

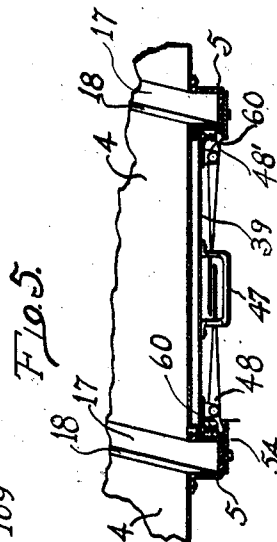
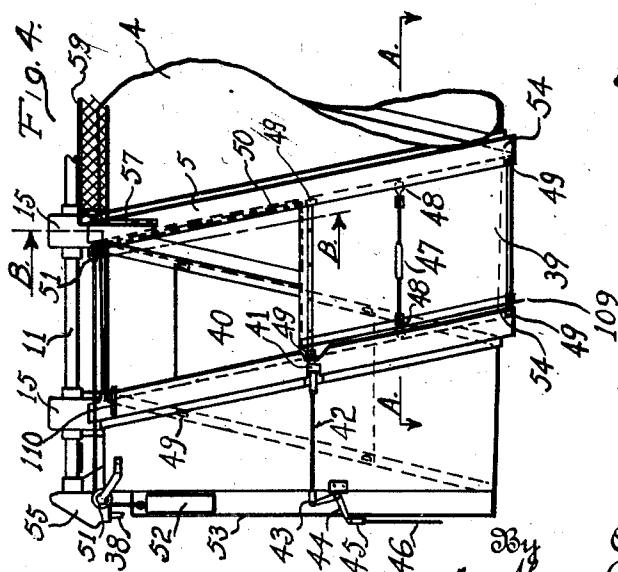
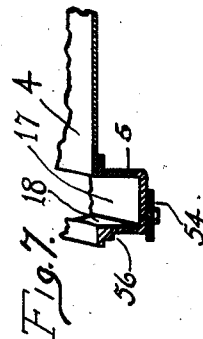
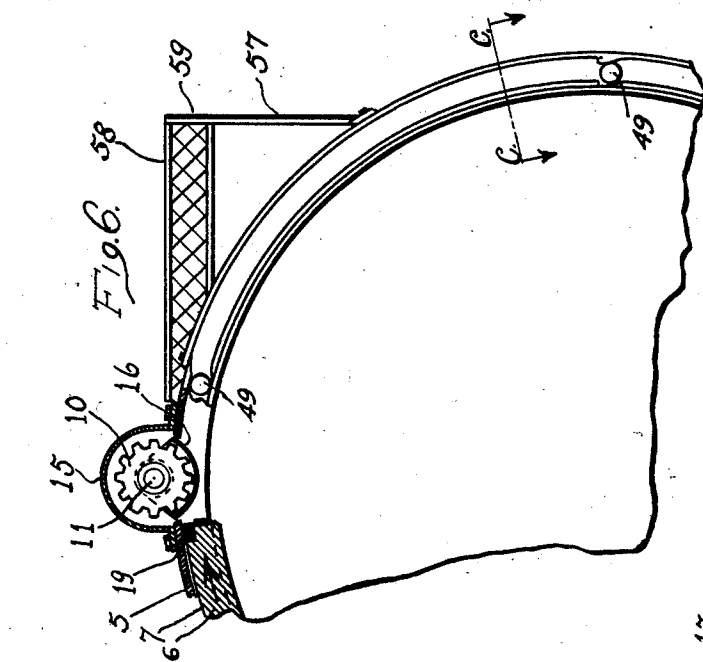
June 5, 1934.

A. HULLEY ET AL
REFUSE COLLECTION VEHICLE

1,961,587

Filed May 13, 1932

4 Sheets-Sheet 2



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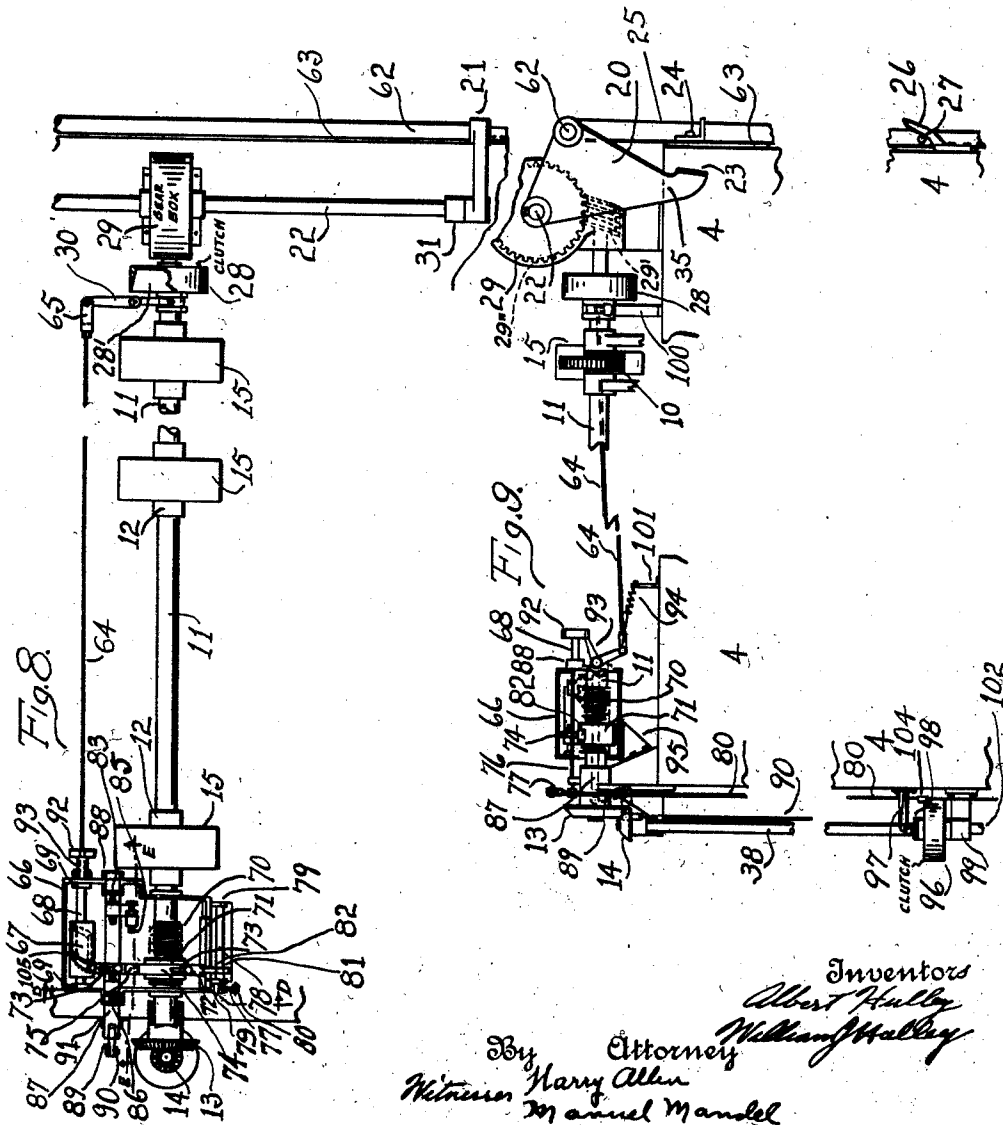
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UNITED STATES PATENT OFFICE

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REFUSE COLLECTION VEHICLE

Albert Hulley and William J. Hulley, New York,
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Application May 13, 1932, Serial No. 611,137

15 Claims. (Cl. 214—67)

This invention broadly relates to a refuse collection vehicle and more particularly to an apparatus that will pack and crush and compress the load it has to carry and will use the same means for the discharging or unloading of the load.

Hitherto the weight of the loads carried in a refuse body or receptacle has been very light considering the space occupied on account of the bulky and spongy nature of refuse—for example—boxes, cartons, packages, paper, etc. Considerable difficulty has been encountered in endeavouring to pack and compress the light bulky material encountered while collecting the average refuse. The general practice heretofore has been to break and pack by hand boxes, cartons, etc., in an effort to get greater weight or amount in a given space. A great loss of time and lower efficiency occur in this way. Another difficulty has been found in discharging the load from the body by means of gravity on account of the light nature of the load and the tendency of refuse to jam in the body. It is an object of our invention to create a combined crushing, packing, compressing and discharging device operated by common means which will not only be relatively simple in structure and operation but which will save time and labour and will function perfectly under all conditions.

It is another object of our invention to provide a body that is completely enclosable. Another object of our invention is to provide a device that will load the body fully and at the same time break up or crush the refuse and compress the refuse so that a greater load can be carried in a given space than can be carried without crushing and compressing. Another object of our invention is to provide means whereby the pressure applied in compressing the load may be controlled so that the container or body and tail gate etc. will not receive destructive pressure. Another object of our invention is to provide a means whereby the load is impelled to the end of the body and the material will be worked while moving the material towards the end of the container or the body. In this way the material can be more effectively crushed and packed. Another object of our invention is to provide a means so that the end of the container or body can be automatically unlocked and automatically opened and automatically closed and locked. Still another advantage of our invention resides in the fact that the same means that we use for crushing and packing and compressing the load will be used for the purpose of discharging or unloading the load when the end of the body or tail gate is in an open position

by merely continuing the impeller towards the end of the container or body until the impeller has fully cleaned the container or body and fully discharged the load. Another object of our invention is to provide suitable openings for the purpose of loading the body with any substance and suitable means for closing and locking the doors. Another advantage of our invention is to provide an upper deck attached to the body for the purpose of carrying objects that are too big to go in through the door or openings in the body. Another object of our invention is to provide a means whereby the tail gate when in an open position will be free to be pushed up still higher so that when the load is being discharged there will be no possible chance of the tail gate being damaged in resisting the discharged material if it should pile up or bulge. Another important object of our invention is to provide a means whereby the impeller and the tail gate function in relative sequence.

Other and further important objects of this invention will be apparent from the disclosures in the specifications and the accompanying drawings.

The invention (in a preferred form) is illustrated in the accompanying drawings and hereinafter more fully described.

In the drawings:—

Fig. 1 is a side elevation showing our invention mounted on a truck chassis of which only a portion of the chassis frame is shown—the front of the body being broken away in order to clarify the showing. The tail gate is shown in full lines in a closed position and in dot and dash lines in the open position.

Fig. 2 is a front view with the front end cover removed and a portion of the impeller shown in section in order to clearly show the gearing.

Fig. 3 is a plan view of a part of the front end and in which the body is broken away and the impeller is shown in position.

Fig. 4 is a side elevation of the front end of the body showing the arrangement of the doors and also the method of preventing the impeller from being moved while the doors are open.

Fig. 5 is an enlarged sectional view of a part of the body and doors taken on the line A—A of Fig. 4, and showing the sliding door locking handles.

Fig. 6 is an enlarged transverse sectional view on line B—B of Fig. 4 showing a portion of the impeller in section and also a view of the sliding door track.

Fig. 7 is a section on line C—C of Fig. 6.

60

65

70

75

80

85

90

95

100

105

110

Fig. 8 is a plan view showing the combination impeller and tail gate control.

Fig. 9 is a side elevation of the parts of Fig. 8, also showing the frictional driving clutch on the vertical drive shaft and also a view of the tail gate locking pin.

Fig. 10 is an enlarged sectional view taken on the plane of the line D—D of Fig. 8.

Fig. 11 is a sectional view on the plane of the line E—E of Fig. 8.

Fig. 12 is a fragmentary sectional view showing the locking device for holding the door closed.

Fig. 13 is an enlarged fragmentary section of a frictional holding device for the door.

Fig. 14 is a front view of the parts shown in Fig. 13.

The invention is especially applicable to what are sometimes called collection vehicles of the motor driven type having wheels 1 and a chassis 2 of any desired construction. The main body or container 4 is generally cylindrical in form and may have longitudinal external reinforcing beams 3 supported by the chassis.

Mounted in the body is a piston-like member 6 which we have termed an impeller. This impeller, however, is different from the ordinary piston in that it has a warped surface and rotates something like a screw. Its periphery (in the form shown) is guided in a groove 5 in the wall of the body 4.

The periphery of the impeller is provided with gear teeth 9 and the outer edge 7 and side edge 8 are guided by the outer wall 17 and the side wall 18 of the groove 5.

Above the body of the receptacle is mounted a shaft 11 supported in bearings 12 and carrying a number of pinions 10, 10 which are adapted to mesh with the teeth of the gear segment 9 of the impeller as the impeller is driven first by the left-hand gear 10, as seen in Fig. 1, and so on consecutively by the respective successive pinions 10.

The shaft 11 and its pinions are driven from suitable motive power carried by the vehicle. For this purpose the shaft 11 has a bevel gear 13 meshing with a bevel pinion 14 on the upper end of a vertical shaft 38. These pinions 13 and 14 may be suitably supported.

The driving of the shaft 38 is effected through a friction clutch 96 and a shaft 102. This clutch 96 is spring loaded so as to permit the shaft 102 to transmit limited power to shaft 38 when the operator has connected his power source (not shown) to the shaft 102 either in the forward or reverse direction. Forward and reverse can be determined by the position of a conventional shift lever (not shown).

The impeller travels in the helical groove provided by the member 5 and may be provided with a cleaner and seal 19 at its periphery to engage the inner wall of the body 4 and groove 5. Each of the pinions 10 has a shield member 16 pivotally mounted on its shaft or adjacent to it in such a way as to hang downwardly into the grooves 5 and close off the lower side of the housing 15 around the pinion except when the impeller reaches it, whereupon the impeller engages the shield 16 and swings it out of the way, as shown in Fig. 2, thus allowing the pinion 10 to mesh with the gear teeth 9 on the impeller. The impeller has a circumferential length greater than 360° so that it is always in mesh with one of the pinions as it travels along the helical groove 5.

The rear end of the body is normally closed by a tail gate 25. The tail gate is supported by

a transverse hinge rod 62 which in turn is supported by two actuating segments 20 which have bearings 21 for the pivot shaft 62.

The segments 20 are carried by another transverse shaft 22 which has stationary bearings 31. The lower part of the tail gate carries projecting pins 27 which are adapted to be wedged or locked behind the inclined latch members 26, as shown in Fig. 9, when the tail gate is supposed to be closed. The shaft 22 is adapted to be driven from the overhead shaft 11 through the medium of a friction clutch and gear train.

The clutch consists of an inner cone member 28' and an outer clutch member 28. Member 28' rotates with the shaft 11 and the member 28 is mounted on a shaft with the worm 29' which meshes with the worm 29'' in the gear box 29. The clutch members 28 and 28' are always disengaged except when raising the tail gate. When the parts of the clutch are in engagement the transverse shaft 22 is driven from the shaft 11 and rotates the segments 20 anti-clockwise, as viewed in Fig. 9. The first part of this motion raises the tail gate and releases the locking pin 27 from the latching member 26. Each segment 20 has an extension 35 with a foot 23 adapted to engage the cross-piece 24 as soon as the locking pin 27 clears the latch 26, whereupon the continued rotation of the shaft 22 causes the tail gate to be raised to the position shown in the upper part of Fig. 1. A yielding gasket or rubber seal 63 may be provided between the rear end of the body 4 and the tail gate.

Doors 39 and 40 are provided on opposite sides of the body to permit the introduction of the refuse. These doors may be of any suitable type and in the form shown each is adapted to slide between two adjacent turns of the guide helices 5, being held in place in tracks 56 beneath the edges of plates 54. Each door has attached to it a cable 50 which passes over pulleys 51, 51 and has a counterweight 52 guided in a housing 53. Each door has a handle 47 by which it may be raised or lowered. Each edge of each door is frictionally held by a spring 60 which presses against the edge of the door and against the short arm 48' of a lever, which presses against the inner surface of the plate 54. The long arm 48 of each of these levers extends through one edge of the handle 47 so that when the handle 47 is grasped the two lever ends may be simultaneously grasped by the fingers of the same hand and pulled outwardly so as to compress the spring 60 and thus free the edges of the door so that it can slide more freely.

Each edge of the door is preferably provided with two guide rollers 49 which normally rest in the position shown in Fig. 6 when the door is closed. To reduce the friction we may provide raised tracks 56 for the guide rollers which lift the upper and lower edges of the door away from the adjacent portions of the body as soon as the door starts to move downwardly.

As a safety precaution each door is locked in its closed position except when the impeller is at the front end of the body. For this purpose we provide a latch bolt 110 adapted to enter an opening 111 in the flange 109 carried by the door. This bolt is guided in bearings 112 and 113 and pressed toward the locking position by spring 114. The tail piece 115 of the locking bolt projects through a slot into the guiding groove member 5, as shown in Fig. 12. When the impeller is in the front end of the body its edge engages the tail piece 115 of the locking bolt and retracts the locking bolt so that the door is free

to be operated by means of the handle above described. As soon as the impeller leaves the tail piece 115 the spring 114 throws the locking bolt into action in the hole 111 and locks the door positively so that it can not be opened.

As a further precaution against operation of the impeller when the door is open we provide a locking rod 42 supported in bearings 41. The right-hand end of this rod 42, as viewed in Fig. 4, is located below the lower edge of the closed door and at one side thereof so that its operation is not interfered with by the door when the door is closed. When the door is open, however, a part of the flange 109 stands in the path of movement of the rod 42. This rod is connected by a clevis 43, a rocker or bell crank lever 44, and a clevis 45 to a rod 46, which is connected to the control lever (not shown) of the power take-off. When the door is open it is therefore impossible to start the impeller.

For convenience in storing articles which can not properly be placed in the body we may provide an overhead platform 58 whose sides 59 are supported by uprights 57.

Normally the tail gate is closed and the impeller is moved back and forth by the rotation of the shaft 11 until sufficient refuse has been compacted into the rear end of the body to warrant unloading. When this time arrives the clutch members 28' and 28 are brought together through the action of a hand-controlled member and the operation of the impeller. For this purpose we provide the control box 66 and associated parts. The control mechanism includes a screw-threaded sleeve 70 secured on the shaft 11 and rotatable in a threaded block 71 secured to a sliding bar 74. Cap screws 72 extend through slots 73 in the sliding bar and are screwed into the block 71 so that the sliding bar has a limited transverse motion with respect to the shaft 11. The bar 74 moves back and forth with the screw block 71 as the shaft 11 rotates. A rock shaft 76 carries a blade 78 which is adapted to slide in a groove 81 in one end of the bar 74.

The shaft 76 may be oscillated by the action of a rod 80 and arm 77. This rod 80 is adapted to be operated by any suitable manually controlled mechanism conveniently located to the operator who, by moving the rod 80, can slide the bar 74 back and forth.

The cam 67 on the shaft 68 has a slot 105 adapted to receive the pin or roller 74' on the end of the sliding bar 74. The slot 105 in the cam 67 is so shaped that as the block 71 travels along the threaded sleeve 70, the cam is first rotated through approximately 180° so as to rotate the shaft 68 in the bearings 69 a corresponding amount. This shaft 68 carries a cam 92 which has two oppositely grooved portions adapted to engage the end of a rocker 93 which is connected by a rod 64 to the clevis 65 and forked lever 30 which operates the inner clutch member 28'. The spring 94 tends to press the upper end of the rocker 93 against the cam 92. This spring action tends to rotate the cam 92, shaft 68 and cam 67 so that the roller 74' will clear the outer ends of the inner cam walls and thus insure the passage of the roller around the corners of the cam surfaces at the ends of the cam.

When the cam 67 has turned through 180° as above mentioned the clutch members 28, 28' are brought into engagement and power is transmitted through the shaft 11 to the worm 29', worm gear 29'' to the shaft 22 so as to oper-

ate the segments 20 and raise the tail gate as previously described. All of this opening action takes place during the first 180° rotation of the cam 67, after which the continued action of the shaft 11 moves the screw block 71 and bar 74 toward the right, as viewed in Fig. 8, while the impeller is discharging the contents of the body.

The pitch of the screw threads 70 will, of course, be designed to move the bar 74 at a properly reduced rate and distance with respect to the movement of the impeller.

While the cam 67 is turning through 180°, as above mentioned, the cam 92 is rotated correspondingly so that at the completion of 180° rotation of the cam 67 the cam 92 has rotated through the same angle and therefore retracted the rocker 93 and disengaged the clutch member 28' from the clutch member 28 and stopped the movement of the tail gate, where it is held in its raised position by virtue of the non-reversing characteristics of the worm 29' and worm gear 29''.

In order to prevent damage to the parts it is desirable to automatically stop the driving action of the shaft 11 when the impeller reaches the rear end of its proper travel, that is, the fully discharged position. For this purpose we provide a sliding bar 87 which is guided in bearings 88 and connected by a rocker 89 (pivoted into bracket 91) and a rod 90 to a part of the mechanism for connecting and disconnecting the power (not shown). This bar 87 carries an adjustable stop 83. Just before the impeller reaches the rear end of its travel the sliding bar 74 engages the stop 83 and moves the sliding bar 87 to the right, as viewed in Fig. 8, thus tilting the rocker 89 and operating the rod 90 to automatically shut off the power.

To close the tail gate and return the impeller to the front end of the body the motive power device is reversed and the shaft 11 reversed. This action includes a lifting of the rod 90, the tilting of the rocker 89 clockwise as viewed in Fig. 11, and the sliding of the bar 87 further toward the right as viewed in Fig. 8. As soon as the shaft 11 begins to rotate in the reverse direction it moves the bar 74 toward the left and thus starts the rotation of the cam 67 through the interaction of the roller 74' in the right hand end of the groove 105, thus rotating the cam 92 backward and allowing the clutch parts 28' and 28 to again become engaged long enough for the tail gate to be lowered and locked. As soon as the cams 67 and 92 have rotated 180° the clutch members 28' and 28 are again disengaged by the action of the cam 92 against the rocker 93 so that the tail gate remains stationary while the impeller is driven back to the front end of the body. When it reaches the front end of the body power is automatically shut off by the engagement of the crossbar 74 with the adjustable stop 86 on the sliding bar 87 which moves the rocker 89 and rod 90 back to the neutral position.

In order to load the body the impeller will ordinarily be moved back and forth a number of times without operating the tail gate. In order to effect this action the sliding bar 74 is retracted or moved to the right as viewed in Fig. 10 by the action of the rod 80, lever 77 and tilting blade 78 which engages in the groove 81 in the bar 74.

This withdraws the roller 74' from the cam 67 so that the bar 74 can travel back and forth on the screw 70 without affecting the cam 67. When the tail gate is to be operated the bar 74 is in

such a position that the cut-out portion 75 clears the stop 85 at the rear end of the movement of the control mechanism but when the tail gate is to be left undisturbed in its closed position a solid portion of the crossbar 74 is in line with the stop 85 so that when this portion engages the stop the bar 74 forcibly moves the sliding bar 87 and its stop 85 toward the right, as viewed in Fig. 8, so as to operate the rocker 89 and the disconnecting rod 90 for automatically turning off the power and throwing the operating lever into neutral.

In one form of construction, as above described, we may employ a clutch of limited power between the driving shaft section 102 and the shaft 38 through the clutch 96. In such a case it may be desirable to provide additional power for discharging the load. This can be effected through a toggle member 97 and a clutch collar 98. When the rod 80 is pulled upward to set the tail gate operating mechanism into motion, the stop 104 engages the toggle member 97 and forces one end of it against the clutch member 98 so as to furnish additional clutching pressure and consequent additional driving power.

The ends of the gear segments of the impeller are shown at 103 and 108 in Fig. 1 and the surface of the impeller is curved or warped as indicated in Fig. 3.

By constructing the impeller in such a manner that it rotates at the same time that it is traveling lengthwise in the body, we are able to provide a screwlike working action which serves to more effectively compress the refuse and require less power than would be the case were the impeller to move merely longitudinally.

Having thus described our invention we desire it to be understood that the invention is in no wise limited to the particular illustrative embodiment disclosed, the scope thereof being set forth in the following claims.

We claim:—

1. A collection vehicle having a body, an impeller mounted to rotate and move longitudinally in the body and having a warped surface so constructed as to work the refuse as well as compress it and means engaging the outer periphery of the impeller for rotating it in the body.

2. A refuse collection vehicle having a body, an impeller mounted therein, means for rotating the impeller and moving it longitudinally in the body, and automatic means for stopping the rotation when the impeller reaches a predetermined point in the body.

3. A refuse collection vehicle having a body with a helical track arranged in the periphery thereof, an impeller adapted to travel along said helical track for compressing refuse in the body and power actuated means engaging the periphery of the impeller to rotate it.

4. A refuse collection vehicle having a body with a tail gate at the rear and an entrance door near the front, an impeller mounted to travel in the body, and interlocking means coacting between the impeller and the door to prevent opening the door when the impeller has passed it toward the tail gate.

5. A refuse collection vehicle having a body with an entrance door, an impeller mounted to travel in the body, power means for driving the impeller, and control means coacting with the door to prevent the starting of the impeller when the door is open.

6. A refuse collection vehicle having a body, an impeller mounted therein having a helical

gear and a series of pinions mounted outside the body for successively engaging said gear as the impeller moves along the body.

7. A refuse collection vehicle having a body, an impeller mounted therein having a helical gear and a series of pinions mounted outside the body for successively engaging said gear as the impeller moves along the body, each of said pinions having a swinging shield adapted to be moved out of position by the impeller.

8. The combination of a body having a tail gate and an impeller, means for driving the impeller back and forth in the body, means for opening the tail gate, and common means for operating both of the aforesaid means including friction clutch mechanism.

9. A collection body having a helical groove in its wall, an impeller mounted therein, and means engaging the periphery of the impeller for rotating the impeller and moving it back and forth in the body for stirring and discharging the contents of the body.

10. A collection body having an impeller mounted therein and having a helically disposed pressing surface, and means for rotating the impeller and moving it back and forth in the body.

11. A collection receptacle comprising a body open at one end, a movable tail gate for closing said end of the body, an impeller mounted in the body, power mechanism for moving the impeller toward the tail gate to compress material within the body and manually controlled means for coupling the tail gate to the power mechanism for opening the tail gate by means of the power mechanism as the impeller moves toward the tail gate so that the tail gate is open while the impeller is forcing the contents of the body from the body.

12. A collection receptacle comprising a body open at one end, a tail gate for normally closing said end of the body, an impeller mounted in the body, power mechanism for moving the impeller toward the tail gate and away from the tail gate and means for coupling the tail gate to the power mechanism to automatically close the tail gate when the impeller moves away from the tail gate after discharging the contents of the body.

13. A collection vehicle having a body having a helical groove, an impeller having teeth mounted to travel in the groove, a shaft outside of the body extending substantially the entire length thereof, and a series of gears on said shaft for successively engaging said teeth and rotating and advancing the impeller in the body.

14. A collection vehicle having a body with a discharge opening, a movable gate normally closing said opening, an impeller in the body, power mechanism for moving the impeller to compress material in the body when the gate is closed and to discharge material from the body when the gate is open, said power mechanism including a clutch of limited transmitting power and means for increasing the transmitting power of the clutch.

15. A collection vehicle having a body with a discharge outlet, a gate normally closing said outlet, an impeller in the body, means for rotating the impeller and moving it toward the gate, and means for automatically stopping the movement of the impeller toward the gate when a predetermined pressure has been developed in the body by the movement of the impeller.

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