position,
- f. an arcuate cam secured to said sleeve and extending outward therefrom,
  - 1. a cam engaging member mounted on the refuse vehicle to engage said cam to move said lever about the axis of said boom so as to invert the refuse container and direct the refuse therefrom into a refuse receptacle on the vehicle, when said boom is moved inwardly and upwardly.
- 4. A semi-automated refuse vehicle, as defined in claim 3; wherein
  - a. said lever, which is fixedly secured to said sleeve, has an outwardly extending plates on the outer end thereof opposite said sleeve to receive said cylinder and said arms therebetween,
  - b. shock absorber means pivotally interconnecting the non-rotatable part of said boom and one of said plates so as to maintain said plates and said arms substantially in horizontal position when said boom is in an outwardly extended position and to minimize the shock when rotating the lever and the refuse container from an inverted position to an upright position.
- 5. A semi-automated refuse vehicle as defined in claim 3; wherein
  - a. a guide bar is mounted on the side of the vehicle and is secured thereto and extends outwardly therefrom, and
  - b. a pair of guide rollers mounted on said boom in position to engage said guide bar as said boom is moved inward to discharge the contents of the refuse container.
- 6. A semi-automated refuse vehicle as defined in claim 1; wherein
  - a. said boom is a non-rotatable, tubular member,
  - b. a motor mounted on the end of said tubular member and has the shaft thereof extending thereinto,
  - c. a further shaft extending through said tubular member,
    - 1. the shaft of said motor being connected in power transmission relation to said further shaft so as to selectively rotate said further shaft through at least 180°,
  - d. a lever fixedly secured to the outer end of said further shaft and extending outwardly therefrom,
  - e. said pair of refuse container engaging arms pivotally mounted on said lever near the outer end thereof and adapted to occupy a substantially horizontal position, when the boom is in one position to enable the arms to engage the refuse container, and
  - 1. said container engaging arms adapted to be moved to a second position of 180° to invert the container to discharge refuse therefrom.

- 7. A semi-automated refuse vehicle as defined in claim 6; wherein
  - a. said motor is a fluid motor,
  - b. a control valve for rotating said motor in either direction to enable the refuse container to be picked up in upright position and to be discharged into the refuse receptacle.
- 8. A semi-automated refuse vehicle as defined in claim 1; wherein
  - a. said boom is a non-rotatable, tubular member,
  - b. a motor mounted on the end of said tubular member and has the shaft thereof extending thereinto,
  - c. a further shaft extending through said tubular member,
  - d. a lever fixedly secured to the outer end of said further shaft and extending outwardly therefrom,
  - e. said pair of refuse container engaging arms pivotally mounted on said lever near the outer end thereof and adapted to occupy a substantially horizontal position, when the boom is in one position,
  - f. a sleeve is mounted on said rotatable shaft near the outer end thereof,
  - g. said lever being fixedly secured to said sleeve and extending downwardly therefrom,
  - h. fastening means to detachably secure said sleeve to said rotatable shaft,
  - i. a plate mounted on the lower end of said sleeve at an angle with respect thereto,
  - j. a second plate interconnecting with the first plate and being a spaced distance therebelow,
  - k. said arms being pivotally secured between said plates so the refuse container gripped between said arms will be upright when in one position and will be inverted when in another position.
- 9. A semi-automated refuse vehicle as defined in claim 1; wherein
  - a. said boom is a non-rotatable, tubular member,
  - b. a motor mounted on the end of said tubular member and has the shaft thereof extending thereinto,
  - c. a further shaft extending through said tubular member
  - d. a lever fixedly secured to the outer end of said further shaft and extending outwardly therefrom,
  - e. said pair of refuse container engaging arms pivotally mounted on said lever near the outer end thereof and adapted to occupy a substantially horizontal position, when the boom is in one position,
  - f. said outwardly extending lever on said shaft has a plate secured thereto,
  - g. a further plate secured to said first plate therebelow,
  - h. a pair of arms pivotally mounted between said plates,
  - i. a double acting hydraulic cylinder connected to said arms near the inner ends thereof and extending between said arms,
  - j. the refuse container being polygonal in shape,
    - 1. said face of said refuse container being complementary with respect to said plates,
    - 2. spaced apart abutments on two opposite sides of said refuse container, which abutments form a V-shaped groove,

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3. the inner face of each said arm being complementary to one said V-shaped groove so when said arms are clamped therein said refuse container will be lifted from a position on the terrain and directed to a position above the refuse receptacle, 5
4. conduits leading from said source of fluid under pressure to said motor, and
- k. valve means within said conduits to selectively direct fluid to said motor to rotate said motor in a selected direction. 10
10. A semi-automated refuse vehicle as defined in claim 9; wherein
- a. each said arm has a plate secured to the end thereof which arms extend inward over said refuse container, when said arms are in engaged position. 15
11. A semi-automated refuse vehicle as defined in claim 1; wherein
- a. said arms are of a configuration to grip a polygonal container, 20
- b. a refuse container,
1. horizontal, elongated, triangular-shaped abutments on opposite sides of the refuse container 25

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- within the length thereof and forming an arm receiving groove therebetween.
- c. a complementary, elongated angle member on each said arm to engage said polygonal container between said abutments in complementary relation, and
- d. a plate secured to the outer end of each said arm to prevent outward movement of said polygonal container.
12. A semi-automated refuse vehicle as defined in claim 11; wherein
- a. said refuse container is rectangular in cross section,
- b. said arms adapted to tightly embrace said container which is rectangular in cross section to remove said container from the terrain and to discharge the contents thereof into said refuse receptacle on said refuse vehicle.
13. A semi-automated refuse vehicle as defined in claim 1; wherein
- a. an elastomer element is secured to each said arm to frictionally engage the refuse container.
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