Aug. 27, 1963 H. M. ROBERTSON ET AL 3,101,974

DUMP TRUCK

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FIG-1

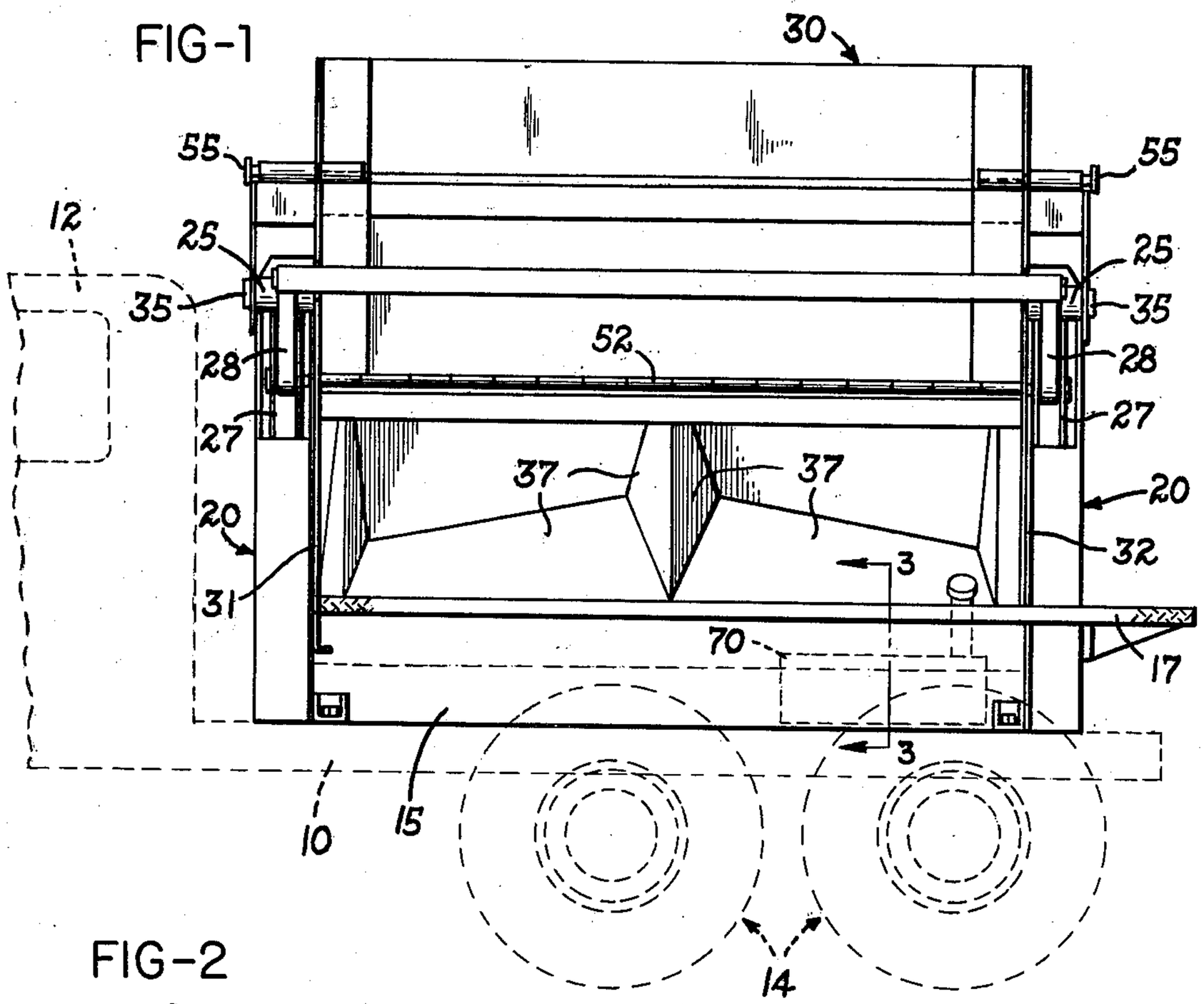

FIG-2

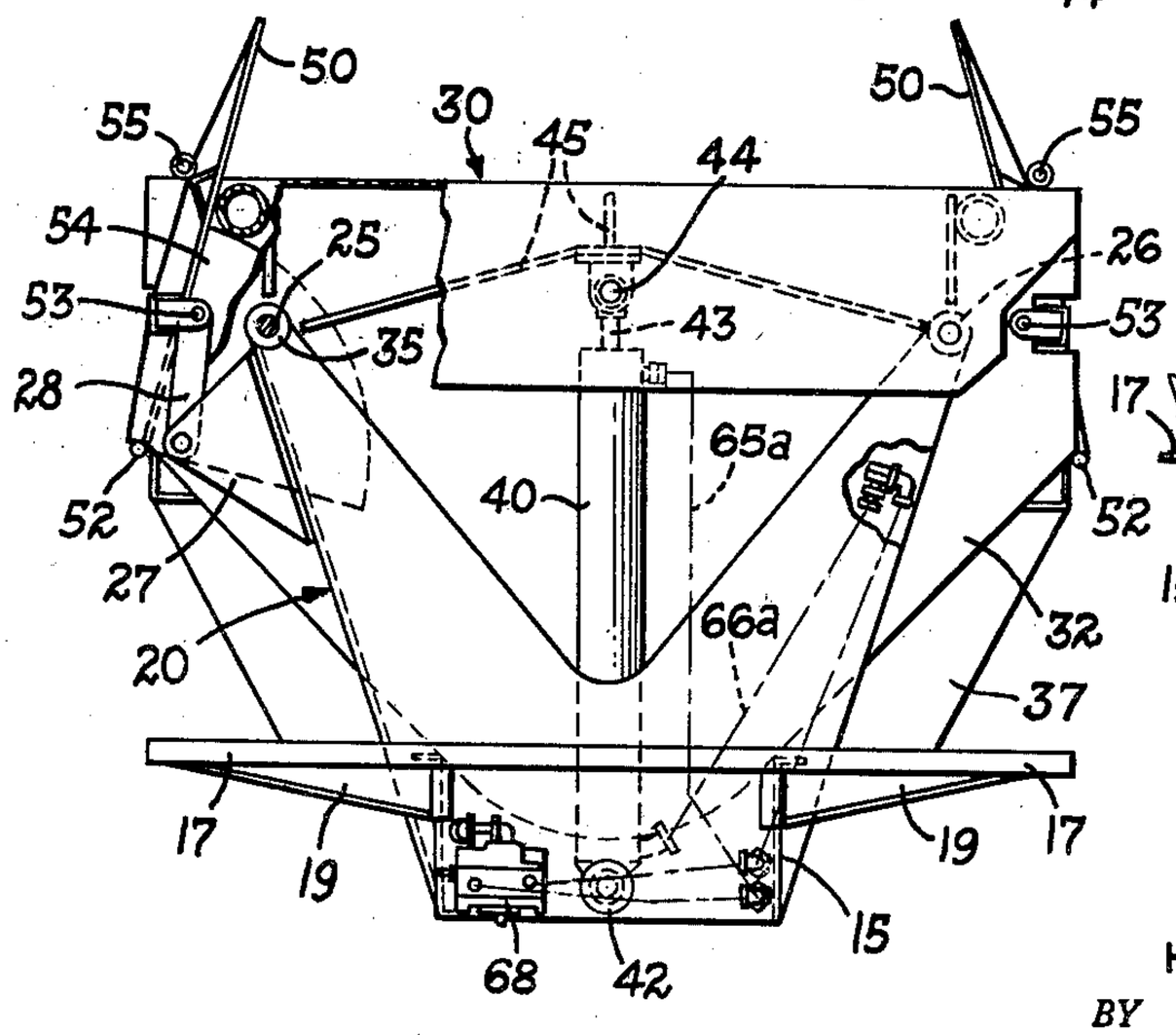

FIG-3

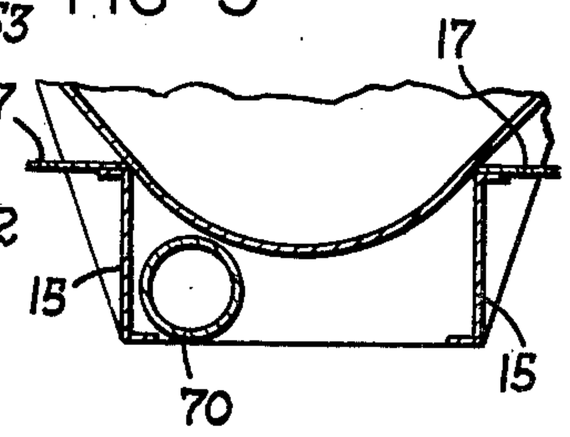

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FIG-4

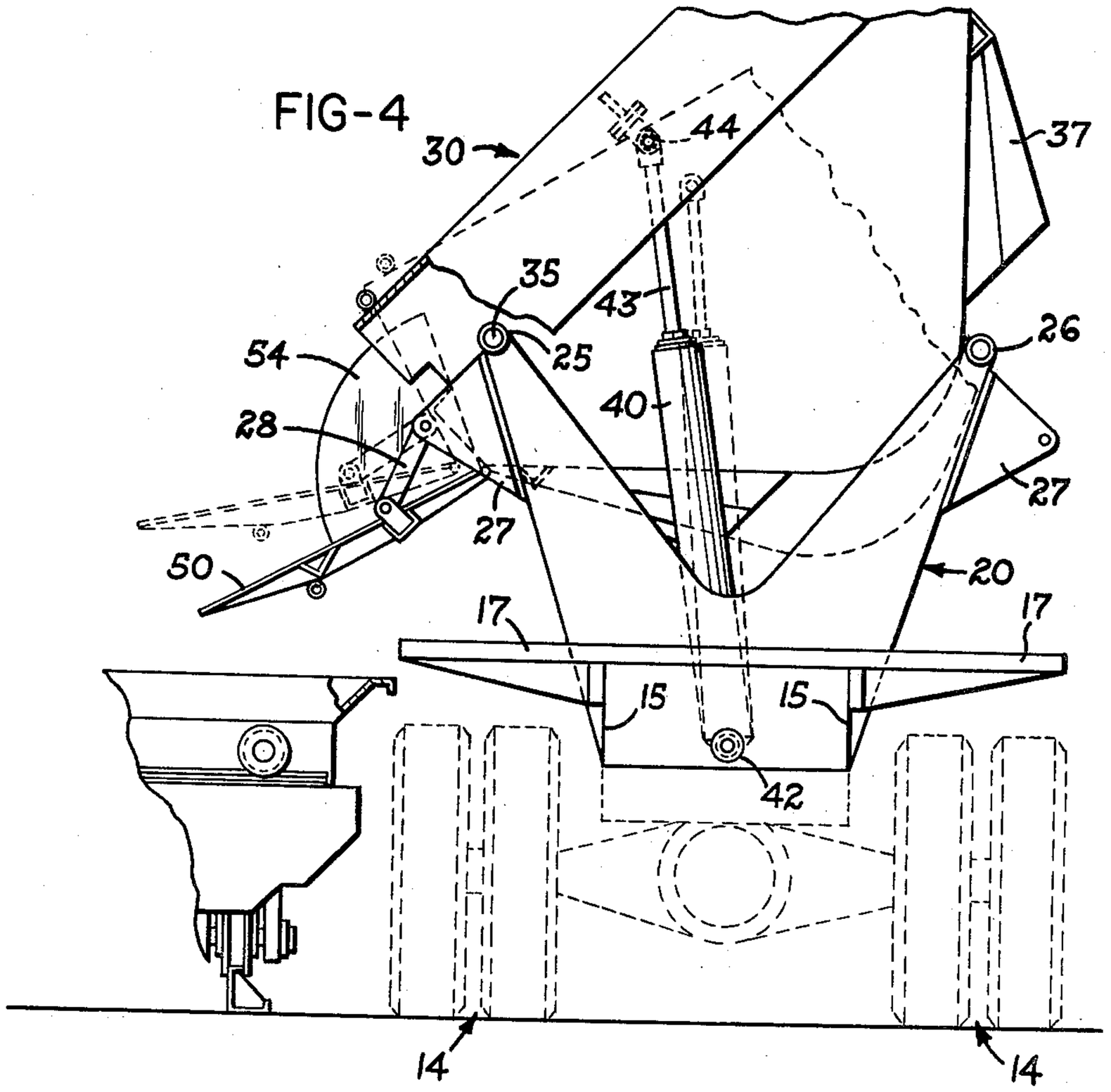
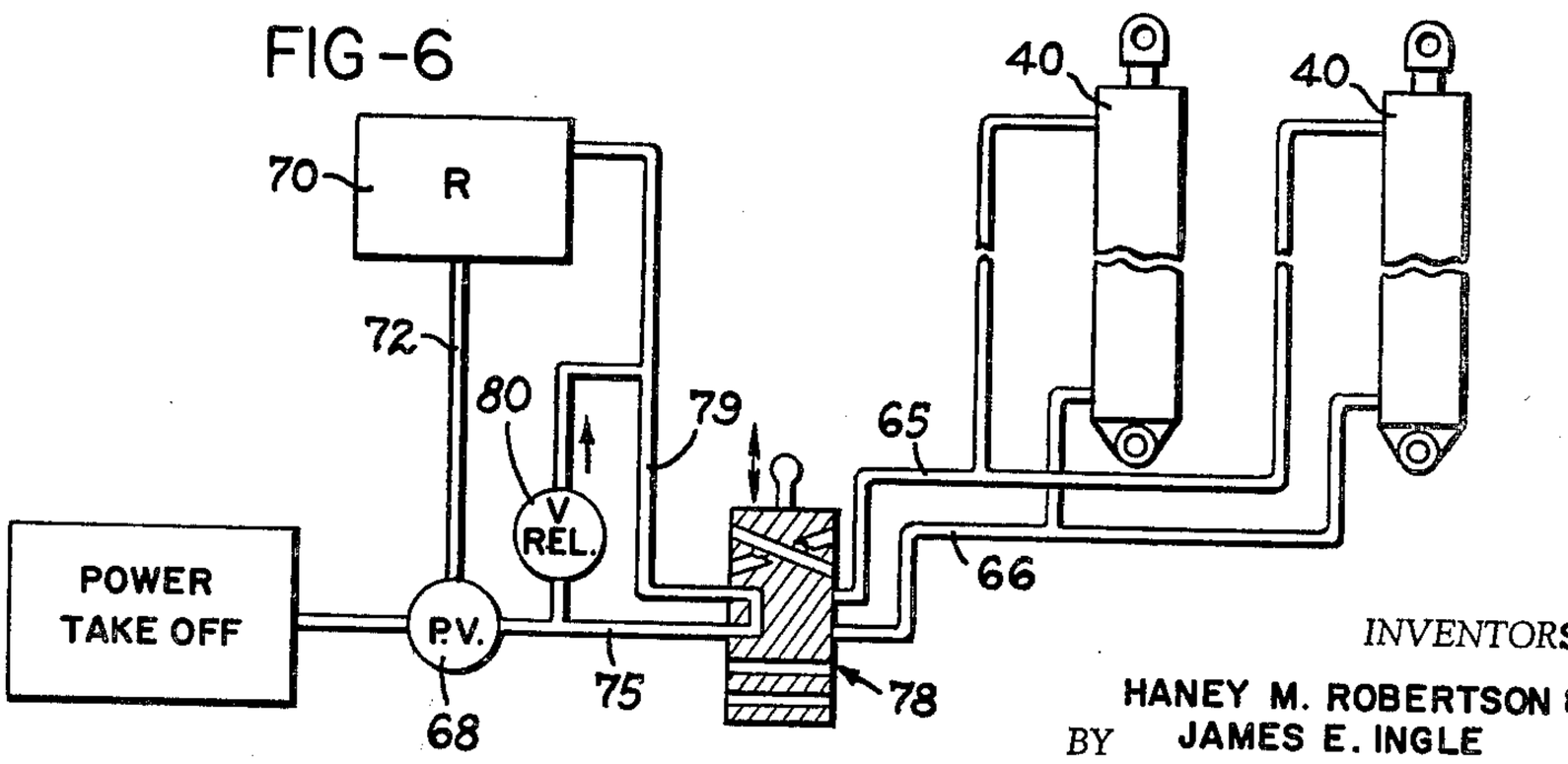


FIG-6



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DUMP TRUCK

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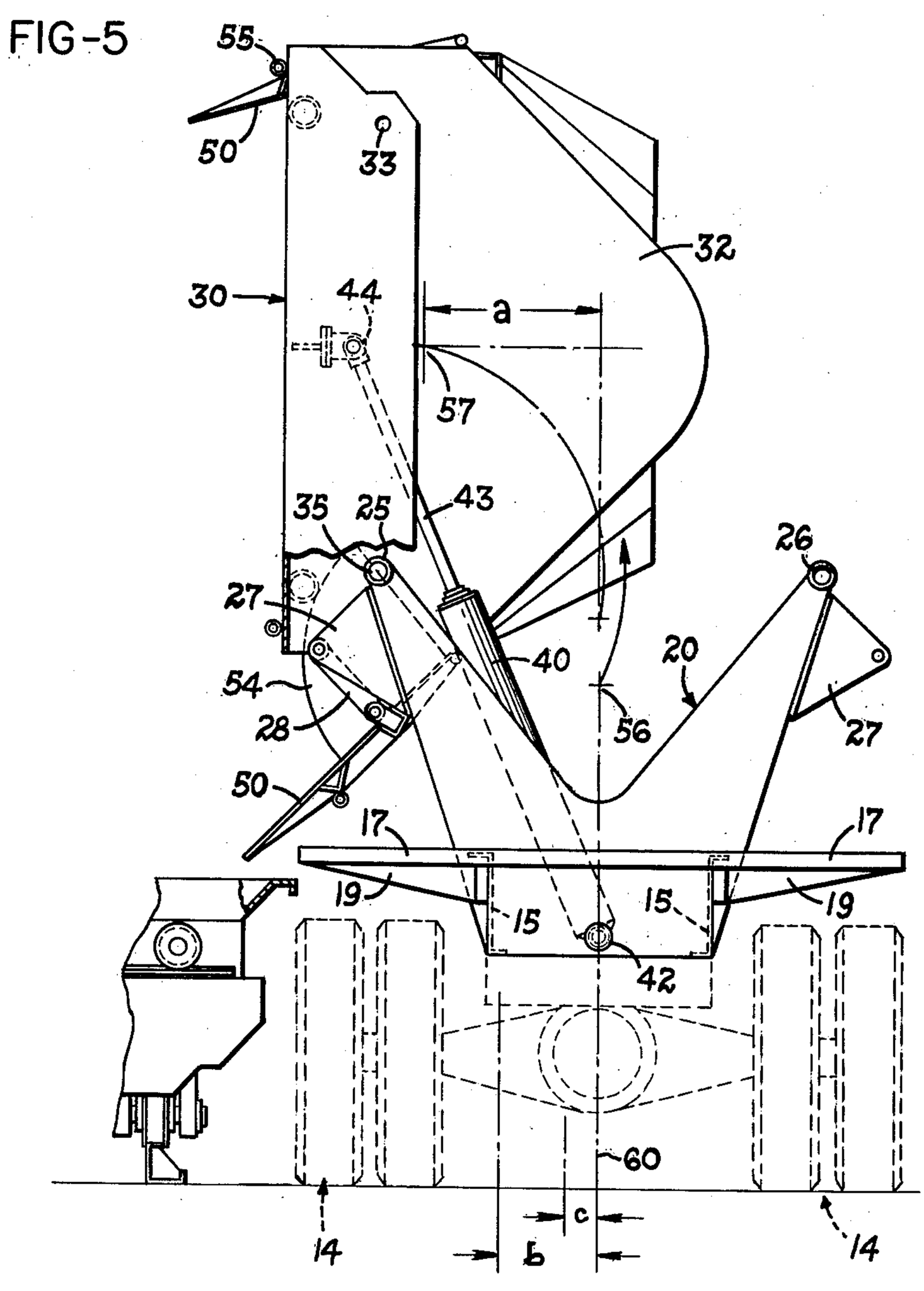
FIG-5



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DUMP TRUCK

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FIG-7

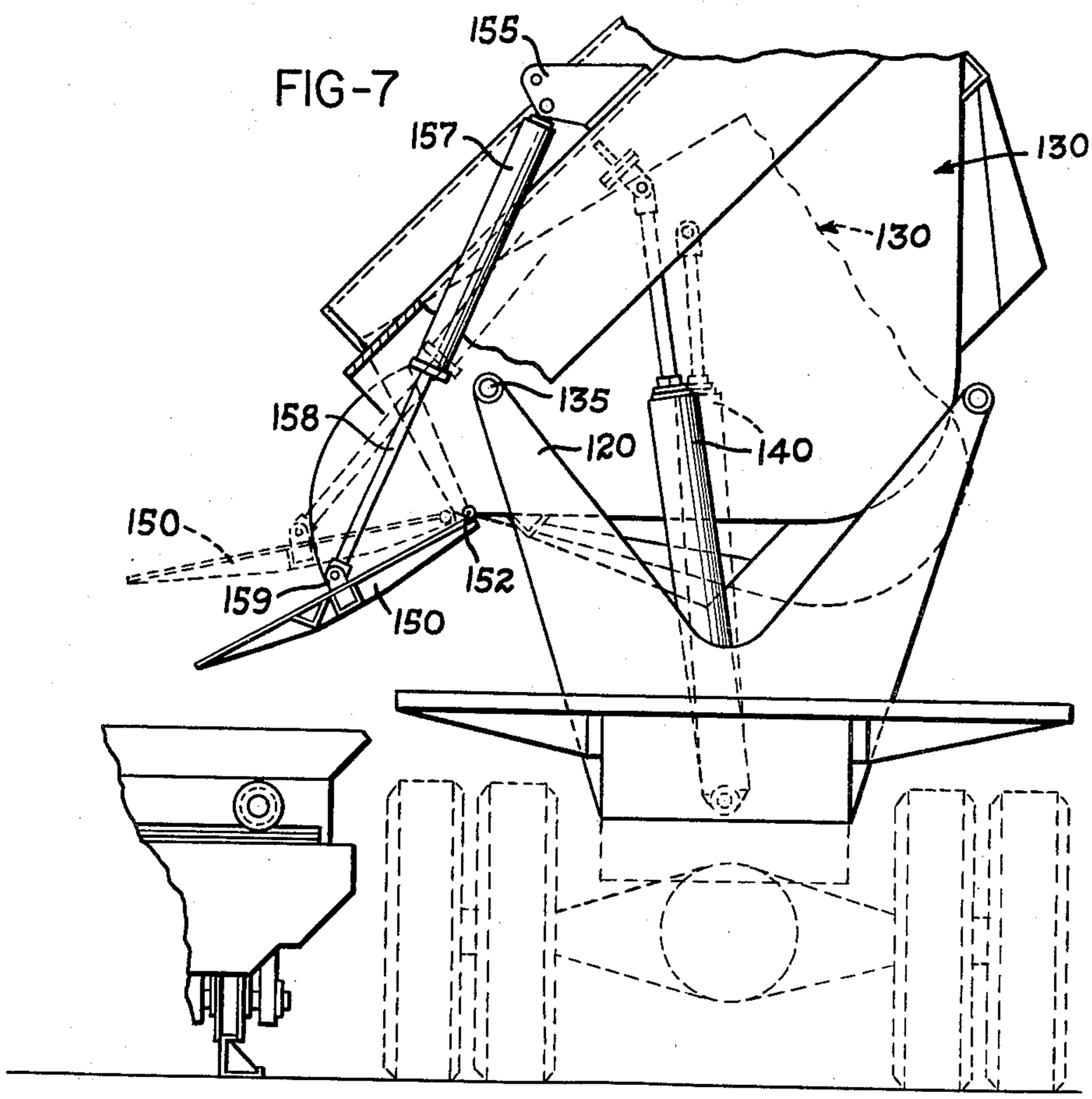


FIG-8

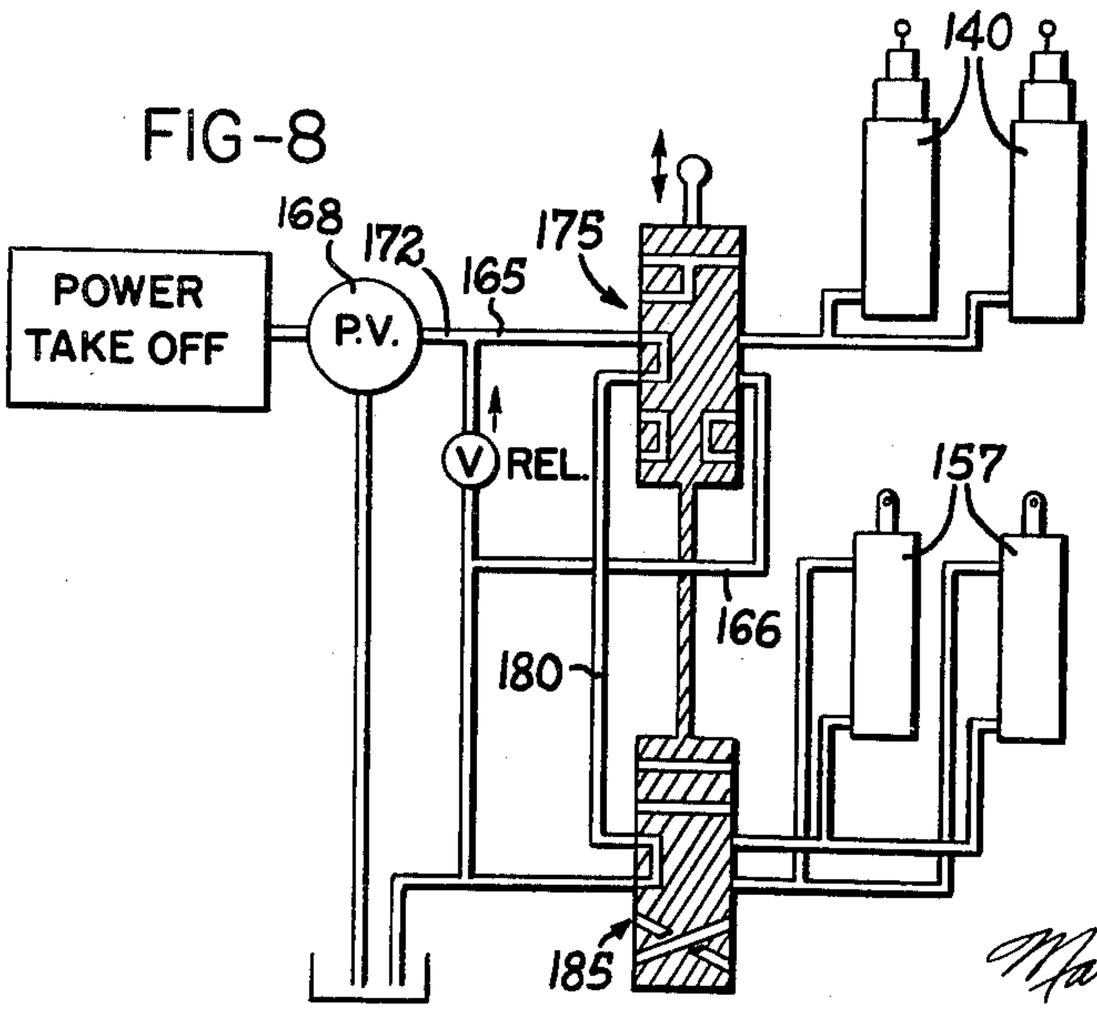
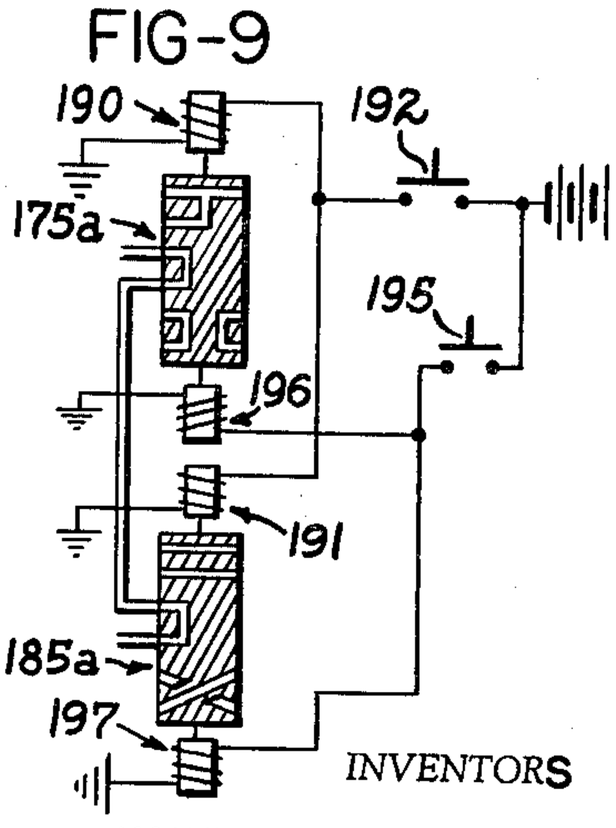


FIG-9



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DUMP TRUCK

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Filed Jan. 9, 1961, Ser. No. 81,563
4 Claims. (Cl. 298—17.6)

This application relates to dump trucks for conveying and dumping flowable materials, particularly for conveying and dumping freshly mixed concrete.

In the art of concrete paving, particularly, a well known system followed by contractors who are paving great lengths of pavement, such as roadways, runways, etc., involves the use of a central mixing plant in which the concrete is mixed, and from which it is transported to the paving site and then spread and finished by machinery operating over the roadbed. One suitable type of spreader for use in this fashion is shown in copending application Serial No. 733,949, filed May 8, 1958, now Patent No. 3,043,201, assigned to the same assignee as this application, in which a spreader bucket is mounted on a frame for traversing movement across the roadway, and in which the frame operates along the forms for the roadway, using them as rails, such that a load placed in the spreader bucket may be distributed in a ribbon transversely of the roadbed, and the machine then moved forward to prepare for spreading the next "ribbon" of concrete. Such a spreading machine is capable of relatively high speed operation, in this art, but the bucket has a rather large capacity, for example up to six cubic yards of fresh concrete, and in order for this machine to operate rapidly, and thus with the best efficiency, it is necessary to supply the fresh concrete to the bucket at a rate concomitant with its best operating speed. The present invention provides a dump truck which is capable of performing this function.

In accordance with the invention, dump trucks are provided having dump bodies which dump to either side of the truck frame or chassis, and thus permit the trucks to be driven along the side of the roadway directly into position opposite the spreading machine, to dump the load directly and rapidly into the spreading machine bucket, and to pull away with the least possible disruption of routine, and with minimum amount of time required. Thus, the dump body is required to handle approximately six yards of fresh concrete, which will weigh in the neighborhood of twelve tons, and to dump this entire load off to either side of the truck, without disrupting the truck chassis or without the necessity for any external bracing or temporary support to steady the truck chassis during the dumping operation.

Accordingly, the primary object of this invention is to provide a novel dump truck body construction capable of dumping large heavy loads off to either side of the truck body, without the need for external support, by maintaining the center of gravity of the loaded dump bucket, during the initial portion of the dumping operation, essentially in line with the longitudinal center line of the truck frame, thus preventing any excessive side force which would tend to topple the truck, with the load gradually being diminished as it is dumped overboard.

Another object of this invention is to provide such a novel side dump body in which gate constructions are incorporated tending to control the dumping of the load in such a way as to facilitate the maintenance of the center of gravity of the load adjacent the center line of the truck body until the load is essentially discharged.

Another object of this invention is to provide a side dump truck body wherein the axis about which the load carrying bucket is rotated during a dumping operation is

located to one side of the truck frame and well above the center point or longitudinal central axis of the dump body, requiring that the bucket be lifted up and about its pivot point and thus maintaining the center of gravity of the loaded body essentially adjacent to the center line of the truck during the initial portions of the dumping operation.

A further object of this invention is to provide a novel mounting for such a side dump body in which alternate pivot points are provided which may receive hinge pins for the dump bucket, providing for dumping thereof toward either side of the truck chassis.

An additional object of this invention is to provide a dump truck body, particularly adapted for transporting and dumping fresh concrete, in which there is a relatively high discharge point for dumping the material laterally over one side of the truck chassis, which incorporates a novel gate construction which opens rapidly toward its full extension as the dump bucket is lifted initially, and which does not require any special chute or like construction to direct the concrete into a spreader bucket or the like.

Other objects and advantages of the invention will be apparent from the following description, the accompanying drawings and the appended claims.

In the drawings—

FIG. 1 is a side elevational view of a dump body in accordance with the invention, with portions of a truck cab, frame, and wheels shown in dotted lines;

FIG. 2 is a view of the dump body per se, viewing the rear thereof, as from the right end of FIG. 1, with portions broken away and shown in section, and with parts of the hydraulic control and power system shown schematically;

FIG. 3 is a partial sectional view on a slightly enlarged scale, showing the manner in which the bucket rests normally upon the lower base portion of the body, and showing also the location of the hydraulic reservoir;

FIG. 4 is a view similar to FIG. 2, with the bucket shown in full lines in a partly raised position, and shown in dotted lines in a somewhat different raised position, with a segment of a spreader bucket located to one side of the truck chassis, which is shown in dotted lines;

FIG. 5 is a view similar to FIG. 4, showing the dump bucket in its fully raised or extended position, and showing also the locations of the center of gravity as the bucket is raised;

FIG. 6 is a schematic diagram of a suitable hydraulic system for controlling movement of the dump bucket;

FIG. 7 is a view similar to FIG. 4, showing a modification of the invention, wherein the discharge gate is provided with a power drive for opening and closing thereof, independent of the pivoting or dumping movement of the bucket; and

FIGS. 8 and 9 are schematic diagrams of suitable hydraulic systems used in connection with the modified construction shown in FIG. 7.

Referring to the drawings, which illustrate a preferred embodiment of the invention, and particularly with reference to FIGS. 1, 2 and 3, a truck body is provided adapted for mounting upon a truck frame **10** of any suitable construction, rearwardly of the cab **12** thereof, and inwardly above the rear load bearing axles and wheels, of which there are usually two sets in heavy duty trucks of this type, indicated by the general reference numeral **14**. The truck body includes a bed or frame which is provided by a pair of horizontally extending beams **15** and reinforcing platforms **17**, which may actually be part of the truck fender construction, extending beyond the opposite sides thereof together with gusset or reinforcing plates **19** which are suitably welded in place, in the position shown. At the forward and rearward end of this bed construction,

which is generally open along the middle as shown in FIG. 3, there are provided mounting means for the dump bucket indicated by the general reference numeral **20**, and such mounting means are provided by generally **V**-shaped support arms, each of which extends toward opposite sides of the bed, and thereabove, as shown in FIGS. 2, 4 and 5.

Each of the mounting and supporting arms **20** is of reinforced double walled construction, and includes at each of its upper arm ends hinge pin bearings **25** and **26**, respectively, and the mounting arms are so aligned upon the bed that the bearings **25** and **26** are aligned front to rear to define pivot axes extending parallel to the length of the bed substantially above the main frame thereof. Each arm of the mounting members also includes an extension plate or support **27** which provides a mounting for a pivotally arranged guiding link **28**, with the link pivoting about its fixed mounting on the plate **27**.

The load carrying dump bucket is indicated by the general reference numeral **30**, and is likewise of generally V-shape in cross-section, and of essentially the same cross-section throughout its length, terminating in front and rear end walls **31** and **32**. The bucket is relatively deep with respect to its width, for example the depth at its center is greater than one-half its greatest width (near the top of the end walls) and the center depth may be about three-quarters of the greatest width, as shown in the drawings. Sockets **33** (one shown in FIG. 5) are provided in the end walls of the dump bucket for alignment with the hinge pin bearings **25** and **26**, respectively, and hinge pins **35** are inserted on one side only, as selected, to provide a pivotal mounting of the dump bucket for a dumping movement thereof about the chosen pivot axis which is located above the side lip of the bucket over which the contents are discharged, as seen particularly in FIGS. 2 and 4. The hinge pins preferably may be selectively placed in either of the bearings **25** or **26** and received accordingly in the corresponding sockets in the dump body, to change the dumping action of the bucket from one side to the other of the dump body.

The dump body normally rests in its load carrying position with the lower central portion thereof extending between the beams **15** forming part of the bed (FIG. 3) and this arrangement provides a convenient support for the load carrying bucket **30**. The dump bucket **30** also is provided with suitable reinforcing gusset plates or like structure, shown at **37**, to strengthen the bucket, since in one convenient size of construction this bucket may be dimensioned to carry up to six cubic yards of fresh wet concrete weighing in the neighborhood of twelve tons.

Power pivoting movement of the dump bucket is provided by linear acting hydraulic motors **40** of the piston cylinder type, one being located within each of the supporting arm structures at the forward and rearward ends of the bed. In a preferred construction the cylindrical portion of the motor is pivotally mounted in a bearing **42** to the bed structure, and the piston rod **43** is pivotally connected at **44** to the appropriate end wall of the bucket through reinforcing plates **45**. Thus, as is described hereinafter, actuation of these motors will cause a pivoting dumping action of the bucket about the inserted hinge pins **35**.

In order to assure that the load is dumped rapidly beyond the selected side of the dump body, gate members **50** are provided, each pivotally connected to the upper edge or side lip of the bucket structure per se, as by suitable piano-type hinge members **52** (FIGS. 1 and 2). The gate which is located on the side closest to the selected pivot axis, where the hinge pins **35** are inserted, is in turn pivotally connected at **53** to the outer end of the guiding and controlling link **28**, and the locations of the pivot points between length **28** and plate **27** as well as the hinge **52** and the pivot connections **53** are so related dimensionally that as the bucket **30** is raised in a pivoting movement about the hinge pins **35** the gate **50** will swing

open with an initially accelerated motion such that the load will pass rapidly over the gate to be dumped at the side of the truck. Each gate includes wings **54** functioning to prevent material from flowing off the side edges of the gate when it is opened.

This quick opening action of the gate is particularly shown by comparison of the dotted and full line positions shown in FIG. 4 with the final raised position of the dump body, and the relative position of the gate, as shown in FIG. 5. It will be apparent from inspection of the drawings that by the time that the bucket is raised approximately half way through its dumping motion, as shown in the full line portion of FIG. 4, the opening gate **50** is well beyond a half way open position with respect to dump body **30**, and by the time the body is raised to its full dump position shown in FIG. 5, the motion of the gate has retarded such that the gate surface is substantially coplanar with the adjacent sloping interior surface of the dump body. The gate not being used is held in its closed or raised position by pins **55** which can also be transferred for use with either gate.

Accordingly, particularly with reference to FIG. 5, as the loaded bucket is raised through its dumping motion, the lip adjacent hinge pins **35** moves downwardly and inwardly toward the center of the bed. The center of gravity of the loaded bucket, indicated approximately at **56** in FIG. 5, will move essentially vertically along, and initially somewhat to the opposite side of, the longitudinal vertical center plane of the dump body, the load will be dissipated by reason of the dumping action over the quickly opened gate **50** such that the center of gravity of the dump bucket, now empty as shown in FIG. 5, will be approximately at **57**, and the total lateral deviation of the center of gravity of the bucket will be within the limits indicated at *a* in FIG. 5. It will be noted that at no time does the center of gravity of the dump bucket move beyond the pivot axis thereof, nor beyond the track dimensions of the truck wheels. Furthermore, the center of gravity of the fully loaded body, at rest and during the initial portion of the dumping action is maintained essentially at the center of the bed and below the pivot axis, and the forces tending to tip the truck during dumping are thus substantially minimized. In actual practice, it has been observed that there is no apparent tipping action of any consequence upon the truck as a whole during dumping of a full load of approximately twelve tons of material.

For example, referring particularly to FIG. 5, the vertical longitudinal center plane of the truck body is indicated by the dot-dash line **60**. As noted previously, the center of gravity of the loaded bucket is indicated at **56**. When the dump bucket is fully raised the center of gravity of the entire dump truck body, including the bucket and supporting frame, deviates to the left of this center plane approximately by the distance *b* as shown in FIG. 5, and this results in a deviation of the center of gravity of the entire truck and dump body combination, with the dump bucket raised, of the relatively slight distance *c*. Therefore, it will be seen that the total deviation of the center of gravity of a truck equipped with a dump body in accordance with the invention is relatively slight, and will not produce any significant force tending to topple the truck.

FIG. 6 illustrates a typical hydraulic power drive for controlling movement of the dump bucket. The hydraulic motors **40** (normally called "hydraulic cylinders" in practice) are connected in parallel to supply lines **65** and **66**. The power takeoff from the truck engine, shown schematically in FIG. 6, is connected to operate a positive displacement pump **68**, and this pump draws hydraulic fluid from reservoir **70** through line **72** and supplies this fluid through line **75** for direction to either of the lines **65** or **66**, depending upon the manipulation of a manually controlled 3-way valve which is shown schematically at **78**.

In its center position this valve will close off the lines **65** and **66** from the supply and provide a dump or by-pass connection from pump **68**. Thus the bucket will be retained at whatever position it occupies when the valve is so closed. In its other two positions this valve will alternately direct fluid under pressure to lines **66** or **65**, to raise or to control the lowering of the dump bucket **30**. The opposite line will at the same time be connected, in conventional fashion, to an exhaust or tank line **79** which will return fluid to reservoir **70**. Also, a conventional relief valve **80** is connected between lines **75** and **79** to relieve excessive pressure in line **75**, should this ever develop. The location of the elements of the hydraulic system are shown generally in FIG. 2, wherein it will be noted that lines **65** and **66** include flexible hose sections **65***a* and **66***a* accommodating the necessary pivotal motion of the hydraulic motors during actuation thereof. Pump **68** may be conveniently mounted at the rear of one of the beams **15**, and the reservoir **70** may be suitably mounted in the space between these beams, as shown in FIG. 3.

It is also possible to use a simplified hydraulic power and control system wherein single acting cylinders are employed instead of the double acting ones **40**, thus providing power only to dump and relying upon gravity for lowering the emptied bucket. This will result in a simpler hydraulic system with fewer lines and connections, and will be obvious to those skilled in the art.

The modified construction shown in FIGS. 7 and 8 is similar to the arrangement previously described in many respects. Accordingly, similar reference numerals in the 100-series are applied to parts which are identical in operation and function to corresponding parts previously described. Not all of these parts are mentioned specifically hereafter, but it will be understood that they correspond to the above described construction without specific reference thereto.

Accordingly, in FIG. 7 the dump bucket **130** is shown as pivotally mounted on hinge pins **135** which in turn are carried at the top of the supporting arm structure **120**. The bucket is swung between its carrying position and its dumping position by the hydraulic cylinders **140**, of which there is one at each end of the bucket, and the gate member **150** is hinged to the side of the bucket at **152**. At the upper edge of the bucket construction there is a bracket or mounting plate **155** which provides a pivotal mounting for a hydraulic gate control cylinder **157**, and the piston rod **158** of this cylinder is pivotally connected at **159** to gate **150**.

Referring to FIG. 8, the pump **168** may be driven by the power take-off from the truck engine, and supplies hydraulic fluid under pressure from the tank or reservoir **170** to the supply line **172**. The main or bucket control cylinders **140** are shown as of the single-acting type, and the supply and exhaust of hydraulic fluid thereto is under the control of the manually operated 3-position valve **175**, which has three different internal passage arrangements as shown. Connected to this bucket drive circuit, which includes the pressure fluid supply line **165** and the exhaust or drain line **166**, is a circuit for the gate drive cylinders **157**, it being understood that there is one of these cylinders arranged at each end of the gate **150**. These cylinders are shown as of the double-acting type, and the hydraulic fluid is supplied thereto through control line **180**, and exhausted through line **181**. Line **180** is connected to the pressure supply line **165** through an internal connection in valve **175**, in each position thereof, and supplies pressure fluid to a manually operable 3-way valve **185**. Preferably, valves **175** and **185** are provided as a single unit in actual practice, having a single manual control lever. However, for simplification of illustration they are shown as individual valves. It should be understood, however, that there are commercially available valve units which provide all the necessary functions of these two valves

in a single unit, which is indicated schematically by the dotted lines in FIG. 8.

This, when the pressure fluid is supplied to the bucket motors or cylinders **140**, line **180** is simultaneously connected to the pressure fluid supply line, and the cylinders **157** operate to open gate **150** simultaneously with the dumping action of the bucket. It has been found that in actual practice, due to the resistance provided by the load on the main cylinders **140**, that the hydraulic circuit will inherently function to supply pressure fluid to cylinders **157** acting to cause a quick opening of gate **150** as the bucket **130** is raised, in essentially the same manner as previously described in connection with the mechanical linkage construction shown in FIGS. 2, 4 and 5. If the cylinders **157** are found to open too rapidly in relation to the bucket's dumping motion, the operation of these cylinders can be retarded by employing a line **180** of lower capacity, or otherwise throttling the flow of pressure fluid to these cylinders.

The foregoing description, with respect to the system shown in FIG. 8, assumes that the operator will manipulate the manual controls for the valves **175** and **185**, and probably that these controls will be on the truck body, for example to the rear thereof as shown in FIG. 2. It may be desirable in some instances to provide a remote control for operation of the dump body, for example by push button operation from the truck cab so that the driver can control the entire dumping operation without leaving the cab. In such an arrangement, a convenient system can be provided in accordance with the apparatus shown in FIG. 9, wherein the valves **175***a* and **185***a* are of the same type as valves **175** and **185**, respectively, as regards internal porting and passages.

These valves, however, are normally self-centered by springs or the equivalent (not shown) and each may be shifted in one direction or the other by pilot controls. For purposes of explanation, such pilot controls are shown as remotely controlled solenoids, the solenoids **190** and **191** being energized simultaneously by closing of switch **192**, to move these valves to a position supplying pressure fluid to swing the dump bucket to its discharging position and to open the gate. Similarly, closing of switch **195** will energize solenoids **196** and **197** to shift these valves in the opposite direction and thus to return the emptied dump bucket to its normal carrying position and to close the gate. These push button switches can be of the spring-opened type which require the operator to hold the button depressed in order to close the switch and operate the system, and of course such switches can be conveniently mounted in the cab for manipulation by the driver.

The foregoing description assumes the desirability of providing a dump body which can be connected to dump to either side, as described. Of course, if at the time of construction it has already been determined that the body is to dump only to one side, then the supporting arms **20** can be constructed with only one arm, instead of the V-shaped arm construction shown. With such an arrangement all operating parts would be the same as described previously, except that the dump body would of course discharge only to the side toward which such modified arms extend to provide the high point pivot mounting.

Accordingly, the present invention provides a novel dump body for trucks and the like which is readily adapted to standard truck chassis or to similar conveyance chassis, and which maintains the center of gravity closely adjacent to the longitudinal center line of the body such that no additional or temporary supporting structure is needed to accommodate shifting of load during the dumping operation. The present invention also provides a dump body in which dumping can be accomplished conveniently to either side, and with which a relatively large load of material, such as fresh concrete, can be completely dumped within a short period of time, since

there is very little metering of the load through small discharge chutes or members during the dumping operation.

While the form of apparatus herein described constitutes a preferred embodiment of the invention, it is to be understood that the invention is not limited to this precise form of appaartus, and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. A dumping body comprising a rectangular bed adapted for mounting on a chassis with its longer dimension extending front to back of said chassis and its shorter dimension centered on said chassis, a load-carrying dump bucket of generally symmetrical configuration about a vertical plane extending longitudinally through its center and along the longer dimension of said bed, opposed upwardly and divergently extending sides on said bucket extending angularly with respect to said central plane of said bucket, front and rear end walls on said bucket connected to said sides and projecting upwardly above said sides, at least one of said sides terminating in a lip extending essentially the full length thereof and located substantially below the top of said end walls, a gate hinged to said bucket adjacent said lip and extending the full length of said lip and projecting upward therefrom in the load-carrying position of said bucket, means forming an upward extension from the other of said sides to at least the top of said end walls, said sides and said end walls together with said gate and said extension forming means defining a load-carrying enclosure which has a depth along its said central plane of more than one-half the width of said bucket at its greatest width dimension adjacent its top, mounting means for said bucket positioning it on said bed with its said central plane centered with respect to said bed in load-carrying position, pivot means included in said mounting means and attached to said bucket defining a pivot axis extending parallel to and spaced above said lip and located substantially closer to said lip than to said central plane of said bucket, said pivot axis being above the center of gravity of said bucket when said bucket is in its load-carrying position with a load therein, power dumping means acting on said bucket for causing pivotal movement thereof about said pivot axis to cause said lip to move downwardly and inwardly and to cause the center of gravity of the loaded bucket to remain near to said central plane until after the material begins to discharge over said lip, and means for opening said gate during dumping motion of said bucket to carry material discharged over said lip outwardly over said gate beyond the side of said bed.

2. A dump body as defined in claim 1 wherein said extension means comprises an additional gate hinged to said other side of said bucket, and additional pivot means included in said mounting means and forming a pivot axis along said other side of said bucket arranged parallel with respect to said first mentioned pivot means, means for selectively and alternatively causing one of said pivot means to be operative and the other to be inoperative, and controls for said gates also alternatively and selectively operable to open during a dumping operation only that gate over which the load is being discharged.

3. A dump body as defined in claim 1, including a linkage pivotally connected to said gate and to said mounting means for causing predetermined opening movement of said gate in response to dumping movement of said bucket.

4. A dump body as defined in claim 1, including power operated means operably connected to said gate, and a control for said power operated means for causing opening movement of said gate during dumping movement of said bucket.

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