Oct. 20, 1959 J. F. WEIR 2,909,295

VEHICLE BODY WITH PACKER AND EJECTOR

Filed Oct. 20, 1955 4 Sheets-Sheet 1

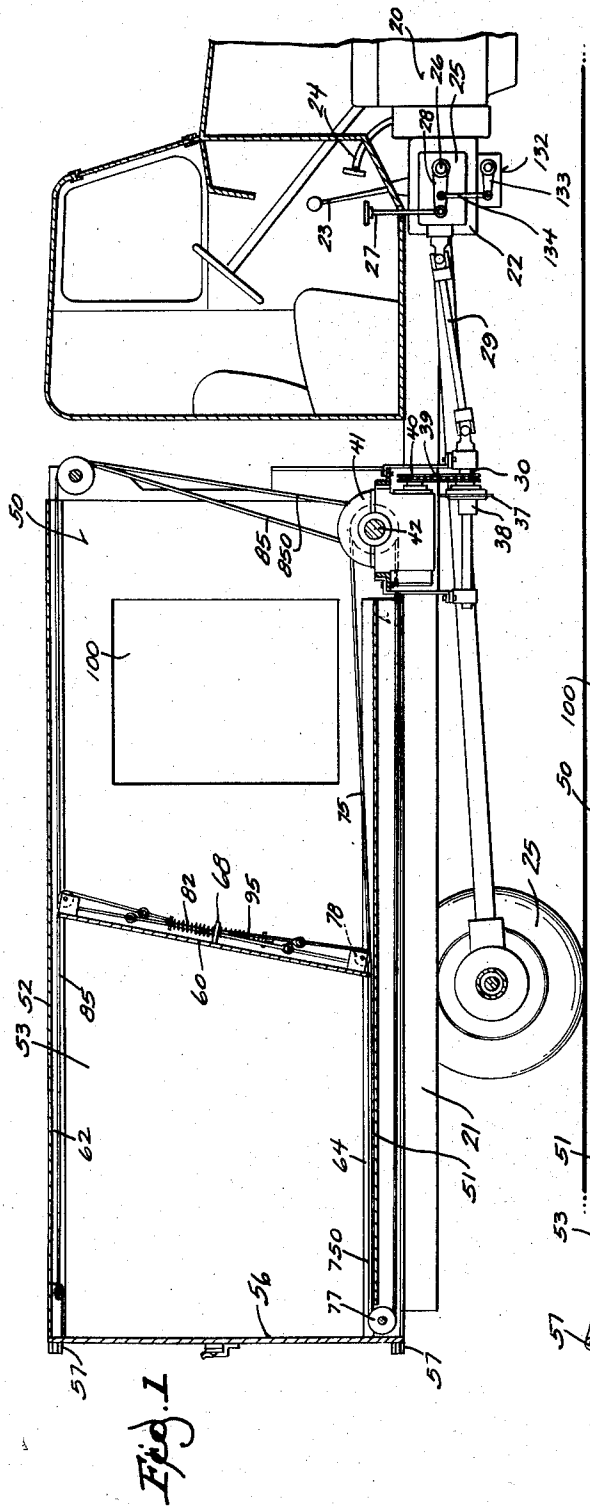


Fig. 1

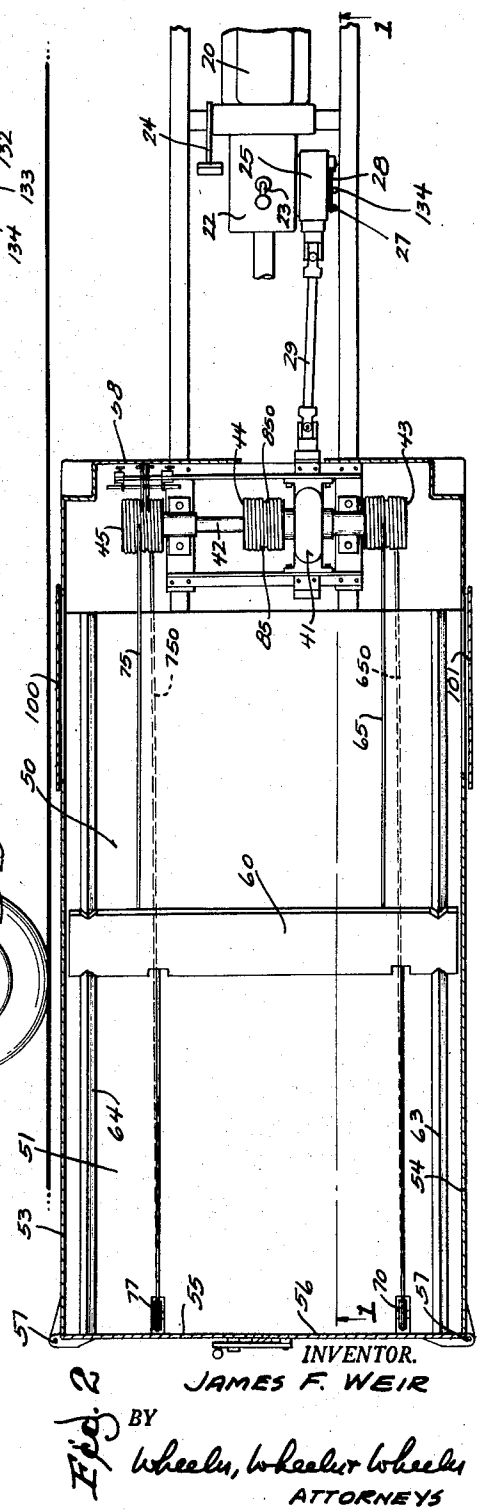


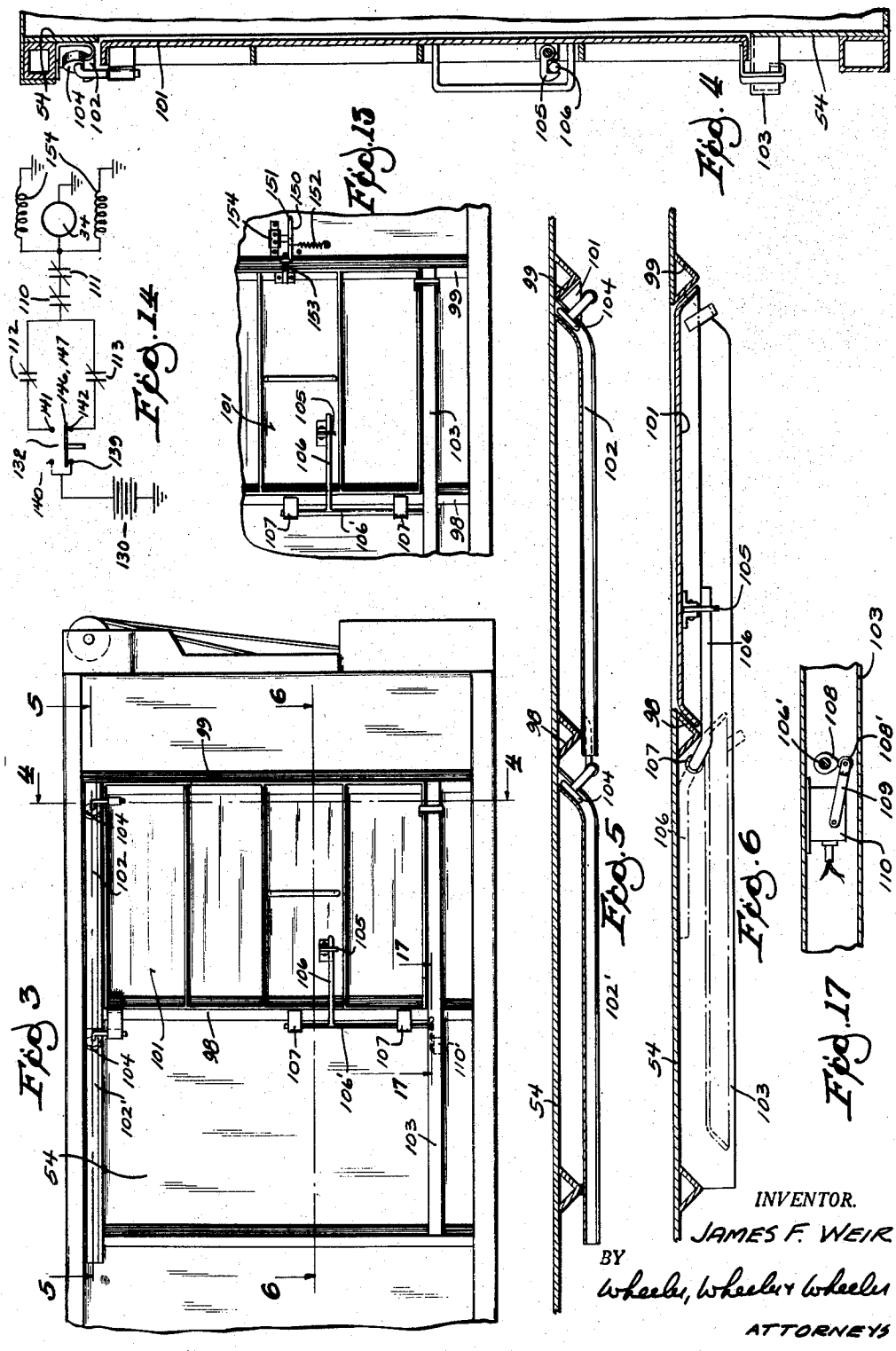
Fig. 2

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Filed Oct. 20, 1955 4 Sheets-Sheet 2

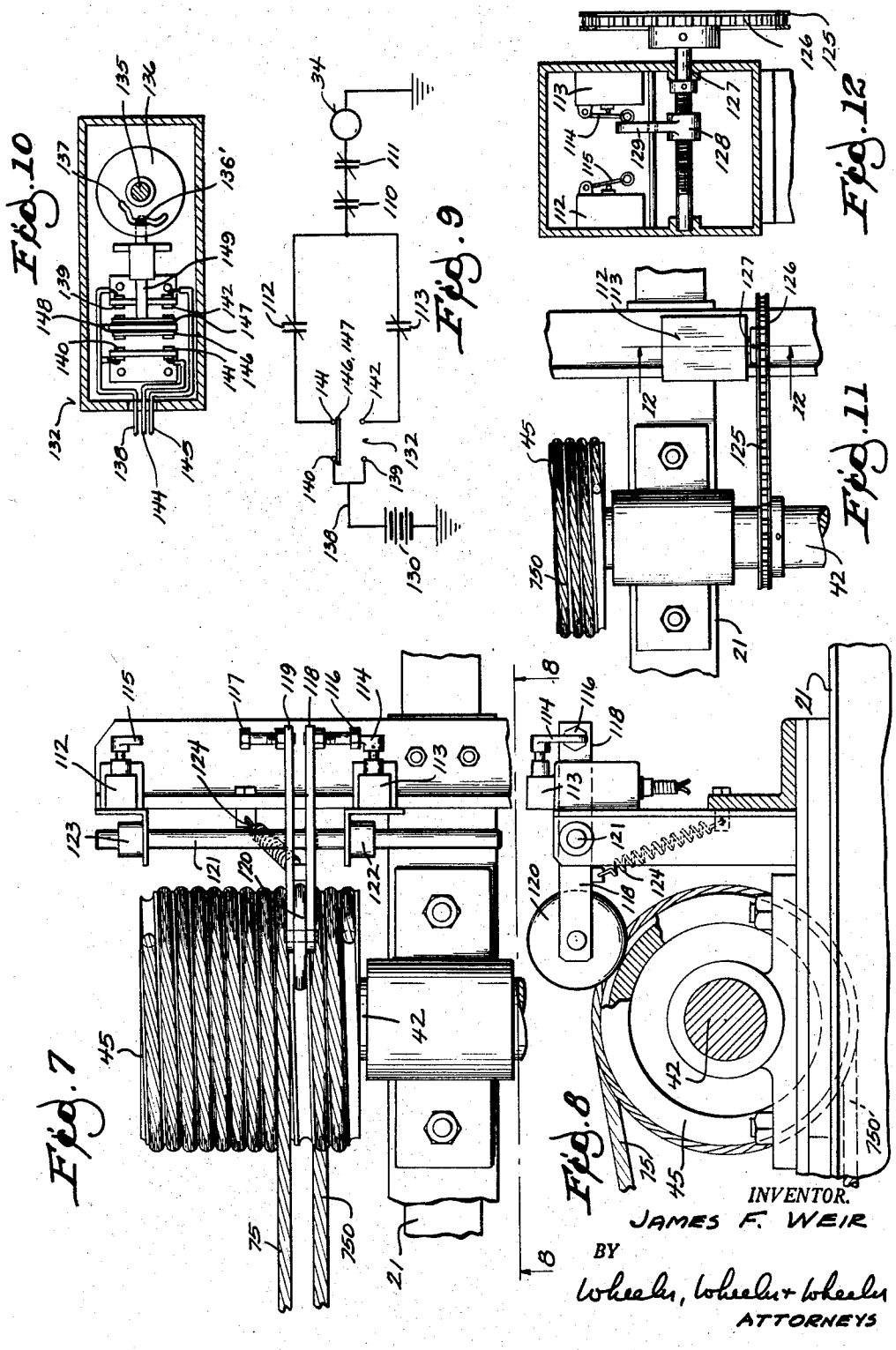


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VEHICLE BODY WITH PACKER AND EJECTOR

Filed Oct. 20, 1955 4 Sheets-Sheet 3



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VEHICLE BODY WITH PACKER AND EJECTOR

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Fig. 15

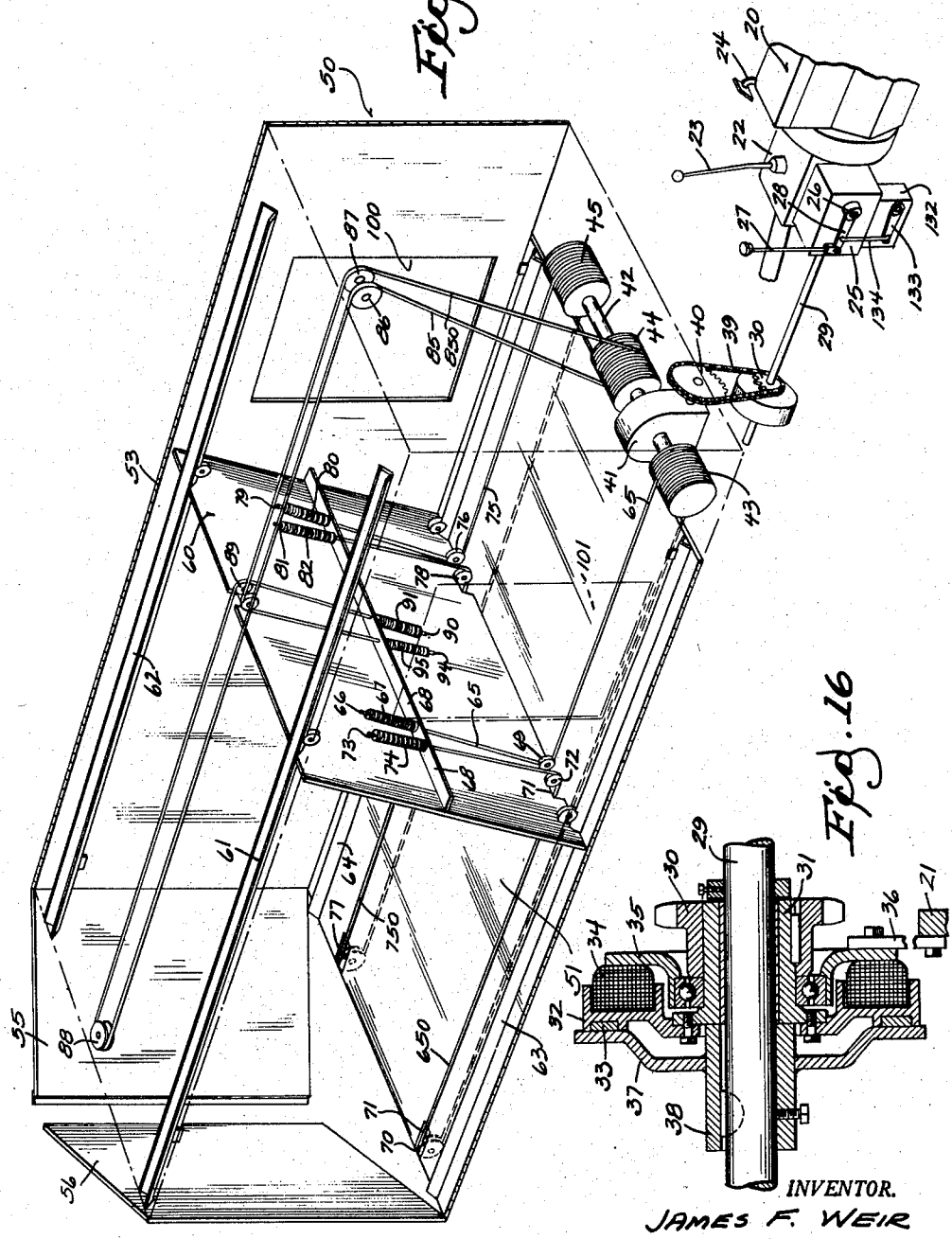


Fig. 16

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VEHICLE BODY WITH PACKER AND EJECTOR

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Application October 20, 1955, Serial No. 541,644

11 Claims. (Cl. 214—82)

This invention relates to a vehicle body with packer and ejector.

The body has lateral doors near its forward end for receiving material to be packed and transported. Doors open the entire rear end of the body for discharge. The packer plate, also used in ejecting the material through the rear door, is provided with upper and lower guides upon which it is reciprocable longitudinally of the body to and from a position forwardly of the work-receiving doors. Cables provided with spring takeups on the plate are driven by drums at the forward end of the body and guided over pulleys to propel the plate forwardly and rearwardly in the course of rotation of the drum shaft.

The drive to the drum shaft from the power takeoff of the vehicle upon which the body is mounted includes a reversing gear set and a drive to the drum shaft through an electric clutch which functions as a torque-limiting slip clutch in addition to providing safety interlock controls, clutch energization being dependent upon circuits controlled by the respective loading doors and by limit switches which are operated at the extremes of movement of the packer plate. The arrangement is such that with either of the loading doors open the clutch is deenergized and the clutch is also deenergized whenever the packer plate reaches either extreme of its movement. If the resistance of the packed material precludes further movement of the packer plate in a rearward direction, the clutch will slip at a torque which can be adjusted by varying the current applied thereto.

In a preferred embodiment of the invention, there is a further electrical interlock which secures the loading doors against being opened at any time when the packer plate is in operation in either direction.

In order to permit the packer plate to be started in a reverse direction after having reached either extreme of its movement and opened one of the limit switches, there is a special double throw switch at the power takeoff which is reversibly connected with the gear set in such a way that manipulation of the reverser will change the direction of packer plate movement and will also close the circuit through the clutch limit switch that becomes effective only when the packer plate reaches the other end of the body. The actual location of the limit switches is desirably close to the drums by which the packer plate is operated. The limit switches may either be actuated directly from one of these drums or from a separate shaft connected with the drum shaft.

In the drawings:

Fig. 1 is a diagrammatic view in longitudinal section through an installation embodying the invention, portions of the vehicle being omitted.

Fig. 2 is a diagrammatic view in horizontal section through the body and portions of the vehicle chassis.

Fig. 3 is a fragmentary detail view in side elevation of a forward end portion of a truck body embodying the invention.

Fig. 4 is an enlarged detail view taken in section on the line 4—4 of Fig. 3.

Fig. 5 is an enlarged fragmentary detail view taken in section on the line 5—5 of Fig. 3.

Fig. 6 is an enlarged fragmentary detail view taken in section on the line 6—6 of Fig. 3.

Fig. 7 is a fragmentary detail view of one of the drums by which the packer plate is operated.

Fig. 8 is a view taken in section on the line 8—8 of Fig. 7, portions of the drum being broken away.

Fig. 9 is a circuit diagram showing the control of the electric clutch by which the packer plate is operated.

Fig. 10 is a detail view in side elevation of the reversing switch, the operating shaft and casing being shown in section.

Fig. 11 is a fragmentary plan view similar to Fig. 7 showing a slightly modified limit switch drive.

Fig. 12 is a view on an enlarged scale taken in section on the line 12—12 of Fig. 11.

Fig. 13 is a view similar to Fig. 3 showing a modified embodiment.

Fig. 14 is a view similar to Fig. 9 showing the circuit used with the embodiment of Fig. 13.

Fig. 15 is a diagrammatic view of the body and operating parts as these appear in perspective, the outline of the body being indicated in broken lines and only portions thereof being shown.

Fig. 16 is an enlarged detail view taken in section through the electric slip clutch which adheres to the drive in the packer plate.

Fig. 17 is a fragmentary detail view taken in section on the line 17—17 of Fig. 3.

The truck chassis is generally conventional. The motor is diagrammatically shown at **20** and the frame at **21**. There is the usual gear box or transmission at **22** controlled by shift lever **23** and clutch pedal **24** for the transmission of power to the rear wheels **25** of the vehicle.

As is common in such chassis, there is a power takeoff from the transmission **22**. The power takeoff itself is not shown, but there is illustrated in Figs. 1, 2 and 15 the reverser **25** which contains the usual reversing gear set and clutch (not shown) operated by hand lever **27** which connects with the arms **28** of rock shaft **26**. By manipulation of lever **27**, the direction of rotation of the output shaft **29** can be reversed at the will of the operator.

The power takeoff output shaft **29** drives the sprocket **30** through electric clutch mechanism shown in Fig. 16. The sprocket is mounted on the hub portion **31** of the driven clutch element **32**. The forward side of the annular clutch element **32** has a shallow channel within which the clutch facing **33** is disposed. The rear side of the annular clutch element **32** is channeled to receive the stationary electromagnetic winding **34**, the mounting **35** of which is supported at **36** from the vehicle frame **21**.

The driving clutch element **37** constiutes an armature connected to element **32** when the winding **34** is energized and released from driving engagement when the winding **34** is deenergized. The driving clutch element **37** has its hub **38** splined to the power takeoff shaft **29** to receive motion through the reverser **25** from the power takeoff with which transmission **22** is provided.

When the electric clutch is energized, motion will be transmitted from sprocket **30** by means of chain **39** and sprocket wheel **40** to a gear reducer **41** which actuates the drum shaft **42**. The drum shaft extends transversely of the front end of the body hereinafter to be described and carries three separate helically grooved drums at **43**, **44**, **45**, respectively.

The body, generically designated by reference character **50**, comprises a floor **51**, a top **52**, side walls **53** and **54** and a rear closure which comprises doors **55** and **56** hinged at **57** to the side walls. The body requires no front closure but a partial closure is illustrated at **58**, Fig. 2.

The packer plate 60 is reciprocable longitudinally of the body desirably being disposed in a generally upright position. As illustrated, it has a slight inclination with the top end being somewhat nearer the front of the vehicle than is its bottom. Guides are provided for the packer plate, which is movable longitudinally of the body. These guides may conveniently comprise rails made of angle iron. Two such rails are mounted at 61 and 62 on the top wall 52 of the body. Parallel rails 63, 64 extend along the bottom 51. The packer plate 60 is provided with notches complementary to the rails to receive guidance therefrom in the course of its longitudinal reciprocation.

An operating cable 65 has an anchorage at 66 bearing on a compression spring 67 seated on the flange 68 at the rear of the packer plate. Cable 65 passes around a pulley 69 in the bottom of the packer plate and thence along the body bottom 51 to the top periphery of drum 43. As already stated, this drum is helically grooved. The cable passes one or more times about the helical grooves of drum 43 and is connected to the end thereof. A complementary cable 650 attached to the opposite end of the drum and passing one or more times about the helical grooves therein issues from the bottom of the drum to pass beneath the body bottom 51 to a sheave 70 mounted in a notch 71 near the rear door 56. After passing about sheave 70, the cable 650 extends along the surface of the body bottom and through a notch 71 in the packer plate 60. Here it passes about a pulley 72 mounted on the packer plate and upwardly along the front side of the packer plate to an anchorage 73 engaging another compression spring 74 seated on flange 68. The arrangement is such that the compression springs 67 and 74 take all slack from cables 65 and 650 to maintain them taut in both directions. This arrangement ensures that the bottom portion of the packer plate to which pulleys 69 and 72 are attached will move forward or rearwardly according to the direction of rotation of the drum 43.

A similar arrangement is provided at the opposite side of the body where cable 75 is wrapped around a drum 45 and passes over pulley 76 to anchorage 79 on compression spring 80 which is supported on flange 68. The complementary cable 750, likewise anchored to the drum and having one or more turns about the helical grooves thereof passes beneath the floor of the body to the pulley 77 at the rear thereof and thence back along the top surface of the body floor to the pulley 78 carried by the lower margin of the packer plate. Thence cable 750 extends upwardly through flange 68 to an anchorage at 81 on the top of compression spring 82 supported by such flange. Since drum 43 and drum 45 are mounted on the same shaft 42, the cables 75 and 750 constrain the lower portion of packer plate 60 on which pulleys 76 and 78 are mounted to move forwardly and rearwardly at the same rate as the other side of the packer plate and according to the direction of rotation of the shaft 42 and respective drums 43 and 45.

The top of the packer plate is correspondingly operated by the cables 85 and 850 which are terminally wrapped around drum 44. The two runs of cable pass from the drum about guide sheaves 86 and 87 at the top of the body. Thence cable 85 passes over the packer plate to a sheave 88 at the rear of the body and returns over pulley 89 on the packer plate to anchorage 90 supported by compression spring 91 beneath flange 68. The other run of cable 850 extends from sheave 87 directly to the pulley 93 on the packer plate and down through the flange 68 to an anchorage 94 beneath the compression spring 95 which is seated on the lower side of the flange. Thus all portions of the packer plate are required to move in unison according to the direction of rotation of shaft 42, whereby the packer plate is maintained substantially at a fixed and generally upright angle regardless of its position in the body.

The body is provided at its forward end with loading doors 100, 101, respectively, slidable along the body walls 53 and 54 to open and close openings through which garbage or other material is introduced into the body.

Fig. 3 shows a detail side elevation of the reenforced construction of wall 54 with the upper rails 102 and 102' and the lower rail 103 upon which the door rollers 104 are guided for movement longitudinally of the body. As clearly appears in Figs. 3 and 5, the forward ends of the respective rails are all curved inwardly so that the door 101, when closed, seats against the reenforcing angles 98 and 99 of the body. A manually operable latch 105 is pivoted to the door and normally engages over a bolt 106 pivotally mounted on ears 107 of the body.

In order to protect the operators by insuring that the packer plate will not be moved with the doors open, each door is provided with a safety switch in series with the clutch winding magnet to require that the doors be shut before the clutch can be energized. One way of accomplishing this result is to actuate the required switches by means of the locking arm 106 which can be moved to positions shown in Fig. 3 and Fig. 6 only when the door is closed. Otherwise, the arm 106 lies in the position shown in dotted lines in Fig. 6.

At the lower end of the rock shaft 106' upon which arm 106 is mounted for oscillation in the ears 107, I may provide a cam such as that shown at 108 in Fig. 17. This engages the cam follower roller 108' at the end of the actuator arm 109 of the normally open switch 110 to close the switch only when the door locking parts are in the position illustrated in Fig. 6 and Fig. 17. Any displacement of the locking arm 106 from locked position will allow switch 110 to open. A similar switch 111, likewise in series with switch 110 and the clutch winding 34, is indicated diagrammatically in Fig. 14 and is closed only when the door at the opposite side of the body is closed.

The limit switches 112, 113 are normally closed and are in parallel with each other and in series with the switches 110 and 111 and the clutch winding 34. The limit switches are arranged to be opened at the extremes of packer plate movement. One way of accomplishing this is shown in Fig. 7 where the limit switches 112 and 113 have their actuators 114, 115 disposed in the path of movement of bolts 116, 117 which are adjustable in the arms 118, 119. These arms support a wheel 120 that operates in the grooves of drum 45 between the runs of cable 85. As the drum rotates to pay out one of the runs of cable 85 and to wind the other, the wheel 120 moves axially of the drum, carrying with it the rock shaft 121 upon which the arms 118 and 119 are mounted. The rock shaft 121 slides axially in its bearings at 122, 123 until one or the other of the bolts engages one or the other of the switch actuators to open the switch controlled by such actuator. A tension spring at 124 holds the arms in positions in which the wheel 120 is securely engaged in the groove of drum 45.

In the alternate arrangement shown in Figs. 11 and 12, the drum shaft 42 is connected by chain 125 and sprocket 126 with a screw shaft 127 upon which a nut 128 is fed in one direction or the other according to the rotation of the shaft. The arm 129 carried by nut 128 engages the limit switch actuators 114, 115 and the two extremes of packer plate movement to open switches 112 or 113 as the case may be and to deenergize clutch armature 34 in either instance.

The two limit switches 112 and 113 are not simultaneously in circuit between the battery 130 and the clutch winding 34. They are in parallel with each other (see Figs. 9 and 14) and are alternatively connected in circuit with the door switches and the clutch winding 34 by means of a double pole, double throw switch 132 (see Figs. 1 and 2) which has its actuating arm 133

connected by link **134** with the lever **28** of the power takeoff reverser **25**.

Fig. 10 shows a preferred mechanical structure for the switch **132**. The arm **133** operates a rock shaft **135** on which there is a disk **136** provided with a cam groove **137**. The line **138** from battery **130** is connected to the fixed contacts **139** and **140**. The fixed contacts **141** and **142** are connected to the respective limit switches **112** and **113** by conductors **144** and **145**. The movable contacts **146** and **147** are carried by an insulated bar **148** mounted on a rod **149** which has a cam follower **136'** engaged in the track **137** to be advanced or retracted in the oscillation of disk **136** by arm **133**. Fig. 10 shows the acuator in an intermediate position. If moved to the left, the circuit will be closed between fixed contacts **140** and **141** to energize limit switch **112**. Moved to the right, the movable contactor **147** will close the circuit between fixed contacts **139** and **142** to energize limit switch **113**. Thus, as the reversing gear is shifted to condition the drum shaft for moving the packer plate reversely away from the position at which it has come to rest, the reversing switch **132** bypasses the limit switch that has brought the packer plate to rest and establishes a circuit to the clutch armature through the limit switch that will be opened as the packer plate reaches the extreme of its reverse movement.

As shown in Fig. 10, the cam track **137** has an intermediate dwell which maintains the switch **132** in a centered open position whenever the power takeoff clutch is in neutral. In this position, the packer plate is at rest both by reason of the neutral position of the reversing gears and also because the electric clutch winding **34** is deenergized. Only with the packer plate at rest is it safe to open the loading doors **100** and **101**.

These doors may be provided with electromagnetically operated latches **150** which are pivoted at **151** to the body as exemplified in Fig. 13 and are normally held by their springs **152** in retracted positions in which the latch element does not engage the keeper **153** mounted on the door. The solenoid **154** attracts the latch of each of the loading doors to engage the respective keeper on the door whenever the clutch winding **34** is energized. As shown in Fig. 14, the solenoids **154** may be in parallel with the winding **34** for this purpose. Only when the clutch winding is deenergized, as in the neutral position of the controls shown in Fig. 10, it is possible for the door to be opened. While this feature is optional, it is regarded as desirable. Even though the opening of a loading door deenergizes the clutch winding by opening one of the normally closed switches **110** or **111**, some continuing movement of the packer plate by its momentum might be possible. Accordingly, it is preferred to require the operator to disconnect the clutch winding and disengage the driving gears as a prerequisite to the opening of the door, this being accomplished by a latch of the type of that shown in Fig. 13.

As will be understood, refuse or other material to be transported is inserted into the body by opening one of the doors **101** at a time when the packer plate is at its forward extreme of movement. Thereupon the doors are closed and the operator moves the clutch to position the power takeoff for rearward movement of the packer plate. Simultaneously, the electric clutch armature is energized through the limit switch **113**, assuming this to be the limit switch that opens at the rearmost position of the packer plate.

The rearward movement of the packer plate compresses the contents of the body either against the rear doors or against previously compressed material. Assuming that there is material behind the packer plate to be compressed in its rearward movement, the limit switch **113** will never open. Instead, the electric clutch will slip at a predetermined value of pressure exerted by the plate upon the contents of the body. It is then

incumbent on the operator to reverse the power takeoff clutch and to reenergize the electric clutch winding through the normally closed limit switch **112**, which can be opened only when the packer plate reaches its extreme forward position, ahead of the loading doors. In this position of the plate, the electric clutch will be deenergized and the packer plate movement will be arrested even if the power takeoff clutch remains engaged. Even if the magnetic latch shown in Fig. 13 is employed, the doors may now be opened, since the functioning of the limit switch has deenergized the solenoids **154** along with the winding **34** of the electric clutch. This permits further material to be introduced into the body for repetition of the cycle as above described.

When the body is fully loaded, its discharge doors **55**, **56** at the rear may be opened, in which event the rearward movement of the packer plate will eject the contents of the body.

I claim:

1. The combination with a vehicle body having a door and a packer plate therein, of means for actuating said plate including an electrically operable clutch and a clutch circuit including means to de-energize and energize the clutch, in combination with an electromagnetically operable latch for said door, and means for closing and opening said latch as the electric clutch is respectively energized and deenergized.

2. In a vehicle having an engine provided with driving connections and with a power takeoff, the combination with said power takeoff, of a manually operable reverser, a vehicle body provided with a reciprocable packer plate having driving connections from said reverser including an electromagnetic clutch having a winding, a pair of limit switches in parallel with each other in series with said winding, and a double throw switch connected with said reverser for manual operation concurrently therewith, said switch having connections for closing the circuit through one of said limit switches in one reverser position and for closing the circuit to the other of said limit switches in the other reverser position.

3. The device of claim 2 in which the driving connections to the packer plate include a drum shaft, drums mounted thereon, cables operating over the drums and connected with the plate, and a limit switch actuator having driving connections from the drum shaft.

4. In a vehicle having an engine provided with driving connections and with a power takeoff, the combination with said power takeoff, of a manually operable reverser, a vehicle body provided with a reciprocable packer plate having driving connections from said reverser including an electromagnetic clutch having a winding, a pair of limit switches in parallel with each other in series with said winding, and a double throw switch connected with said reverser for manual operation concurrently therewith, said switch having connections for closing the circuit through one of said limit switches in one reverser position and for closing the circuit to the other of said limit switches in the other reverser position, one of the drums on the drum shaft being provided with a cable-receiving helical groove, a limit switch actuator including a follower operating in said groove for moving said actuator in a direction parallel to the drum shaft axis.

5. In a vehicle having an engine provided with driving connections and with a power takeoff, the combination with said power takeoff, of a manually operable reverser, a vehicle body provided with a reciprocable packer plate having driving connections from said reverser including an electromagnetic clutch having a winding, a pair of limit switches in parallel with each other in series with said winding, and a double throw switch connected with said reverser for manual operation concurrently therewith, said switch having connections for closing the circuit through one of said limit switches in one reverser position and for closing the circuit to the other of said

limit switches in the other reverser position, in further combination with an actuator for the limit switches including a screw shaft having driving connections from the drum shaft, and a nut operable along the screw shaft and provided with an arm in the path of which said limit switches are disposed.

6. The combination with a vehicle body having a packer plate reciprocable therein, of a vehicle transmission provided with a power takeoff having manually operable reverser, driving connections from the reverser to the packer plate including an electric clutch having a winding, limit switches having contact operators, means movable with the plate between said operators for the opening of the respective limit switches in predetermined positions of the plate, and a reversing switch connected with the reverser and movable between two extreme positions in the reversing movement of the reverser, the said limit switches being operatively connected in parallel with each other and in series with said winding for the energization of the winding, and a source of power selectively connected through the reversing switch with one of the limit switches according to the position of the reversing switch whereby to energize the winding through one of the limit switches, the connections being such that the winding is always energized by the limit switch which is to be opened at the predetermined position toward which the packer plate is being moved through the electric clutch by said reducer.

7. The combination with a vehicle body having a packer plate reciprocable therein, of a vehicle transmission provided with a power takeoff having manually operable reverser, driving connections from the reverser to the packer plate including an electric clutch having a winding, limit switches having contact operators, means movable with the plate between said operators for the opening of the respective limit switches in predetermined positions of the plate, and a reversing switch connected with the reverser and movable between two extreme positions in the reversing movement of the reverser, the said limit switches being operatively connected in parallel with each other and in series with said winding for the energization of the winding, and a source of power selectively connected through the reversing switch with one of the limit switches according to the position of the reversing switch whereby to energize the winding through one of the limit switches, the connections being such that the winding is always energized by the limit switch which is to be opened at the predetermined position toward which the packer plate is being moved through the electric clutch by said reducer, the said body being provided with a lateral door opening with spaced jambs, a door movable to and from a position between such jambs and slidable longitudinally of the body, and upper and lower rails for guiding movement of the door, said rails having forward portions respectively turned inwardly for guiding door movment to and from the door position between said jambs.

8. A refuse truck body having a side wall provided in a forward portion with a loading door opening and having upright reenforcing members at opposite sides of the opening, a door having a closed position in which it is fitted between said upright reenforcing members and having an open position in which the door is offset longitudinally of the body at the rear of the loading door opening, upper guide track means having portions directed inwardly adjacent the respective reenforcing members at opposite sides of the door opening, the door having supporting means guided on the track means and adapted to be guided by the inwardly extending portions of the track in movement to and from its closed position, the said track means including portions extending rearwardly upon which said supporting means rides in the movement of the door to and from its open position.

9. The device of claim 8 in further combination with a packer plate reciprocable within the body and means for packer plate actuation, together with a control for said last mentioned means actuated by a door lock to permit packer plate operation when the door is closed and to preclude packer plate operation when the door is open.

10. The device of claim 9 in further combination with a door lock comprising a rock shaft rotatably mounted on the body at the rear of the loading door opening and within the path of door opening movement, an arm connected with the rock shaft and movable between a retracted position across which the door moves in opening and an operative position in which said arm overlies the closed door, and switch means comprising the aforesaid control and having an actuator operatively disposed to be operated in the oscillation of said rock shaft and arm.

11. The device of claim 8 in which the door comprises a sheet metal plate with outwardly flaring side margins, said door reenforcing members at opposite sides of the door opening having oppositely divergently flaring side surfaces to which respective door margins are complementary, the door seating against the surfaces of said members in closed door position.

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