May 30, 1950 F. BISZANTZ 2,509,388

GARBAGE TRUCK

Filed Feb. 1, 1946 5 Sheets-Sheet 1

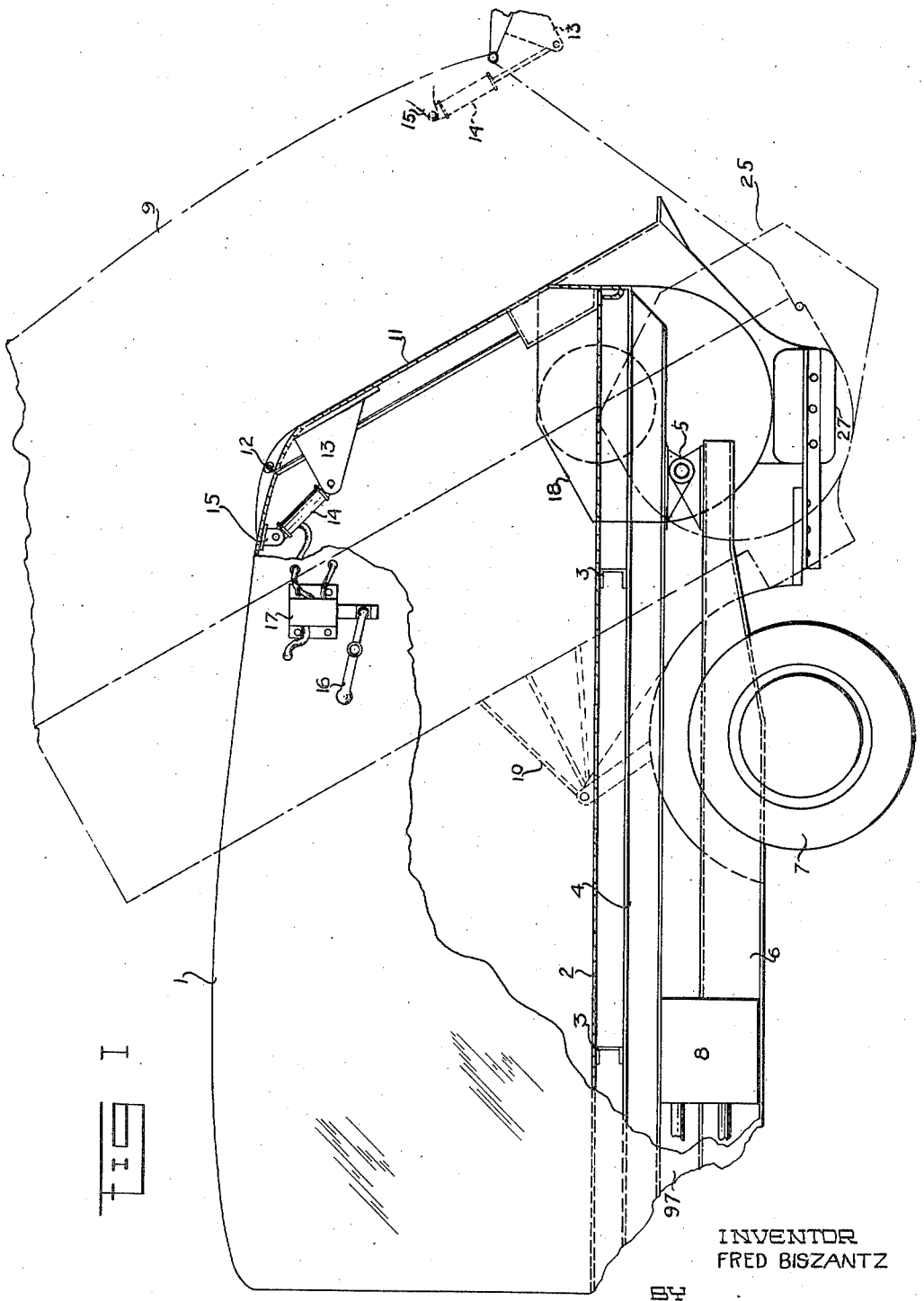


FIG. 1

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May 30, 1950 F. BISZANTZ 2,509,388

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Filed Feb. 1, 1946 5 Sheets-Sheet 2

FIG 2

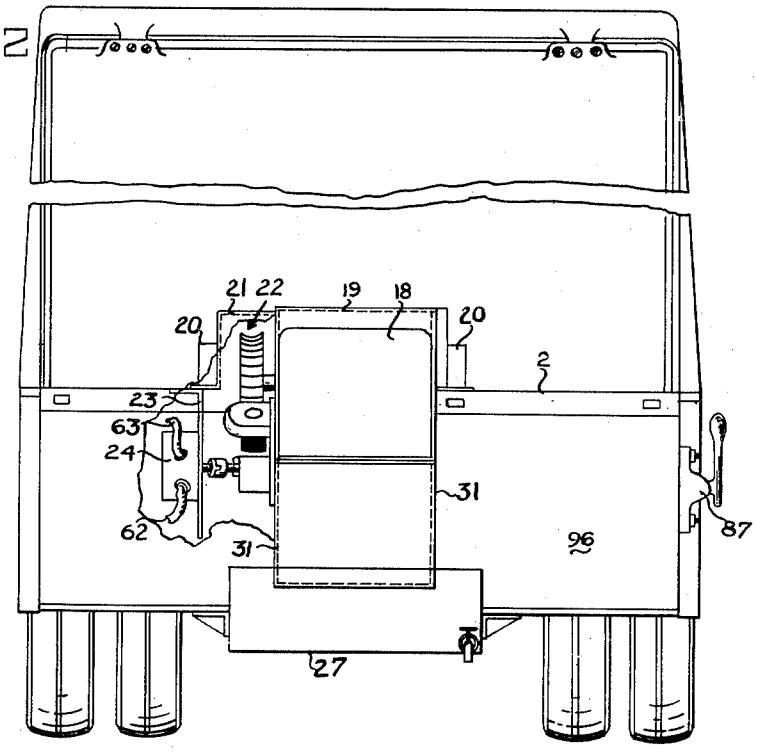
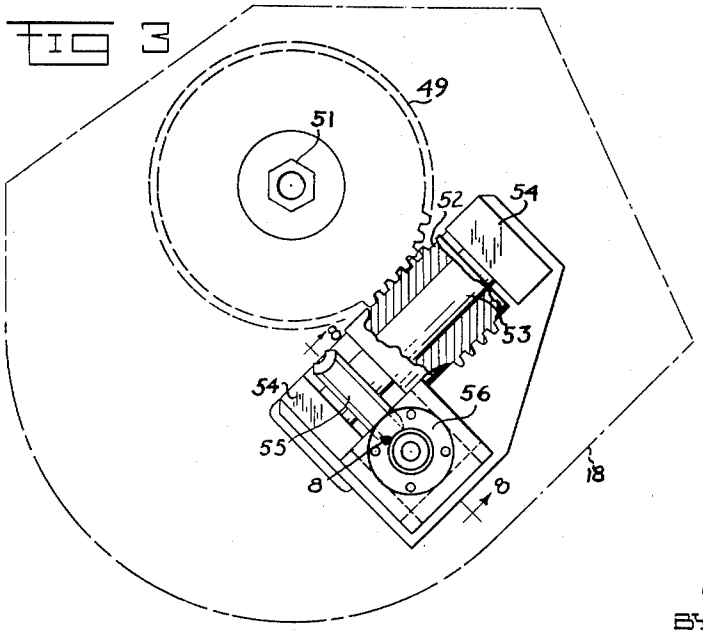


FIG 3



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May 30, 1950 F. BISZANTZ 2,509,388

GARBAGE TRUCK

Filed Feb. 1, 1946 5 Sheets-Sheet 3

FIG 4

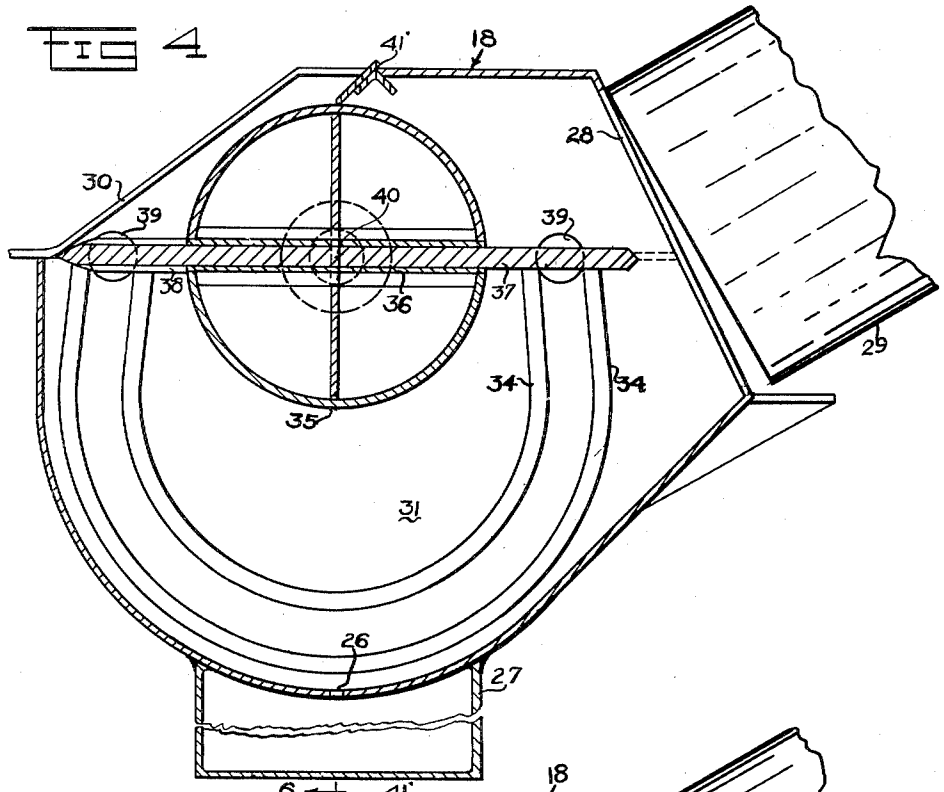
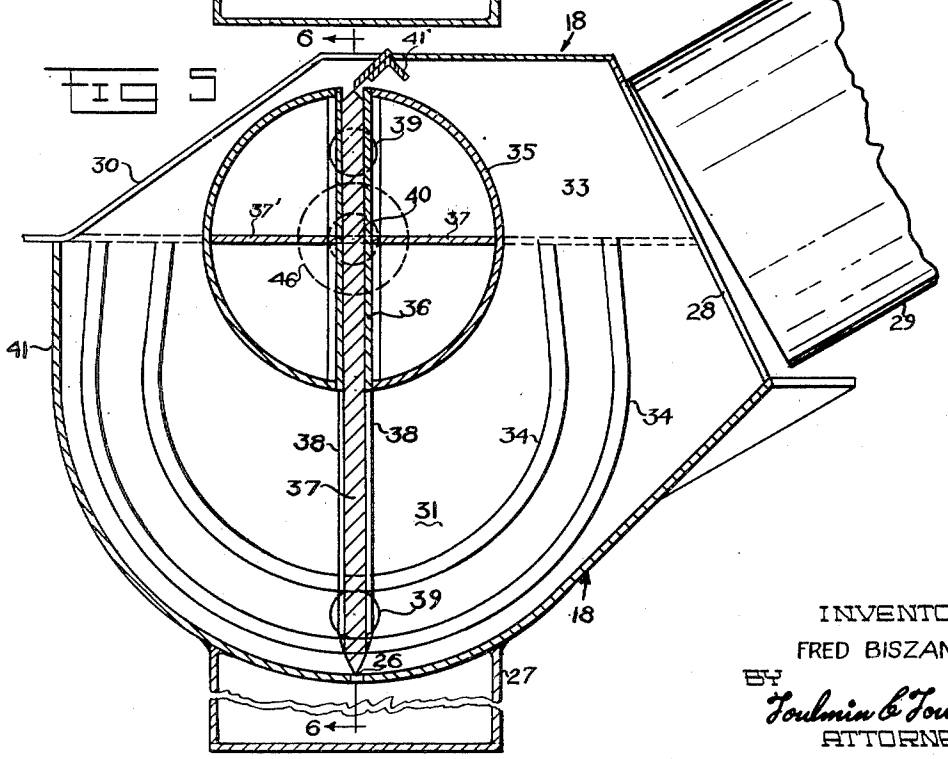


FIG 5



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May 30, 1950 F. BISZANTZ 2,509,388

GARBAGE TRUCK

Filed Feb. 1, 1946 5 Sheets-Sheet 4

FIG 6

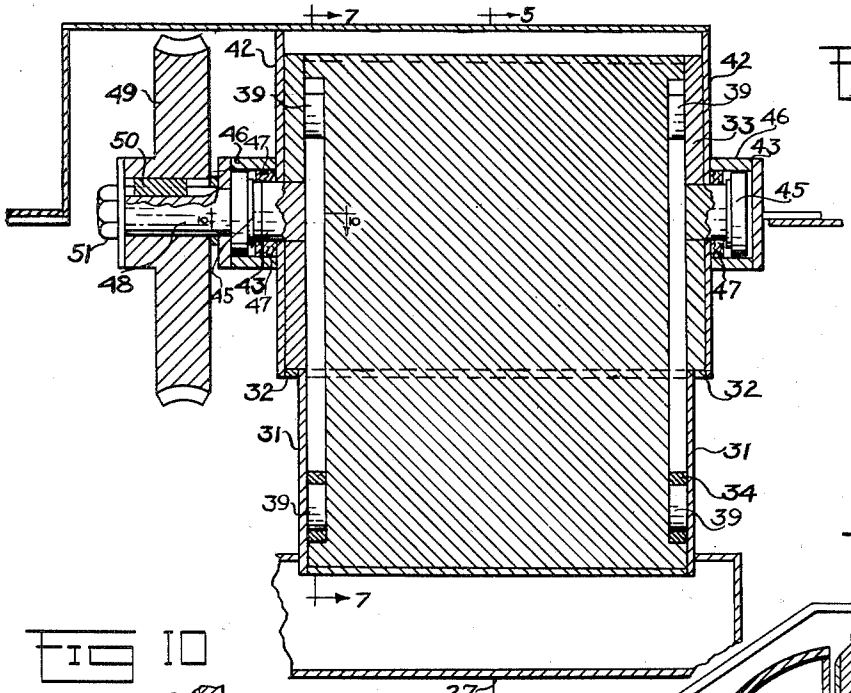


FIG 7

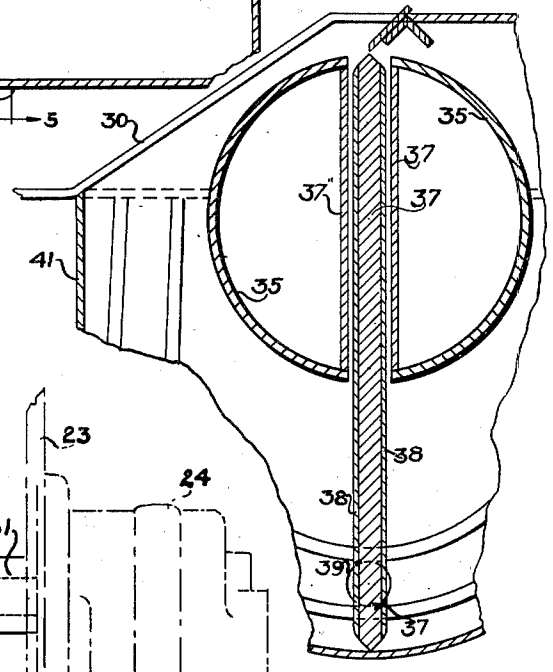
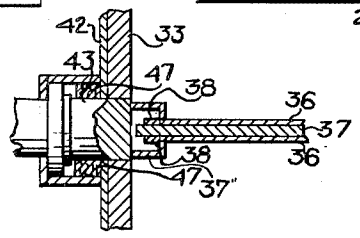


FIG 10



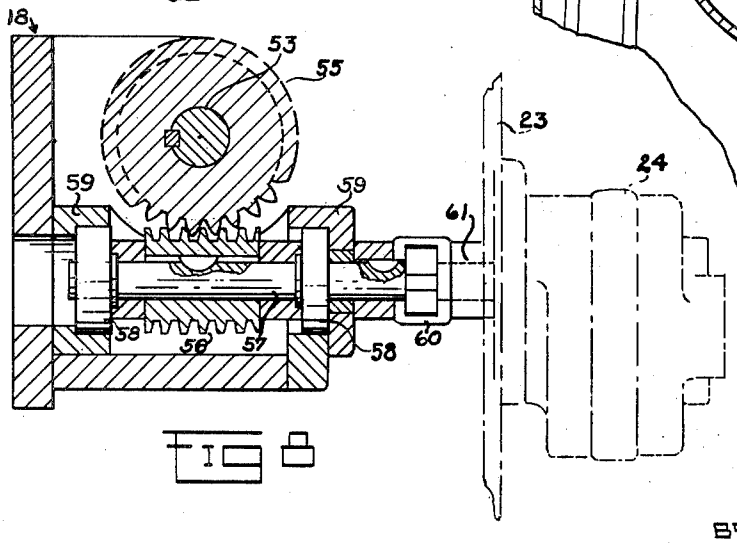


FIG 8

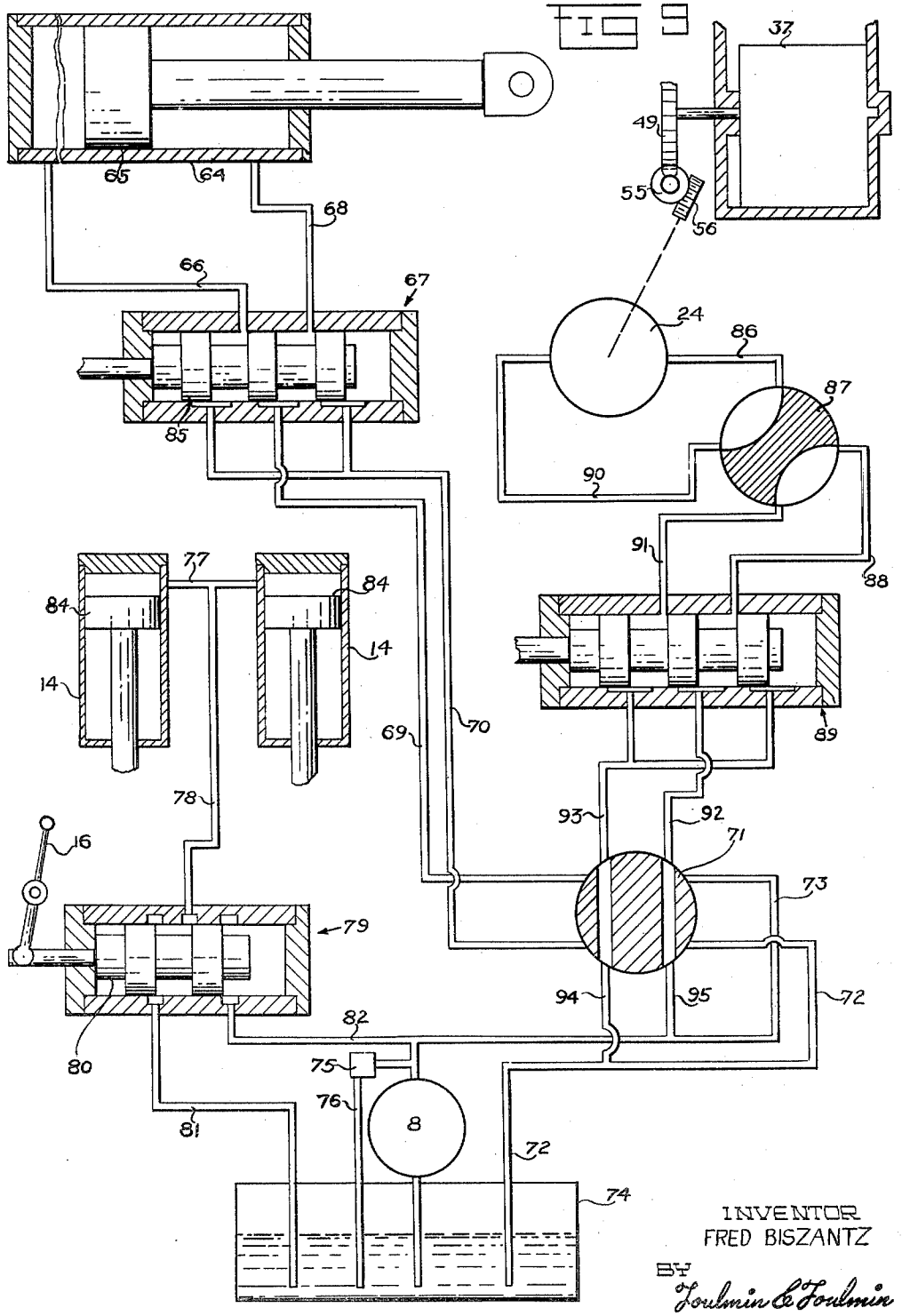
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May 30, 1950 F. BISZANTZ 2,509,388

GARBAGE TRUCK

Filed Feb. 1, 1946 5 Sheets-Sheet 5

FIG 9



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Patented May 30, 1950 2,509,388

UNITED STATES PATENT OFFICE

2,509,388

GARBAGE TRUCK

Fred Biszantz, Galion, Ohio, assignor to The Galion Metallic Vault Company, Galion, Ohio, a corporation of Ohio

Application February 1, 1946, Serial No. 644,896

5 Claims. (Cl. 214—67)

1

The present invention relates to garbage trucks and more particularly to trucks of this character in which the garbage is automatically loaded from a hopper into the interior of the truck.

The prior forms of automatic loading garbage trucks employ a rotating screw set on an incline and the garbage is deposited at the lower end of the screw, which conveys the material upwardly into the body of the truck. While this form of conveying mechanism is fairly satisfactory, it has been found that the inclined screw tends to become clogged when hard, solid objects, such as tin cans and the like, are included in the garbage so that it often becomes necessary to reverse the direction of the motion of the screw in order to relieve the mechanism. Another disadvantage of the screw form of feed is that the quantity of garbage that can be handled is rather limited.

The primary object of the invention is to provide an improved garbage truck which conveys the garbage from the hopper to the truck interior by means of a sweeping or swinging vane of considerable area so as to accommodate large quantities of garbage. While a single vane is preferably employed, the arrangement is such that the blade swings from one side of an actuator drum to the other side by a camming operation which presents the blade to the garbage twice during every revolution of the drum.

Another object is to provide a garbage truck of the automatic feed type which continually eats and digests the garbage at a steady flow instead of absorbing it in indigestible batches.

Still another object is to provide an improved garbage truck in which a considerable compression of the garbage is obtained as it passes from the hopper to the truck interior and this compression effect causes a dehydration of the contents as well as permitting the full utilization of the interior of the truck.

Another object is to provide a vehicle of the type described in which the loading of the garbage is convenient and simple, and no doors have to be opened or closed.

Still another object is to provide a garbage truck of the dump body type and in which the contents may be dumped with the assurance that it cannot tip over backwards and there are no encumbrances to prevent the contents from sliding.

Further objects and features will be apparent as the specification is perused in connection with the accompanying drawings, in which:

Figure 1 represents the rear side view of the improved garbage truck with a portion broken away in section to show some of the interior elements.

2

Figure 2 is a rear elevation view of the improved truck.

Figure 3 represents the end view of the swingable hopper in dot-dash outline, together with the actuating gearing including the hydraulic motor.

Figures 4 and 5 are vertical sectional views taken through the hopper and the swingable vane mechanism, the position of the vane or paddle being different in the two figures.

Figure 5 is a view taken along the line 5—5 in Figure 6.

Figure 6 is a cross sectional view taken through the vane when the latter is in a vertical position as shown in Figure 5. The section is taken along line 6—6 in Figure 5.

Figure 7 is a view similar to Figure 5 except that it is taken along line 7—7 in Figure 6.

Figure 8 is a sectional view, in enlarged form, taken along line 8—8 in Figure 3 to show in detail the mechanism associated with the swingable vane element.

Figure 9 shows in diagram a typical form of hydraulic system which can be employed to actuate various hydraulic motors in tilting the body, also operating the end gate and in causing the garbage pusher vane to swing.

Figure 10 is a detail section view taken along line 10—10 in Figure 6.

Referring more particularly to Figure 1, reference character 1 designates the body of the garbage truck which is preferably completely enclosed except for the opening at the rear in which the garbage is introduced. The body is provided with a floor or platform 2 which is separated by cross bolsters 3 from two or more longitudinal sills 4. At each side of the truck, near the rear end, heavy trunnions 5 are provided, mounted on suitable plates and the latter are carried by heavy frame members 6. These members may be spring supported from an axle (not shown) on which wheels 7 are mounted. A pump 8 is carried on the frame members 6, this pump being actuated from the engine (not shown) of the truck and serves, among other functions to be described hereinafter, to elevate the body from the horizontal position shown to an inclined position indicated generally by the dot-dash lines 9. For this purpose, the usual form of tilting apparatus 10 may be employed, connected through suitable levers to a hydraulic motor (usually of a reciprocatory type as will be further explained in connection with the hydraulic circuit) and

supplied with pressure fluid from the pump 8. The tilting or dumping mechanism forms no part of the present invention and, therefore, no detailed description appears to be necessary.

The end of the truck is provided with a swingable tail door 11 pivoted at 12, this door being adapted to move outwardly when the body is in tilting or dumping position. A pair of inwardly projecting lug plates 13 are oppositioned at opposite sides of the door 11 near the top. An expansible hydraulic element 14 is connected between each of the plates 13 and a swivel lug 15 which is secured to the top stationary portion of the body. When pressure is applied to each element 14, as will be explained in connection with the hydraulic system (Figure 9), the piston within the cylinder is moved to push the plates 13 away from the lugs 15 and thus, swing the door 11 about its pivots 12. The application of pressure fluid to each cylinder 14 is controlled by a hand lever 16 operated through a valve 17, the pressure fluid being obtained from the pump 8.

Hopper mechanism

As shown in Figures 1 and 2, the hopper may comprise a hollow housing formed of heavy sheet metal and supported at the top by a transversely extending framework 19 carried on upright portions 20 which are secured in any suitable manner to the floor of the truck. The framework also includes a separate compartment 21 which houses the actuating mechanism generally indicated at 22 for the pusher vane contained within the hopper housing. A heavy bracket 23 is also secured to the platform 2 of the truck, and extends downwardly for carrying a valve 24 and an associated hydraulic motor which is adapted to rotate the actuating mechanism 22 of the hopper. It is apparent that the entire hopper and all of the associated mechanism including the hydraulic motor, valve, etc., are carried by the platform 2 of the truck so that as the truck body is raised to a dumping position these various elements travel with the body as indicated by the dot-dash lines 25 in Figure 1.

As shown in Figures 4 to 7 inclusive, the housing 18 takes a semi-circular shape at the bottom and a combined triangular and flat shape at the top, the bottom portion being completely closed except for a small drainage opening 26 which leads into a tank 27 secured to the bottom of the housing. The housing 18 is quite wide so as to accommodate a large amount of garbage and the inlet to the housing is constituted of an opening 28 in one of the inclined sides and of sufficient size to accommodate an ordinary garbage pail or can 29. The outlet or discharge opening of the housing is indicated at 30, the lower edge of this opening being on approximately the same line as the level of the platform 2. It will be understood that the sides of the housing 18 are completely closed by plates 31; these sides may be provided with a shoulder indicated at 32, Figure 6, for accommodating a pair of heavy plates 33 which constitute end cover members for a pair of drum segments 35. Cam tracks 34 may be constituted of a pair of rectangular uprights extending inwardly from each of the plates 31 and positioned parallel with respect to one another. These uprights take a general curvilinear shape for purposes which will be explained presently and terminate at the top at a position at the approximate center of the opening 28. The drum 35 is split down the center to form two parts which are separated

from one another and each part is closed at the end by one of the cover plates 33. As shown in Figure 6, the latter loosely abut the inner surfaces of the housing at each side and are supported on the shoulder 32 of the housing.

The plates 36 extend diametrically across each semi-circular segment of the drum and these plates are spaced apart a difference sufficient to slidably receive a metal vane or paddle 37. If desired, ribs 37' may be employed to add stiffness to the drum and also to the mid-diametral portion of the plates 36. These ribs are preferably positioned about 90° removed from the plates 36 as shown in Figure 5. The vane is constituted of a relatively heavy metal plate and has a length approximately the same as the length of the drum 35, but a width of approximately twice the diametral distance of the drum so that a considerable portion of the vane extends below the drum as can be seen in Figure 5.

In order to prevent the vane 37 from moving lengthwise of the drum 35 and also to give support to the edges of the vane where it contacts the end plates 33, a structure of the character shown in Figures 7 and 10 may be employed. On each side of the vane, there is secured to the end plates 33, a member 37'' of angular cross-section which extends across the diameter of each drum segment and has a length approximately the same as the drum diameter. The outer flange portion of each member extends inwardly toward the vane, on each side, and the plate 36 of each drum segment extends only as far as the outer surface of these flange portions, i. e., between the flanges at opposite ends of the drum. A pair of narrow metal strips 38 are secured to the vane 37 on both sides and at each end, these strips having the same length as the entire width of the blade (Figure 7). The strips are positioned on the opposite side of the flange portions or members 37'' from the plates 36. These strips 38 slidably contact over a limited portion of their lengths, the inner surface of the flange portions of the members 37'' so that the strips not only serve as giving added support to the ends of each vane and particularly that portion of the vane which is being momentarily received by the space between the drum segments but also serve as stops for preventing any excessive end play of the vane as it slides between the plates 36.

The vane 37 is provided at each end with a roller 39, this roller having a diameter somewhat less than the distance between the projections 34. The arrangement is such that as the drum 35 is rotated in a manner which will be described presently, the lower roller 39 is constrained to the path determined by the projections 34 and as will be noted, this path becomes shorter as the vane moves either to the right or left of the center of Figure 5. Thus, the vane is caused to slide between the plates 36 of the drum 35. The reason for requiring the vane to slide in this manner as it swings with the rotating drum 35 is to assure that the end of the vane will always contact or scrape the lower portion of the housing 18. It will be noted in this connection that the cam tracks 34 are given the proper configuration or path direction to accomplish this effect. The housing has a rounded configuration at the bottom (Figure 5) which actually is eccentric with respect to the center 40, thus extending toward the center until it approaches the flat vertical portion 41. Consequently, the garbage that has been emptied from the can 29 into the housing at the

right hand side as seen in Figure 5 is pushed downwardly into the space between the drum 35 and the housing by the rotating vane 37. The space into which the garbage is first moved is relatively large and then it becomes more and more restricted as the vane 37 proceeds from the vertical position to a horizontal position (clockwise movement). Consequently, the garbage is compressed into approximately one-half the space that it originally occupied by this sweeping action of the vane in moving from the horizontal position at one side of the housing to a corresponding position at the opposite side. The fluid or liquor that is squeezed from the garbage during this compressing action can flow through the opening 26 into the tank 27 from which it is periodically drained. A scraper 41' of any well known and suitable type may be mounted endwise on opposite sides of the housing to keep the drum reasonably free from clinging pieces of garbage.

Actuating mechanism for rotating the drum 35

It has been pointed out that the drum is carried on the end plates 33. These plates fit loosely between the sides 42 of the housing 18 so as to permit a sliding movement and are carried on a pair of shafts 43 (Figure 6). Each of the latter is provided with the inner race of a ball bearing 45 of which the outer race is fixedly held within a circular pocket 46 secured to the partitions 42 of the housing. If desired, packing material 47 may be interposed between each of the ball bearings and the partitions 42 to prevent the escape of liquor from the interior of the housing to the ball bearing. One of the shafts 43 is continued through the closure member of the left hand pocket (Figure 6) to terminate in a shaft portion 48. A worm gear 49 is keyed to the latter as indicated at 50 and bolted as at 51.

Referring now to Figure 3, the worm gear 49 meshes with a worm 52 which is carried on a shaft 53 journalled at 54 to the interior surface of the housing. A worm gear 55 is keyed to the shaft 53 and this gear meshes with a worm 56. The worm 56 is keyed to a shaft 57 (Figure 8) which is journalled at 58 in a suitable pocket housing 59 secured in any suitable manner to the housing 18. The bearings 58 are preferably of the frictionless ball bearing type. The shaft 57 extends through the right hand bearing as seen in Figure 8 and carries a tooth coupling member 60 of any suitable and well known type. The other half of the coupling is carried by a shaft 61 which is driven by a hydraulic motor 24 preferably of the rotary type which is secured to the bracket 23. Inlet and outlet conduits 62, 63 (Figure 2) are taken to the motor 24, these conduits being in communication with the main pump and fluid reservoir respectively as will be described in connection with the hydraulic system. Thus, as the motor 24 is caused to rotate the worm 56 is turned, causing the worm gear 55 and the worm 52 to rotate which in turn provides a rotary effect for the drum 35.

It has been explained that when the drum rotates, the vane 37 is caused to swing about the center 40 and the cam tracks 34 causes the vane to move to and fro in the slot provided between the plates 36. The double worm actuating mechanism shown in Figures 3 and 8 serves to reduce the rotary speed of the vane 37 to approximately five revolutions per minute, but still permitting the hydraulic motor 24 to rotate at its most efficient speed which is usually considerable. This reduced speed between the hydraulic motor and the rotary vane lends greater pushing effect to the vane in moving the garbage from the inlet side 28 of the hopper 18 through the compressing action and to the outlet side 30. Lateral rigidity is imparted to the vane during its rotary motion through the mass of garbage by the guides 38 and the plates 36 within the drum 35. These plates and guides, as well as the vane 37, may be constituted of hardened steel so as to eliminate undue wear and to assure minimum friction as the vane slides between the guide members during its rotary excursions.

The hydraulic system

Referring to Figure 9, the main tilting or dumping motor of which there may be two per truck is represented by the cylinder 64 and its contained piston 65. The use of a reciprocatory motor of this type in connection with a truck tilting operation is well known so that no further description of the details is necessary.

The lifting side of the piston 65 is in communication with a conduit 66 which leads to a four-way valve 67 of any suitable and well known type. The opposite side of the piston is provided with a conduit 68 which also leads to the same valve. Pipes 69 and 70 connect with a valve 71 having a pair of parallel passageways and conduits 72, 73 are taken from the valve 71 to a main pump 8 and a reservoir 74 respectively. There is a relief by-pass valve 75 and an associated conduit 76 connected across the pump 8 which opens when excess pressure is developed anywhere in the hydraulic system due perhaps to an obstruction.

The rear door opening and closing motors are indicated by a pair of cylinders 14 positioned at each side of the door and connected in parallel through a conduit 77. This conduit extends through a pipe 78 to a three-way valve 79 having a valve stem 80. A conduit 81 is taken from the valve 79 to the reservoir 74 and a conduit 82 is also connected between the valve 79 and the main pump 8.

Thus, when it is desired to empty the truck of garbage by a dumping action the valve stem 80 is moved by a handle 83 to such a position that pressure fluid flows from the pump 8 to the top side of the pistons 84. The latter applies pressure to the lug plates 13 (Figure 1) which causes the door 11 to swing about its swivel 12. Simultaneously with this operation the valve stem 85 of the valve 67 is moved by a handle (not shown) to a position such that pressure fluid passes from the pump 8 through the conduit 73, pipe 69 to pipe 66, causing the piston 65 to move to the right and thus to hoist the body of the truck to the dot-dash line indicated in Figure 1. It is obviously assumed that the valve 71 has been rotated to a position such that the openings therethrough register with the conduits 72, 73. The exhaust fluid from the right hand side of the piston 65 is lead through the conduit 68, valve 67, through conduit 70, valve 71 to the pipe 72 and thence to the reservoir 74. In order to return the truck body to its horizontal position after disposing of the contained garbage, the valve 67 is operated to a position such that pressure fluid is admitted to the conduit 68 while the pipe 66 is being exhausted. At the same time, the handle 16 is operated to exhaust the top side of the pistons 84 through the pipe 81 and the door will swing to its closed position as the truck body comes to rest.

The hydraulic motor 24 is supplied with pressure fluid through a conduit 86, connected through an emergency valve 87 to a conduit 88 which leads to a four-way reversing valve 89 of any well known and suitable type. The other side of the motor is connected through a conduit 90, the valve 87 to a conduit 91 which also leads to the reversing valve 89. A pressure fluid pipe 92 and an exhaust pipe 93 are connected to the valve 71. There is a pair of pipes 94, 95 connecting the valve 71 with the exhaust pipe 72 and the fluid pressure pipes 73 respectively. Assume that the valve 71 has been moved to the position shown in Figure 9 and that the valve 87 has been rotated clockwise such that the conduit 86 is in communication with the conduit 88, which would bring the conduit 90 in communication with the conduit 91. As the valve 89 is left in the position indicated in this figure, pressure fluid will pass from the pump 8 through the valve 71, the conduits 92, 88, and 86 to the motor 24. This motor will cause the drum 35 to rotate and which in turn gives rise to a reciprocatory movement of the vane 37 as was explained hereinbefore. If, for any reason, there is any clogging effect or obstruction of any kind encountered within the hopper as, for example, when tin cans are contained in the garbage, the operator, if he notices this condition, will immediately rotate the valve 87 to the position shown in the figure which in effect by-passes the pump because a direct connection has been established between the pressure line 88 and the exhaust line 91, and this will immediately stop the rotary movement of the vane 37. Should the operator desire to reverse the movement of the vane so as to clear the obstruction in this manner, it is simply necessary to move the reversing valve 89 to a position such that the conduit 90 now becomes the pressure line and the conduit 86 the exhaust line and the motor 24 will rotate in the opposite direction. If the obstruction appears without the notice of the operator and is sufficiently severe to cause an excessive back pressure to develop anywhere in the system, the valve 75 will open to discharge the output of the pump 8 directly back to the reservoir. This valve will also act in this manner should any excess pressure be developed in either of the hydraulic motors 64 or 14. Consequently, considerable protection against all exigencies within the system is obtained and yet flexibility of operation is assured.

It will be noted that by requiring the pressure fluid which operates each of the motors 64 and 24 to pass through the same valve 71, complete independence of the operation of these two motors with respect to one another is obtained so that it would be impossible to operate the vane rotating motor while the dumping or hoist motor 64 is being operated and vice versa. Consequently, the garbage pushing and compressing device can be operated only when the truck body is in a horizontal position, thus ready to receive the garbage and the body can be hoisted or tilted only after the vane rotating mechanism has stopped. This arrangement adds a high degree of protection to the operation of the structure as a whole.

It will be further noted that the garbage pump consisting of the rotary vane 37 and the housing 18 is part of, and integrally mounted in the body of the truck so that it participates in the movement of the body as the latter is swung about its pivots 5. The contents of the body will therefore readily slide over the exterior surface

of this pump housing. In order further to prevent the garbage from falling into any of the moving parts of the truck either while the body is being hoisted to the disposal position or while garbage is being connected and received into the hopper, all sides of the truck body are preferably extended well down over the wheels as indicated by the tail plate 96 (Figure 2) and the side plates 97 (Figure 1) forming integral parts of the body. These tail and side plates also serve to protect the various pumps and valves from external impacts and assure their continued operation by preventing mud from being splattered thereon.

It will be understood that I desire to comprehend within my invention such modifications as come within the scope of the claims and the invention.

Having thus explained my invention, what I claim as new and desire to secure by Letters Patent, is:

1. In combination, a truck frame, a body mounted thereon, an opening in the body for receiving waste material, said opening leading into a compartment within the body which becomes progressively smaller away from the opening, means including a swingable vane for moving the material through said compartment into the interior of the body, said vane being adapted to move in the direction of its width so as to accommodate the change in the size of said compartment as the vane pushes the waste material from the opening into the body of the truck, and means for removing from the compartment the liquid exuded by such waste material as it is compressed during the passageway through said compartment.

2. In combination, a truck frame, a body mounted thereon, a housing secured thereto into which waste material is first deposited, an opening in said housing for receiving the waste material, means including a swingable element for pushing the material away from said opening through the interior of the housing and into the body, said element being adapted to swing through a space which becomes progressively smaller as the element approaches said body whereby the waste material is caused to be compressed as it moves into the interior of the body, and a sump connected to receive the liquid squeezed from the waste material during its movement by said element.

3. In combination, a truck frame, a body mounted thereon, an opening in the body for receiving waste material, said opening leading into a compartment within the body which becomes progressively smaller as the interior of the body is approached, means including a swingable vane for moving the material through said compartment into the interior of the body, said vane being guided to move in the direction of its width so as to have one edge closely adjacent the interior surface of the compartment thereby to accommodate the change in the size of said compartment and to be in contact therewith as the vane pushes the waste material from the opening through the compartment into the body of the truck and a chamber connected with the lowermost part of said compartment for collecting liquids squeezed from the waste material during movement thereof by said vane.

4. In combination, a truck frame, a body pivotally mounted adjacent its rear end on said frame for tilting in the vertical direction, a compartment at the bottom rear end of said body

forming a part thereof and having an opening exposed to the exterior of the body for receiving waste material and another opening communicating with the interior of the body and means including a swingable vane positioned within said compartment for moving said material away from the external opening through the compartment and into the interior of the body, said compartment being substantially closed at a position which constitutes the temporary uppermost surface when the body is tilted in the vertical direction whereby the waste material is caused to flow by gravity over the floor of the body and over said compartment to the exterior of the truck when the body is tilted in the vertical direction.

5. In combination, a truck frame, a body mounted thereon, means pivoting said body on said frame on a transverse axis adjacent the rear end of said body, a compartment formed in said body for receiving waste material, and positioned largely to the rear of said axis, said compartment including an arcuate channel which becomes progressively smaller from the exterior of the truck to the interior thereof, a rotary vane contacting the surface of said compartment through its variations of dimensions for moving the waste material through the compartment and simultaneously compressing the same, a cam which constrains the vane to move in the direction of its width in order to cause the one edge of the vane to scrape the compartment throughout the length of travel of the waste material through the compartment, and a sump connected with the lowermost portion of said channel for receiving liquids squeezed from the waste material during its passage through said channel.

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