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L. S. GILLES

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REFUSE PACKING AND HAULING VEHICLE

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2 Sheets-Sheet 1

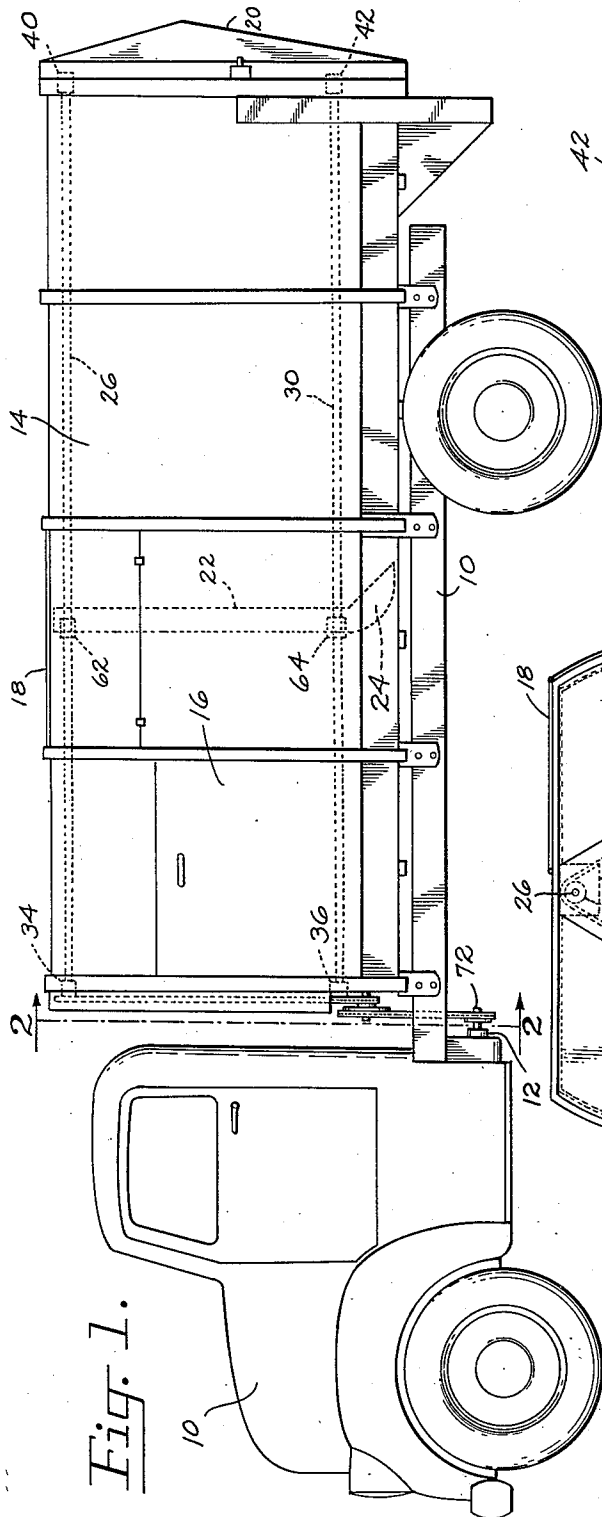


Fig. 1.

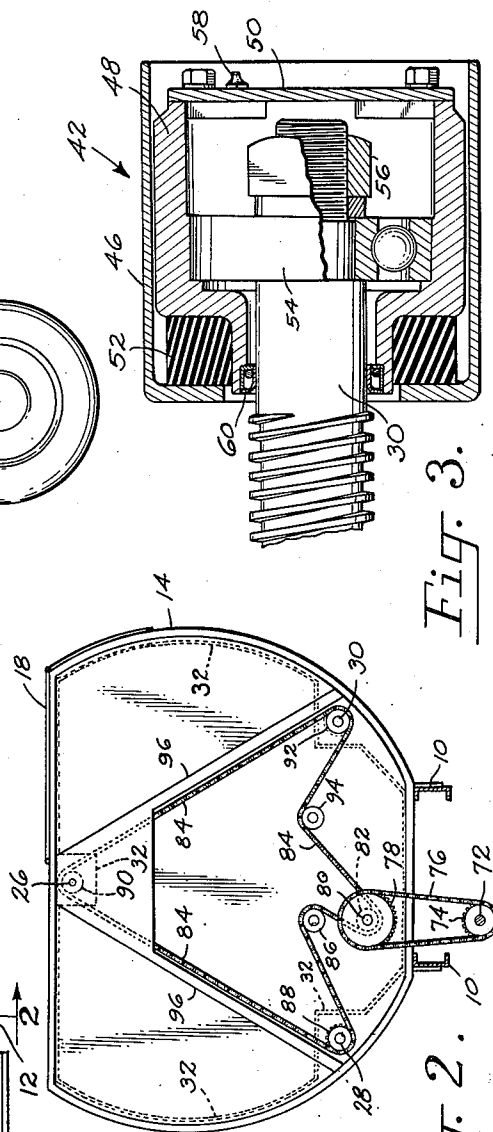


Fig. 3.

Fig. 2.

INVENTOR.
Leonard S. Gilles
BY Eugene D. Farley
Att'y.

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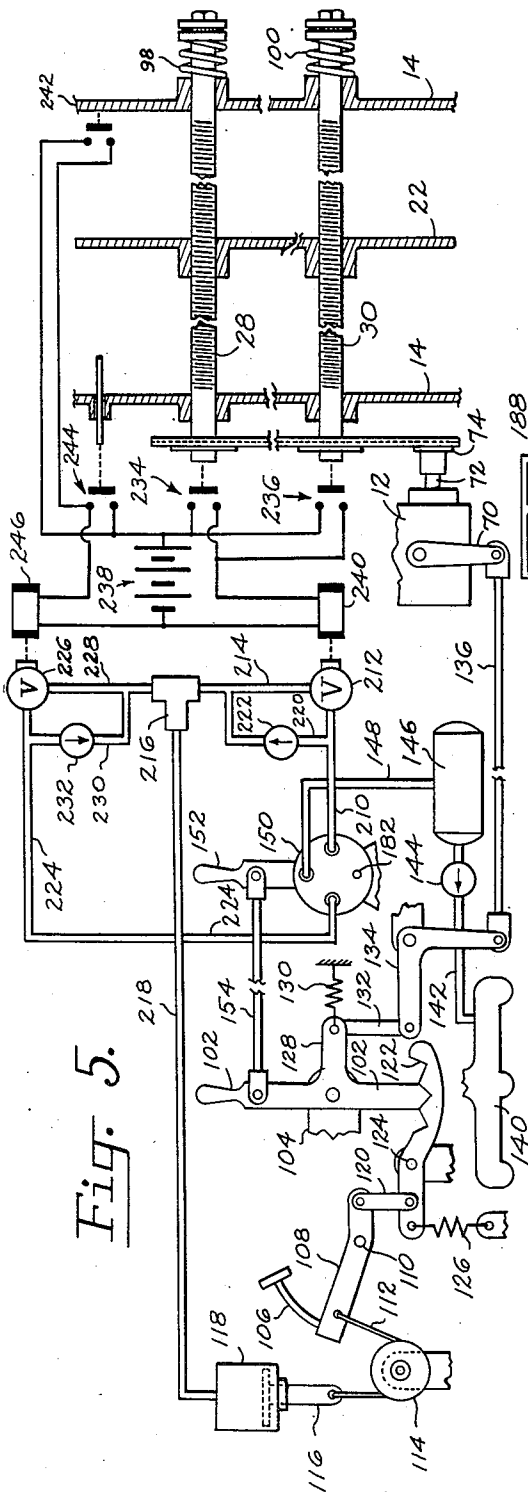


Fig. 5.

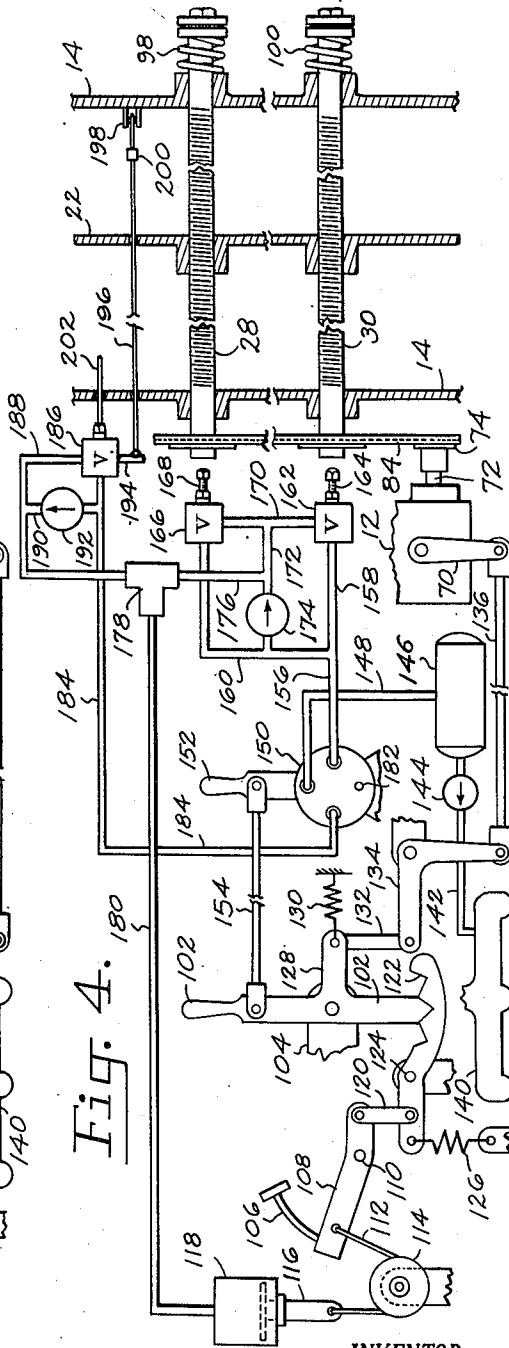


Fig. 4.

INVENTOR.
Leonard S. Gilles
BY
Eugene D. Farley
Att'y.

2,808,158

REFUSE PACKING AND HAULING VEHICLE

Leonard Sherman Gilleo, Portland, Oreg., assignor to U. S. Sanitary Packer Corporation, Portland, Oreg., a corporation of Oregon

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7 Claims. (Cl. 214—82)

This invention relates to refuse hauling apparatus of the class employed for conveying away garbage, leaves, sawdust, ashes, fertilizer, snow and other refuse materials.

It is the general object of the present invention to provide refuse hauling apparatus, specifically a garbage truck, wherein the refuse may be packed to a high degree, thereby providing a truck of large capacity per unit volume.

It is another object of this invention to provide refuse hauling apparatus wherein the contents may be packed or compressed to a substantial extent without damaging the drive or body.

It is another object of this invention to provide refuse hauling apparatus provided with a packing plate which may be driven from a conventional truck motor without extensive modification thereof.

It is another object of this invention to provide refuse hauling apparatus which may be applied substantially universally to the various makes and styles of truck chassis.

It is another object of this invention to provide refuse hauling apparatus which is easy and safe to operate and which may be controlled positively.

It is another object of this invention to provide refuse hauling apparatus provided with means for discharging the refuse efficiently.

It is another object of this invention to provide refuse hauling apparatus which is sealed and sanitary and the drive for which can not become fouled or jammed by the refuse material, even though the latter contains wire, metal containers, bottles, and similar materials which are difficult to handle.

The manner in which the foregoing and other objects of this invention are accomplished will be apparent from a consideration of the accompanying specification and claims taken together with the drawings, wherein:

Fig. 1 is a view in side elevation of the presently described refuse hauling apparatus;

Fig. 2 is a front end view of the body section of the presently described refuse hauling apparatus taken along line 2—2 of Fig. 1;

Fig. 3 is a detail sectional view illustrating the manner of mounting screws which may be employed for driving the packing plate assembly of the herein described refuse hauling apparatus;

Fig. 4 is a schematic view illustrating one form of control means for operating the packing plate contained in the herein described refuse hauling apparatus; and

Fig. 5 is a schematic view of an alternate form of control apparatus for operating the packing plate of the herein described refuse hauling apparatus.

Generally stated the refuse hauling apparatus of this invention comprises a truck or other vehicle body provided with loading doors forwardly of the body and a discharge door hinged to the rear of the body. A packing plate is mounted for longitudinal movement within the body and has for its function packing or compressing the contents as required to completely fill the body.

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Suitable drive means coupled with the power take-off of the truck motor are provided for reciprocating the packing plate within the body. The mounting means for the packing plate is of such character that it is responsive to the pressure applied by the packing plate to the refuse during such reciprocation. Thus when a certain pressure has been reached, the mounting means shuts off the drive for the packing plate, thereby preventing damage to the same and to the other elements of the truck body. Means also are provided for limiting the travel of the packing plate at the forward and rearward ends of the body.

The body and packing plate

The construction of the body included in the refuse hauling apparatus of this invention is illustrated particularly in Figs. 1 and 2. It is mounted on a truck chassis 10 equipped with a power take-off unit 12. The body 14 may be of any suitable shape or design and is suitably affixed to the chassis. It is equipped with doors 16 on the side and doors 18 on the top for filling it with refuse material. It is also equipped with rear door 20 hinged at the top for discharging the refuse material from the body.

A packing or pressure plate 22 having a scoop-shaped lower portion 24 is mounted for longitudinal reciprocation within the body. It has for its function the packing or compressing of the refuse material in the rear portion of the body, thereby making possible carrying a maximum load.

The packing plate drive

Although the packing plate may be reciprocated by any suitable drive means, it preferably is actuated by means of screws. In the illustrated embodiment there are three such screws, screw 26 being centrally located at the top and screws 28, 30 located on opposite sides at the bottom of the body. The screw assemblies are protected by means of a liner 32.

Screws 26, 28, 30 are mounted for rotation in forward bearings 34, 36 and in rearward bearings 40, 42. The lower rear bearings serve the triple functions of supporting the screws; permitting their rotation; and permitting their movement in an axial direction. Hence they may have a construction such as is illustrated in Fig. 3.

In accordance with this construction the bearing is contained in a housing 46 formed with an opening for penetration by screw 30 and provided with means for attachment to the body. Within the housing is a liner 48 fitted with a cap plate 50. Liner 48 is formed with shoulders to provide a seat for an annular bumper block 52 which preferably is made of synthetic rubber and serves as a resilient cushion.

A ball bearing assembly 54 is contained within the liner and maintained on the end of screw 30 by means of nut 56. The interior of the bearing is maintained full of grease introduced through zerk fitting 58 and prevented from leaking out around screw 30 by means of the sealing ring 60. In this manner an efficiently lubricated bearing is provided for rotatably supporting the screw while permitting its movement in an axial direction against the resiliency of cushion 52.

Packing plate 22 is mounted on screws 26, 28 and 30 in a suitable manner, as, for example, by being mounted upon the internally threaded members 62, 64 which receive and are driven by the screws. Accordingly rotation of the screws drives the packing plate either forwardly or rearwardly of the body, depending upon the direction of rotation of the screws.

As has been indicated previously, the packing plate may be driven from the power take-off 12 of a conventional truck assembly. The power take-off is adjustable between forward and reverse positions by means of lever 70. It includes a shaft 72 to which is attached sprocket 74

(Fig. 2). Sprocket 74 drives chain 76 which in turn engages drive sprocket 78 mounted on shaft 80 on the forward end of the body 14.

Shaft 80 carries sprocket 82 which drives chain 84. The latter chain in turn engages and drives idler sprocket 86, sprocket 88 on screw 28, sprocket 90 on screw 26, sprocket 92 on screw 30, and idler sprocket 94. The three screws for the packing plate thus are driven in unison through a single chain 84 housed beneath a shielding member 96.

Packing plate drive control

A suitable control for driving packing plate 22 is illustrated in Fig. 4. In this embodiment packing plate 22 is driven by means of screws, two of which are indicated at 28, 30. The bottom screws are mounted for axial movement against the resiliency of suitable resilient members, those illustrated comprising compression springs 98, 100. It will be apparent that these have the same effect in resisting longitudinal movement of screws 28, 30 as has the rubber cushion 52 of Fig. 3.

Power take off 12 which drives screws 26, 28, 30 is controlled through an operator's lever 102 pivotally connected at a point intermediate its ends to a structural member 104. Lever 102, in turn, is controlled through clutch pedal 106 which may be the pedal conventionally used for operation of the truck motor.

Clutch pedal 106 is rigid to a lever 108 pivoted at 110 and having connected to one of its ends a flexible member or cable 112. The cable passes about a pulley 114 and is connected to the piston rod 116 of a vacuum cylinder 118.

The other end of lever 108, i. e. the right end as viewed in Fig. 4 is connected through a link 120 to a notched locking bar 122. This bar is fulcrumed at 124 to a structural member of the chassis. The one of its ends which is connected to link 120 also is connected to a spring 126 for urging is notched end resiliently into engagement with the end of control lever 102.

Lever 102 is former with an extension 128 which is interconnected with a frame member by means of spring 130. It also carries link 132 which is connected in turn to one end of bell crank lever 134.

The other end of this lever is connected through connecting rod 136 to the end of lever 70 which controls the power take-off. Hence it will be apparent that upon depressing clutch 106, control lever 102, and the power take-off lever 70 which it operates, may be adjusted between forward, neutral, and reverse directions.

Means are provided for arresting the movement of packing plate 22 when a predetermined pressure has been reached during the packing operation; when the packing plate has reached the extreme rear end of the body during discharge of the load; and when the packing plate has reached the forward end of the body after it has been retracted, ready for the introduction of additional quantities of refuse material. For successful operation of the unit, such precise control is needed to prevent damage to the mechanism by the application of excessive pressure by the packing plate, or by over-running of the plate at the forward or rearward ends of the body.

In the embodiment of Fig. 4 the motion of the packing plate is controlled through a fluid operated system, specifically through a vacuum system. Vacuum is applied to the system through the intake manifold 140 of the truck motor, which is connected through line 142 and check valve 144 to vacuum tank 146.

Tank 146 is connected through conduit 148 to the four-way valve 150. This valve in turn is operated through lever 152 which advantageously may be tied to lever 102 through connecting rod 154 so that the two levers operate simultaneously.

In one of its operative positions, valve 150 controls a mechanism for arresting the motion of packing plate 20 when a predetermined packing pressure has been reached. In this position it interconnects conduit 148 leading to

the vacuum tank and conduit 156. The latter conduit in turn divides to form conduits 158, 160. Conduit 158 is connected to an air valve 162 which is operated through a plunger 164, the end of which is adjacent the end of screw 30. Conduit 160 is connected to an air valve 166 operated through plunger 168 which in turn is adjacent the end of screw 28. Valves 162, 166 are interconnected by means of conduit 170. The latter conduit then is interconnected with conduit 160 through a line 172 which includes a check valve 174.

It is desirable to include in the control system both of valves 162, 166, located at opposite sides of the bottom of the truck body, since such an arrangement will respond to excessive pressure exerted on either side of the packing plate. Such a situation can develop where the load is introduced unevenly into the body so that a greater bulk lies on one side of the packing plate than on the other. Accordingly as the plate moves towards the rear portion of the body a greater pressure will be developed on one side than on the other. This could result in damage to the packing plate assembly and drive if valves 162 and 166, spaced apart on opposite sides of the body, were not provided.

Valves 162, 166, operating independently or jointly, act to operate means for throwing out the power take-off and thus arresting the motion of the packing plate. To this end conduit 172 is connected through line 176, three-way connector 178 and line 180 with vacuum cylinder 118. Accordingly, when either of plungers 164, 168 is actuated by the corresponding screw, vacuum is applied to cylinder 118. This retracts the piston therein, pulling on cable 112 and depressing clutch lever 108. This action in turn releases control lever 102 from the notched locking lever 122 whereupon the spring 130 acts to return the lever to its neutral position wherein power take-off lever 70 is also in its neutral position, thereby stopping the motion of plate 22.

Return of control lever 102 to neutral position also returns vacuum control lever 152 to its neutral position. In this position port 182 is connected with lines 158, 160, and accordingly atmospheric air is introduced to valves 162, 166, breaking the suction and returning them to their operative positions in which they can function to again arrest the motion of the packing plate.

Means for preventing over-running of the packing plate when it is used to discharge the contents of the body from door 20 also are provided. Such means include conduit 184 which interconnects vacuum valve 150 with valve 186. The latter valve in turn is connected through conduit 188 with the three-way connector 178, a by-pass line 190 and check valve 192 being included between lines 184 and 188.

Valve 186 is provided with a control lever 194 which is connected to a rod 196. The latter rod extends the length of the body, sliding through or beneath the rear end wall thereof and through packing plate 22. Its forward end slides in a socket member 198. A contact button 200 is rigid to rod 196. This button is positioned at the extreme limit of rearward travel of the packing plate. Accordingly, when the packing plate reaches this limit it contacts button 200, operates valve 186 and applies suction to vacuum cylinder 118. This in turn throws out the control lever 102, returning the power take-off to its neutral position.

Means also are provided for arresting the motion of packing plate 22 at the extreme rear limit of its travel. To this end valve 186 is provided with lever 202. As the packing plate travels rearwardly it contacts this lever, operating valve 186. Vacuum thereupon is applied to cylinder 118, which throws out control lever 102 and the power take-off so that the rearward movement of the packing plate is arrested.

Alternate control for packing plate drive

An alternate control for the packing plate drive is illustrated in Fig. 5. In this form of the invention electric

means are provided for controlling the motion of the plate. As in the embodiment of Fig. 4, the plate is driven from the power take-off 12 by manipulation of control lever 102 operated in conjunction with clutch lever 106. The control for the drive includes again vacuum tank 146 evacuated from intake manifold 140 of the truck, valve 150 operated through lever 152 tied to lever 102, and vacuum cylinder 118 connected to the clutch.

Also included in the vacuum circuit are a conduit 210 and a solenoid operated valve 212, which takes the place and does the work of valves 162, 166 of Fig. 4. Valve 212 is connected to vacuum cylinder 118 through conduit 214, valve 216, and conduit 218. A bypass line 220 which includes a check valve 222 interconnects conduits 210, 214.

Further included in the vacuum circuit is a conduit 224 which connects solenoid operated valve 226 with valve 150. Valve 226 corresponds in function to valve 186 of Fig. 4. It is connected to vacuum cylinder 118 through conduit 228, valve 216 and conduit 218. A bypass or vacuum release line including check valve interconnects conduit 224 and 228.

Valve 212 is actuated when excessive pressure is applied by the packing plate. When this occurs, one or both of screws 28, 30 moves in an axial direction closing one or both of electric switches 234, 236. This completes an electric circuit including current source 238, one or both of switches 234, 236 and solenoid 240. Upon energization, solenoid 240 operates valve 212 to throw out power take-off 12, thereby arresting the motion of plate 22.

Valve 226 works to limit the travel of the packing plate between extreme positions of advancement and retraction, in the same manner as valve 186 of Fig. 4. It is actuated when the packing plate closes a limit switch 242 on a rear frame member of the body or a limit switch 244 on a forwardly located frame member thereof. When either of these switches is closed, an electric circuit is completed including current source 238, one of switches 242, 244, and solenoid 246. Energization of the solenoid operates the valve 226, which in turn operates cylinder 118 throwing out the power take-off 12 and arresting the motion of the packing plate.

Operation

In operation, the packing plate of the presently described refuse hauling apparatus normally initially is in its position of extreme retraction, i. e. at the extreme left in Fig. 1. Refuse material then may be introduced into the body through doors 16 or 18. When an accumulation of material has been deposited in front of the packing plate, the plate is advanced as required to push the material toward the rear door 20 and to pack it or compress it there for increasing the capacity of the vehicle. The plate then is retracted to its initial station and a further quantity of refuse material deposited in front of it. This sequence may be repeated until the body is substantially full. The material then is conveyed to the discharge point, door 20 opened and the material ejected from the open door by again advancing plate 22.

In the foregoing series of operations over compression of the load, and over travel of the packing plate in both directions is prevented by the provision of suitable means. In the control means of Fig. 4, rearward travel of packing plate 22 is achieved by depressing clutch pedal 106, thereby releasing lever 102 from engagement with locking lever 122. Lever 102 then may be adjusted for forward or reverse driving motion. As this is done, lever 152 which is connected to lever 102 also is adjusted for establishing the necessary circuits in the vacuum lines.

Thus at the same time that lever 102 operating through bell crank 134 and lever 70 shifts the power take-off for rearward driving of the packing plate, lever 152 establishes a vacuum circuit including intake manifold 140,

vacuum tank 146, line 148, valve 150, lines 158, 160, and valves 162, 166 (Fig. 4).

If valve 162 is actuated, a vacuum circuit is completed from vacuum tank 146 through line 148, valve 150, line 158, valve 162, line 170, lines 172, 176, valve 178, line 180 and vacuum cylinder 118. The vacuum established in the latter cylinder retracts the piston rod 116 contained therein. This throws out clutch 106, releasing lever 102 which thereupon assumes its intermediate, neutral position because of the action of the spring 130.

At the same time, the lever 152 which is connected to lever 102 is returned to its neutral position. This closes off the vacuum circuit through valve 162 and opens the circuit including air port 182, line 156, line 160, check valve 174, line 172, line 170 and valve 162. Air accordingly is admitted to valve 162 which is again placed in operative position ready for a subsequent contact by screw 30.

When plunger 168 of valve 166 is contacted by the end of screw 28 and a similar sequence occurs. In this case a vacuum circuit is established including vacuum tank 146, line 148, valve 150, line 156, line 160, valve 166, line 170, line 172, valve 178, line 180 and vacuum cylinder 118. Again the piston rod 116 in the latter is retracted, which depresses clutch pedal 106, throwing lever 102 into its neutral position. The latter motion carries lever 152 to its neutral position also, thereby interconnecting valve 166 and air port 182 through check valve 174 for breaking the vacuum in the valve.

After packing plate 22 has been employed for compressing the load within the body it may, as has been indicated above, be used for ejecting the load. In this use door 20 is opened and the packing plate advanced. When it reaches its position of extreme advancement, it contacts button 200 on rod 196. This actuates valve 186, the control lever 194 of which is connected to rod 196. Actuation of the valve establishes a vacuum circuit in line 146, line 148, valve 150, line 184, valve 186, line 188, valve 178, line 180, and cylinder 118. As soon as a vacuum is established in the latter cylinder it acts to depress clutch pedal 106, releasing lever 102 which returns to its neutral position. This throws the power take-off into its neutral position, and also shifts the lever 152 into its neutral position. The latter action interconnects air port 182 and valve 186 through check valve 192, breaking the vacuum in valve 186 and making it ready for another operation.

When the packing plate is retracted to its extreme position to the left as viewed in Fig. 4, it contacts lever 202 on valve 186. This opens the same vacuum circuit as discussed above in connection with the operation of lever 194 on the valve, evacuating cylinder 118 and throwing out clutch 106. Again this throws out the power take-off through the action of lever 70, and breaks the vacuum in valve 186 through the action of lever 152.

The operation of the form of the invention illustrated in Fig. 5 is similar, with the exception that the valves controlling the operation of the vacuum system are operated by means of an electric circuit. Accordingly with the development of pressure by advancement of the packing plate, extension of one or both of screws 28 and 30 will close one or both of electric switches 234, 236. This closes the circuit energizing solenoid 240 which thereupon operates valve 212. This actuates vacuum cylinder 118, throwing out lever 102 controlling the power take-off and lever 152 controlling the vacuum system in the manner described above with reference to valves 162, 166 of Fig. 4.

Advancement of the packing plate to its extreme position during discharge of the load closes electric switch 242 which in turn completes the circuit including solenoid 246. Valve 226 operated by the solenoid then actuates cylinder 118 and control levers 102, 152 to throw out the power take-off and return the vacuum system to neutral

in the manner explained above with reference to valve 186 in Fig. 4.

Also, when the packing plate is retracted to its extreme position, ready for the introduction of a further quantity of refuse material into the truck body it closes switch 244, again completing the circuit including solenoid 246, and operating valve 226 in the manner explained above.

Thus it will be apparent that by the present invention I have provided refuse hauling apparatus of high capacity which includes a packing plate operable with a high degree of efficiency. The plate may be operated without danger of damage to the drive mechanism, and the moving parts may be lubricated effectively in spite of the corrosive character of the vehicle contents. Still further, the packing mechanism is applicable to a wide variety of truck installations, may be operated directly from the clutch of a conventional truck motor, is subject to positive control, and is easy and safe to operate.

It is to be understood that the form of my invention, herewith shown and described, is to be taken as a preferred example of the same, and that changes in the nature of the fluid medium employed for driving the apparatus, and in the arrangement and application of the electric circuits, as well as other changes in the shape, size and arrangement of the parts, may be resorted to without departing from the spirit of my invention or the scope of the subjoined claims.

Having thus described my invention, I claim:

1. Refuse hauling apparatus comprising a body, a packing plate mounted for longitudinal reciprocation within the body, elongated motor driven screw drive means extending longitudinally of the body and connected to the packing plate for reciprocating the latter, bearing means on the body supporting the elongated screw drive means for limited longitudinal displacement, resilient means interengaging the body and the screw drive means and providing a predetermined resistance against said longitudinal displacement of the latter, whereby the screw drive means is displaced said limited distance by the packing plate when said predetermined resistance is overcome by the pressure of refuse being compressed by said packing plate, and control means for the motor of the drive screw means and including actuating means arranged on the body for engagement by the screw drive means upon said predetermined longitudinal displacement of the latter, whereby to actuate the control means to arrest the driving of the screw means.

2. The apparatus of claim 1 wherein the control means comprises clutch means for releasably connecting the motor to the screw drive means, fluid pressure operated actuating means connected to the clutch means, valve means associated with the actuating means for controlling the fluid pressure thereto, and valve operating means positioned for engagement by the screw drive means upon said displacement of the latter.

3. The apparatus of claim 1 wherein the fluid pressure operated actuating means comprises a vacuum motor connected to the intake manifold of an internal combustion engine.

4. The apparatus of claim 1 wherein the valve operating means comprises electric solenoid means having an electric circuit, and switch means in said circuit positioned for actuation by the screw drive means upon said displacement of the latter.

5. The apparatus of claim 1 wherein the bearing means comprises a hollow housing secured to said body and having a restricted opening at one end to receive the end of the screw drive means freely there through, a bearing mounted on said end of the screw drive means and contained freely within the housing, and resilient means interposed between the bearing and the end of the housing having said restricted opening.

6. The apparatus of claim 2 including limit valve means associated with the fluid pressure operated actuating means, and limit valve operating means arranged on the body for engagement by the packing plate at the limits of travel of the latter, to arrest the driving of the screw means.

7. The apparatus of claim 6 wherein the limit valve operating means comprises electric solenoid means associated with the limit valve means and having an electric circuit, and electric switch means in said circuit and arranged for engagement by the packing plate at said limits of travel of the latter.

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