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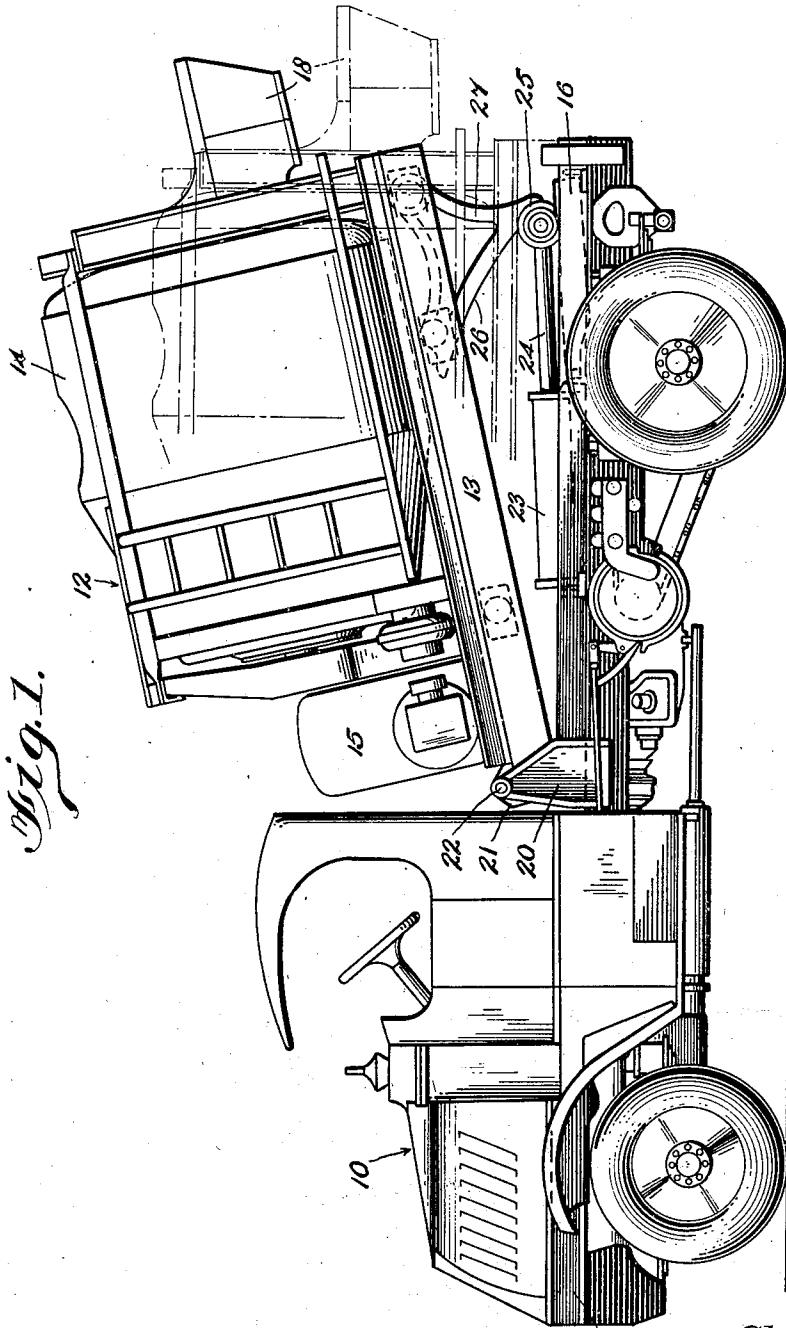
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HIGH DISCHARGE CONCRETE MIXER AND METHOD OF OPERATING THE SAME

Filed May 16, 1931

2 Sheets-Sheet 1



*Fig. 1.*

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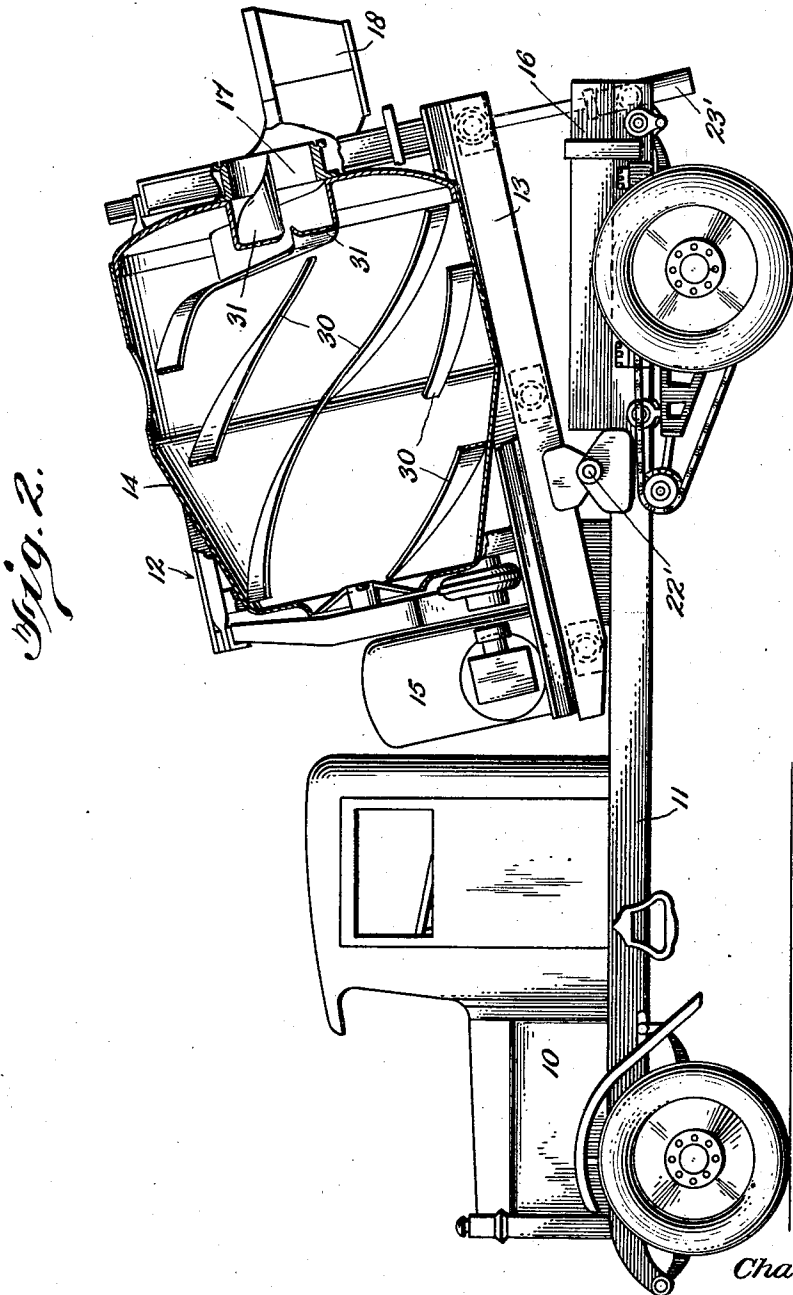
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# UNITED STATES PATENT OFFICE

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## HIGH DISCHARGE CONCRETE MIXER AND METHOD OF OPERATING THE SAME

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10 Claims. (Cl. 83—73)

This invention relates to concrete mixing or agitating apparatus, and has for one of its objects the provision of a concrete mixer or agitator of the truck or transit type so constructed and arranged that the portion of the mixture-carrying receptacle which is provided with the discharge opening may be elevated at the time of discharge materially above its normal mixing and transportation position, such elevation being accomplished without excessively raising the center of gravity of the machine; there being means provided for carrying on the agitation of the concrete while at the same time positively moving it to and through the discharge opening during such elevation, with the result that the benefits of a discharge point materially above the normal position of the discharge opening during mixing and transportation are attained, while at the same time minimizing to a practically negligible point the dangers of instability arising from excessive raising of the center of gravity, and which have characterized all previously proposed high discharge truck concrete mixers and agitators of which I am aware.

In order that the precise nature of the invention may be better understood, it may be said that truck mixers and agitators, as developed in this country, are usually provided with an elongated mixing or agitating receptacle permanently mounted on a motor vehicle chassis, with its longitudinal axis in alignment with the longitudinal axis of said chassis. The receptacle is ordinarily provided with a port or opening in the rear end wall through which the mixed concrete is discharged, and which opening is generally closed by a gate or cover during the mixing and transportation of the concrete. These receptacles are now built in sizes to carry up to five or six cubic yards of concrete, which may weigh as much as ten or twelve tons.

In order that concrete may be economically transported in truck mixers or agitators between the point of loading and the place of discharge, it is important that the apparatus be capable of attaining comparatively high transit speeds. As the points of loading and discharge may be several miles apart, it is common for truck mixers to operate at road speeds of thirty miles per hour, or more, where such speeds are permitted by law, carrying say ten or twelve tons of concrete between such points. Again, this transported concrete is in many instances for use in construction operations, and it frequently happens that at the point of delivery the machine must traverse rough, ungraded, hilly or sloping

terrain, often soft and of unknown load-bearing capacity. Because of these factors, viz., the relatively high transit speeds, and the character of the terrain over which the truck may need to operate in order to reach delivery position, it is of material importance that the center of gravity of the load be kept as low, or as close to the truck chassis, as the nature of its structure will permit; and because of this requirement of low center of gravity, the discharge opening of the receptacle, which is generally at or below the medial horizontal plane thereof, has of necessity been held so low as to seriously handicap delivery of concrete in truck mixers or agitators in many instances.

That is to say, in the placement of concrete from truck or transit mixers, it is frequently desirable that the concrete be flowed directly into forms which are higher than the normal discharge point of the truck mixer, or into a distributing trough or chute through which it may flow by gravity to a point considerably removed from the mixer. It has been heretofore proposed to accomplish this result in connection with agitating bodies of the nonrotating type through the bodily elevation of the entire receptacle, accompanied by a rearward downward inclination of the receptacle so that the concrete material might flow by gravity through the usual rear discharge opening. This bodily elevation and rearward downward inclination of the entire receptacle also raises and moves rearwardly the center of gravity of the mixer and the concrete therein. There is always more or less danger in shifting the center of gravity in a truck-supported load of concrete, especially when standing on ground of uneven or unstable character. Instances are known of truck mixers of this type being overturned, resulting in great damage to property, and also extreme danger to the lives of those employed about the construction work. Truck mixers or agitators of this type are ordinarily provided with revolving blades or paddles mounted within a relatively stationary body and driven through suitable connections from the truck motor. In all previous apparatus of this type with which I am familiar, however, it has been necessary to break the power drive of these agitating paddles whenever the receptacle is elevated for discharge purposes, with the result that during such discharge it has not been possible to revolve the agitating paddles, and considerable difficulty has been experienced in the absence of such agitation, in getting the concrete to flow through the discharge opening. As a matter of

fact, in actual practice it has nearly always been necessary in this type of machine for the operator to climb into the receptacle and move a large portion of the concrete toward and through the discharge opening by hand.

As before stated, only non-rotating agitators have been elevated in the manner described, and it is to be noted that the extreme raising of the center of gravity would be even more dangerous in the case of mixers or agitators of the rotating drum type, such for example as shown in my prior Patent No. 1,781,965, dated November 18, 1930, wherein the torque incidental to the starting of the drum in the discharge direction of rotation, the said drum containing perhaps 4 cubic yards of mixed concrete or more, may be so great, under certain conditions of ground on which the truck is standing, as to be quite apt to result in the overturning of the vehicle, should the entire unit be elevated in the manner above described.

A high discharge point is advantageous in so many instances that it is extremely desirable to provide a structure, adaptable primarily to truck mixers of the rotating drum type exemplified by my prior Patent No. 1,781,965 above mentioned, but also susceptible of use in the non-rotating receptacle type, which will permit of the attainment of such high discharge point in safety, through the maintenance of a relatively low center of gravity of the mixer and batch of concrete contained therein, during discharge as well as during transit.

Hydraulic cement concrete mixtures, because of their inherent tendency to begin to "set" or harden soon after the hydration of the cement is completed, should preferably be kept in a state of agitation to retard such action until they are in the forms or other final place of use. Also, in the case of the "wet" or soupy mixes, i. e., those having a relatively high ratio of water to dry constituents, there is a well recognized tendency for the large aggregate to segregate and settle to the bottom unless agitation is continuous. In the case of these "wet" mixes in particular, it is highly desirable that agitation continue during discharge, to insure completely uniform concrete. Agitation of the mixture, not only during transit, but also during discharge, is therefore an additional factor to be considered in connection with high discharge.

To provide a truck mixer capable of high discharge and embodying the above considerations, I mount the mixing or agitating unit upon the truck chassis in such manner that the receptacle may occupy a lowered substantially horizontal mixing and transportation position, in which mixing or agitation may be the most effectively carried on, and in which the center of gravity is at its lowest feasible point, considered in the light of the limitations imposed by present day automotive vehicle construction, the mounting being such however, that at the time of discharge the receptacle may be inclined upwardly toward the discharge end to raise the discharge opening substantially above its said lowered position. When in such inclined position, the center of gravity is raised only slightly, or to a materially lesser extent than is the discharge opening, and due to the shifting or sliding of the plastic mixture to the non-discharge end, such center of gravity is also moved somewhat forwardly of the truck, so that for all practical purposes, the machine is as stable in its discharge position as in its mixing and transportation position. Means are also associated with the receptacle for agitating the

mixture, and moving it up the incline toward and through the elevated discharge opening, and the construction is such that these agitating means may be effective at all times, whether the receptacle be in transit or discharge position.

With the above and other objects in view which will appear as the description proceeds the invention consists in the novel details of construction and combinations of parts constituting the apparatus, and the novel steps and combinations of steps constituting the method of operation, all as will be more fully disclosed below and particularly pointed out in the appended claims.

Referring to the accompanying drawings forming a part of this specification in which like reference characters designate like parts in all the views:—

Figure 1 is a side elevational view, of a transit mixer of the rotating drum type constructed in accordance with the present invention to obtain the desirable high discharge, the parts being shown in the discharging position; and

Figure 2 is a similar side elevational view partly in section of a slightly modified form of the construction.

Referring more particularly to the said drawings the motor truck or vehicle 10 is provided with a chassis frame 11 upon which the mixing or agitating unit 12 is mounted. The said unit, as disclosed in my said prior patent, comprises longitudinal sills 13, which carry the rotatable drum or receptacle 14 which may be driven by means of the independent motor 15 also mounted on the said sills. In the prior construction these sills 13 have rested upon the longitudinal chassis members 16 and have been rigidly bolted thereto so that the rotative axis of the mixing or agitating receptacle 14 has been substantially horizontal. It has thus been impossible to elevate the discharge opening 17 and hopper 18 of the receptacle except through the building of ramps up which the rear end of the vehicle might be run.

In order to obviate the necessity of such ramps and at the same time to secure the advantages of the high discharge, in the present instance there are provided brackets 20 carried by the truck chassis 11 immediately adjacent the cab, and companion brackets 21 carried by the forward ends of the sills 13 of the agitating unit, which brackets are pivotally connected as at 22, all as is clearly illustrated in Figure 1. Mounted upon the truck chassis is any suitable elevating apparatus here shown as comprising a fluid pressure cylinder 23 from which projects a piston- or operating-rod 24 carrying a roller 25 which bears against the cam surface 26 of the bracket member 27 carried by the sills 13 of the agitating or mixing unit. The bracket member 27 as will be clear from the drawings is arranged adjacent the rear end of the unit and the parts are so constructed and arranged that as the rod 24 is projected from the cylinder 23 and the rear end of the unit 12 will be elevated from its usual horizontal position to the position shown in Figure 1, through the action of the roller 25 upon the inclined surface 26, all as is well known in the art of vehicle body elevation. The details of the elevating mechanism constitute no particular part of the present invention as obviously any suitable form of such mechanism may be employed and that shown has been selected for illustrative purposes only.

When the elevating mechanism is operated as above described the mixing or agitating unit 12 will be tilted about the pivotal connection 22 so

that the rotative axis of the receptacle 14 is inclined upwardly and the rear or discharge end of the receptacle is raised or elevated above the forward or non-discharging end, consequently raising the discharge opening 17 and the hopper 13. The said hopper may be elevated as much as two or two and a half feet above its normal position when the unit 12 is in its lowered or horizontal position, and the concrete from the drum may thus be discharged through the opening 17 from this additional elevation. Such discharge may be accomplished in the case of the rotating drum through the action of the spiral mixing blades 30 which are provided upon the inner periphery of the drum and the discharging buckets 31 arranged adjacent the discharge opening 17. As fully disclosed in my prior patent above mentioned, and copending application filed June 24, 1931, Serial No. 546,591 these blades and buckets are so constructed and arranged that during rotation of the drum in one direction they serve to not only lift and agitate the concrete mixture, but also to move it endwise toward the forward end of the drum, while upon rotation of the drum in the opposite direction they continue the agitation and at the same time move the mixture toward the discharge end and toward and through the discharge opening 17. It is thus possible in apparatus of this rotating drum type to positively discharge the concrete material from the receptacle through the discharge opening 17 even though the said receptacle be inclined in such direction that the tendency of the material is to flow toward the forward end. Furthermore, since the drum 14 is driven through the independent motor 15 which is carried upon the sills 13 the drum drive is not interrupted or anyway affected through the inclination of the unit and the drum may be rotated for discharging purposes when inclined as shown, just as effectively as it could be when in its normal horizontal position.

The form of the invention illustrated in Figure 2 is quite similar to that shown in Figure 1 with the exception that the pivotal connection 22' has been moved somewhat toward the rear of the unit 12 although it still remains forward of the center of gravity of the unit. With this construction, although a slight decrease in the extent of elevation results, the angle of inclination remains substantially the same, and the compensating advantage of retaining the center of gravity at nearly its normal position is had; and, as above pointed out, due to the torque resulting from the starting of the drum containing perhaps four cubic yards of plastic concrete, it is of extreme importance to maintain the center of gravity of the entire machine as low as possible in order to prevent upsetting of the mixer. The modified form of Figure 2 also has the advantage that a lighter hoisting mechanism may be employed, with a resulting saving in cost, and in some instances, a manual hoist may be used.

In as much as the mixing and agitating blades 30 and the pick-up and discharge buckets 31 are operative at all times it is obvious that discharge of the drum contents may be effected not only when the drum is inclined as shown in the drawings, and when it is in its normal horizontal mixing or agitating position indicated in broken lines in Figure 1, as in my said prior patent and application but also in any position intermediate the two, thereby providing an effective discharge at any point within the limits of movement of the discharge opening.

vary the details of construction as well as the precise arrangement of parts without departing from the spirit of the invention, and therefore it is not wished to be limited to the above disclosure except as may be required by the claims.

What is claimed is:

1. In concrete mixing and agitating apparatus, a support; a receptacle having a discharge opening, mounted on said support in a normally substantially horizontal position; means for inclining said receptacle to raise its discharge end above its non-discharge end while maintaining the center of gravity at nearly its normal position; and agitating means operative while said receptacle is thus inclined, for agitating the concrete within said receptacle and moving it toward and through said discharge opening.

2. In concrete mixing and agitating apparatus, a support; an agitating receptacle having a discharge opening at one end, tiltably mounted upon said support; means for tilting said receptacle to elevate said discharge opening above its normal position while raising the center of gravity a lesser amount; and means within said receptacle for simultaneously agitating and moving the concrete therein through said discharge opening while it is elevated.

3. In concrete mixing and agitating apparatus, a support; a rotatable mixing or agitating receptacle tiltably mounted upon said support, said receptacle being provided at one end with a discharge opening; means for inclining said receptacle to elevate said discharge opening above the non-discharge end of the receptacle while raising the center of gravity to a materially lesser extent; agitating means carried by said receptacle for simultaneously agitating and compelling movement of the concrete therein through said discharge opening while in its elevated position; and means for rotating said receptacle upon its axis while in both its normal and its inclined positions.

4. In concrete mixing and agitating apparatus, a support; a rotatable mixing or agitating receptacle having a discharge opening at one end, tiltably mounted upon said support; means for raising the discharge end of said receptacle above the non-discharge end to elevate said discharge opening above its normal position without materially raising the center of gravity; mixing blades and discharging buckets within said receptacle, adapted when said receptacle is rotated in one direction, to agitate and compel movement of the concrete therein toward and through said discharge opening when said receptacle is in either its normal or its inclined position; and means for rotating said receptacle upon its axis when in either of said positions.

5. In concrete mixing and agitating apparatus, a support; a mixing or agitating unit including a rotatable receptacle having a discharge opening at one end, mounted upon said support with the rotative axis of said receptacle normally substantially horizontal; a pivotal connection between said unit and said support adjacent the non-discharge end of said receptacle; means for swinging said unit about said pivotal connection to raise its discharge end above its non-discharge end and to elevate said discharge opening above its normal position without materially raising the center of gravity of the machine; means mounted on the inner wall of said receptacle which through rotation of the latter in one direction simultaneously agitate and impel the concrete therein toward and through said discharge

It is obvious that those skilled in the art may

opening when the latter is elevated; and means for rotating said receptacle while in its inclined position.

6. In a transit concrete mixer or agitator, a vehicle chassis; a mixing or agitating unit pivotally connected adjacent its forward end to said chassis, said unit including a rotatable drum having a discharge opening at its rearward end, the rotative axis of said drum being normally substantially horizontal; means for moving said unit about said pivotal connection to incline said rotative axis and elevate the discharge end of said drum above its non-discharging end while raising its center of gravity to a materially lesser extent; means including spirally arranged blades on the inner surface of said drum for simultaneously agitating and moving the drum-contents toward and through said discharge opening when said drum is inclined; and means for rotating said drum when inclined.

7. In a truck mixer or agitator for concrete and the like, a vehicle chassis; a mixing or agitating unit pivotally connected forwardly of its medial portion to said chassis, said unit including a receptacle having a discharge opening at its rearward end, and said receptacle occupying a substantially horizontal position during transportation; a hoist for moving said unit about its pivotal connection for discharge to elevate the discharge end without materially raising the non-discharge end or the center of gravity of the unit; agitating means within said receptacle; and means for moving said agitating means while the receptacle is inclined to agitate and impel the mixture toward and through the elevated discharge opening.

8. In a truck mixer or agitator for concrete and the like, a supporting frame; a mixing or agitating receptacle closed at one end and having a discharge opening at its other end, pivotally connected to said frame, whereby it may occupy a lowered mixing and discharging position in which its center of gravity is at substantially its lowest feasible point, and may be tilted to an inclined discharging position in which the discharge end is elevated above the non-discharge end and said discharge opening is raised materially above said lowered position, while said center of gravity is raised a materially lesser extent; means for inclining and lowering said receptacle; and means operative when said receptacle is in either its lowered or its inclined position for agitating its con-

tents and moving them toward said discharge opening.

9. In a truck mixer or agitator for concrete and the like, a vehicle chassis; a rotatable mixing or agitating receptacle having an axial discharge opening in one end and closed at its other end, said receptacle being pivotally mounted on said chassis and adapted to normally occupy a substantially horizontal mixing position in which its center of gravity is at approximately its lowest feasible point; means for tilting said receptacle about its pivot to elevate its discharge end above its non-discharge end and raise said discharge opening materially above its lower position, while raising the center of gravity to a considerably lesser extent; means within said receptacle and operable in either position of the receptacle through rotation thereof in one direction to agitate its contents for mixing, and through rotation in the opposite direction to continue the agitation while moving said contents toward and through said discharge opening, said means being operative to discharge said contents when said receptacle is in either its lowered or its tilted position, or in any position intermediate thereto; and means for rotating said receptacle.

10. A truck mixer or agitator for transporting, agitating and delivering concrete or the like having a truck chassis adapted for rapid road travel; a receptacle of large transverse dimension relative to the chassis wheel-width and having a discharge opening at one end, carried on the rear portion of the chassis frame with its longitudinal axis in the plane of the chassis axis, said receptacle normally occupying a lowered position in which the most effective mixing may be had and in which the inherent lateral stability of the vehicle is at its maximum; rotatable means in said receptacle for agitating the concrete and also moving it to discharge position; connections between the truck and receptacle whereby the latter may be moved to an inclined position in which its discharge opening is elevated materially above its lowered position for high discharge of the concrete therefrom, the non-discharge end and the center of gravity being raised to a lesser extent, whereby the lateral stability of the apparatus is maintained during such high discharge to prevent overturning thereof due to the torque of said rotatable means and substantial bodily tilting of the chassis by ground-surface irregularities; and means for raising and lowering said receptacle.

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