June 20, 1967 J. S. WALLACE 3,326,537

TRANSIT CONCRETE MIXER

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Fig. 1.

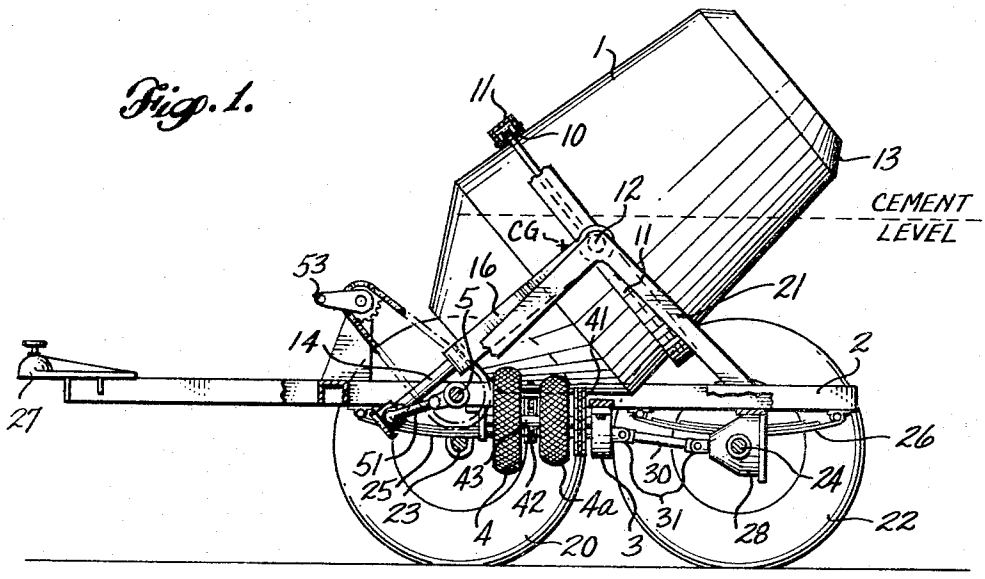
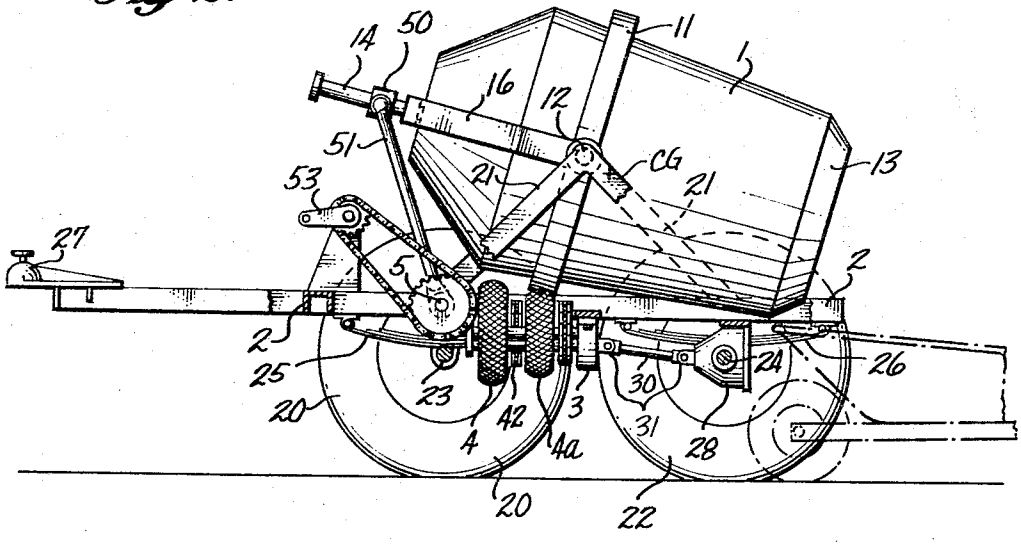


Fig. 2.



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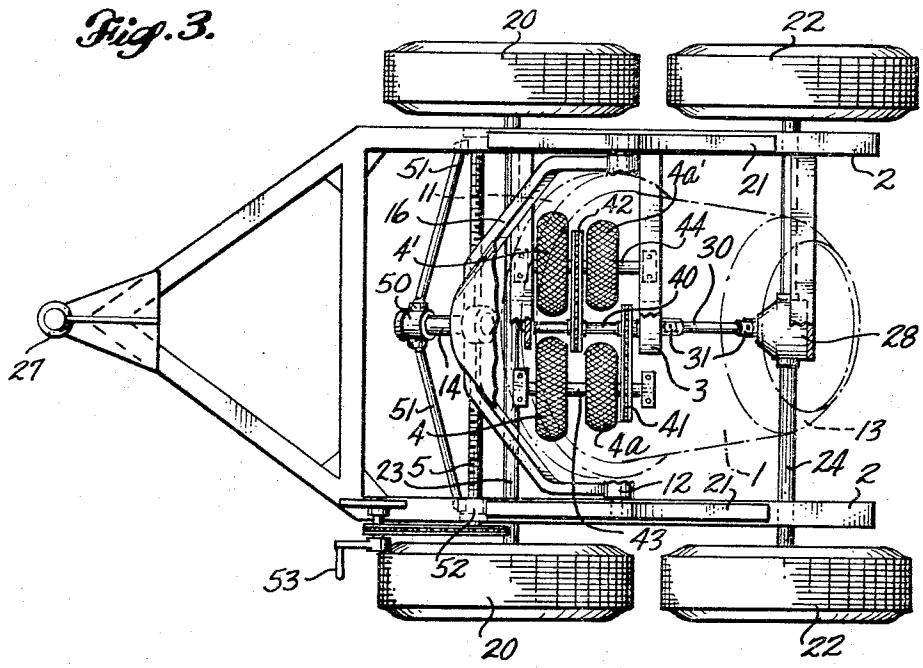
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Fig. 3.



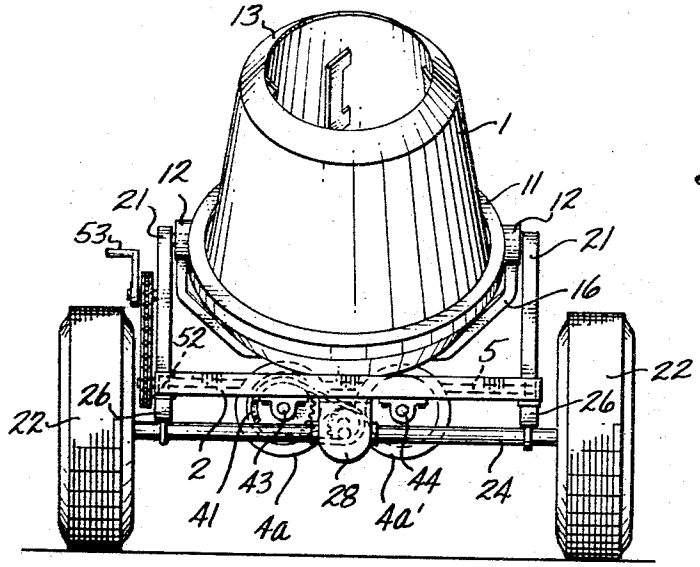


Fig. 4.

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TRANSIT CONCRETE MIXER

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10 Claims. (Cl. 259—177)

The present invention concerns a transit concrete mixer of a special type, not ordinarily one of a size for regular commercial use, with a capacity of several cubic yards of concrete, nor yet one that is intended to be filled with concrete already mixed at a ready-mix plant (which plants are usually distant from residential neighborhoods where the user would wish to pour it), but rather one that is intended for rental to a householder who wishes to pour a cubic yard or so at a time, and who can obtain measured quantities of sand, gravel, and cement at a neighborhood source of supply of the separate ingredients, and who after adding water transports the whole to his site, mixing en route, and using his automobile to haul a trailer whereon the mixer is mounted. The aggregates and cement and water would be within a drum mounted rotatably upon the trailer chassis, and their proportions could be closely controlled. Upon arrival at the site the cement would be ready to pour, having been mixed en route, and can be delivered into forms directly, or into a wheelbarrow, at whatever rate is convenient or necessary.

It has been noted that ready-mix concrete plants are usually located distantly from residential neighborhoods, where such a user might wish to place the concrete. There usually are, however, sources of supply in or near such neighborhoods where bags or other measured quantities of aggregates and cement can be obtained, and the mixer of this invention enables the user to obtain the same readily, and near by, and to mix the whole in the desired proportions, hence he avoids on the one hand, the necessity of ordering and disposing of a minimum load of several yards of concrete when he can only use a part thereof, and on the other hand, of a long haul from a distant ready-mix plant with the small quantity that he needs, perhaps not quite of the correct proportions, and the possibility of setting of the concrete within the drum while en route to his site.

More particularly, aside from the convenience afforded by such a mixer, the drum would be so mounted and driven, upon the trailer, as to render the trailer unit extremely simple and free of the likelihood of complications, particularly in its drive and in its mechanism.

For instance, it is not feasible to rotate the drum from the engine of the tractor automobile, as a commercial transit concrete mixer is driven by the power take-off of the engine that drives the truck whereon it is mounted, nor is it feasible to mount upon the trailer chassis an engine intended solely to rotate the drum. This would add the weight of the engine, its fuel tank, and cooling system to the trailer, would add expense to the renting agent that the renter would have to pay, and would increase the possibility of a stoppage or breakdown en route, unknown to the automobile driver, or which he would be unable to remedy promptly, with consequent danger of setting of the concrete within the drum. Furthermore, such a drive system for the drum would involve expense and down-time while the system was being serviced or repaired.

According to the present invention the drum is mounted upon the trailer chassis in such manner that, during transportation, it is rotated by means of a drive connected to a road wheel or wheels of the trailer. Such a driver, however, must be of a special nature; in particular, it must not be directly and rigidly connected to such driving

wheels, but it must be indirect to the extent that it becomes effective only during forward motion of the trailer, and also at road speeds above a predetermined minimum. A torque converter drive will satisfy the requirements. Thereby the drum will not begin to rotate until the trailer has acquired a predetermined road speed of, say, fifteen miles an hour, and the tractor automobile will not be burdened with the added task of rotating the drum at the time it must start the entire load moving forwardly, nor until that starting burden has slackened, and the car and trailer have gained momentum. Thereafter the drive to the rotating drum gradually becomes more positive as the forward speed increases or maintains its rate.

Moreover, with the torque-converter interposed between the driving wheels of the trailer and the drum, an abrupt stop of the tractor automobile and the trailer can have no adverse effect, for rotation of the drum under its acquired momentum can continue in such event, but will not drive forwardly the trailer or the automobile, whereas if the drive were direct and rigid the rotational momentum of the drum and its contents would tend to continue rotation of the driving wheels, and the driver of the tractor car would lose control of the vehicles. An accidental collision, or jack-knifing of the trailer, could easily result in such a case.

It is also an object of the invention so to mount the drum that it is tiltable readily and with little effort, preferably manually, from its transporting position to its dumping position, and back again, by reason of the nature of the mechanism and the location of the center of gravity of the drum and its load of concrete, yet it is securely held in its transporting position, wherein its weight assists in assuring proper rotation of the drum, and in maintaining the drum against dumping.

Also, in connection with the mounting of the drum for driving, it is an object to afford a certain minimum yieldability to the weight of the drum, yet without impairing the positioning or driving of the drum.

Also, it is an object to design such a transit concrete mixer that the load will be properly distributed between its two axles and their springs, regardless of the attitude of the drum.

In particular it is an object to provide such a transit concrete mixer that is of simple design, that has a minimum of complications in its drive and its dumping, that can dump concrete in small increments if required, and that is well suited for use by users who may have only minimal knowledge of mechanisms or of engines, yet can be kept clean and can be used repeatedly in such service.

With these and other objects in mind, as will appear more fully as this specification progresses, the invention comprises the novel transit concrete mixer shown in an illustrative form in the accompanying drawings, and as will be described in detail hereinafter, and defined in the claims.

FIGURE 1 is a side elevational view, broken away in part, showing the mixer in its traveling and mixing disposition, and FIGURE 2 is a like view, in the dumping position.

FIGURE 3 is a plan view of the mixer, illustrating primarily its driving and dumping mechanism, with the drum shown largely in phantom, in its traveling disposition.

FIGURE 4 is a rear elevational view of the mixer, with the drum in its traveling disposition.

Mixing of the concrete occurs within a drum **1**, open at its rear end for loading and dumping. This drum is mounted for rotation about its longitudinal axis by means of guide rollers **10** (FIGURE 1) mounted exteriorly of the drum about a circle in the vicinity of its loaded center of gravity CG, and rolling within a circular track **11**. This particular mechanism might be otherwise designed, however. The track **11** is tiltable about a diam-

etral tilting axis **12** carried at the apices of opposite longitudinally directed triangular or A-frames **21** rising from the trailer's chassis **2**, and a forward yoke **16** cradles the drum in cooperation with the track **11**, when in the transporting position. The chassis is supported by road wheels **20**, **22**, preferably four in number, carried by the respective forward and rearwad axles **23**, **24**. One axle could serve, but for even support of the load without bearing down heavily upon the tractor car, and for avoidance of exceeding axle-load restrictions, two axles are preferred. Each axle may support the chassis through springs **25**, **26**. The trailer is drawn by a tractor car to which it is connected by any suitable or conventional trailer hitch **27**.

As the trailer is being pulled forwardly, its road wheels **20**, **22** rotate by reason of their contact with the roadway. One pair of wheels, for instance the forward wheels **20**, may be each independently journaled upon the ends of their axle **23**. The other pair, in this instance the rear wheels **22**, are fixed upon the ends of separate half-axles **24**, which are joined through the differential **28**, to rotate a forwardly directed drive mechanism that includes a drive shaft **30** and a torque converter **3**. The drive shaft is connected between the differential **28** and the primary rotor of the torque converter by means of universal joints **31**. The details of the torque converter are not shown, since such mechanism is well known, and any suitable unidirectionally driving converter can be employed.

The torque converter **3**, when turning at a speed such as to effect positive drive of the load (which consists primarily of the rotating loaded drum), rotates a longitudinal shaft **40** journaled beneath the chassis **2**, and through chains **41**, **42** it drives opposite jack shafts **43**, **44**, also journaled beneath the chassis. Fast upon the jack shafts are the respective driving wheels **4** and **4***a*, and **4'** and **4***a'* rotative about axes generally paralleling the drum's rotative axis. These wheels contact and rotate the drum **1** when the latter is fully in its transporting position (FIGURES 1, 3, and 4).

It will be noted that the forward end of the drum is of frusto-conical shape, sloping forwardly towards its axis from a largest circumference, and its rear end also slopes more gently from that largest circumference towards its open rearward end, although a more steeply sloped terminal flange **13** may be used there, to insure retention of the load until it is ready to be dumped. In the transporting position of the drum its forward frusto-conical end rest upon the wheels **4**, **4'**, **4***a*, and **4***a'*. To minimize shocks upon the chassis and the driving mechanism, it is preferred that these driving wheels have pneumatic tires. It will be noted that in the transporting position of the drum the CG of the loaded drum is forward somewhat of the transverse tilting axis at **12**, and tends to maintain contact of the drum with the driving wheels.

In order to avoid mechanical complications, and to afford close control, dumping of the load is preferably effected manually. A stem **14** is integral with the drum, and projects forwardly through the yoke **16** and along the drum's axis. A collar **50** is slidable lengthwise of stem **14**, and is connected flexibly to two links **51** that at their outer ends are flexibly connected to nuts that are threaded on oppositely threaded ends of a transverse right-and-left screw **5** journaled upon the chassis **2**. The screw **5** is rotatable by hand—for example by a hand crank **53** connected to the screw **5** by suitable mechanism Other specific means can be used to shift the collar **50** for tilting the drum.

The drum is tilted from its transporting position by turning the hand crank **53**. The nuts **52** approach, from the outspread position of FIGURE 3; the collar **5** urges the stem **14** upwardly, tilting the drum, and eventually the collar **5** moves towards the drum, along the stem **14**. The final dumping position is at FIGURE 2. The tilting of the drum and consequent rearward displacement of its load of concrete shifts the CG of the whole rearwardly, to some such position as is shown in FIGURE 2. Concrete spills from the open rear end of the drum into a form, or a wheelbarrow, and by means of the manual control of dumping the amount spilled is controllable quite closely.

When a householder has a small concrete job to accomplish, such as laying a walk-way, he rents the trailer and a trailer hitch for application to his car, and buys correctly measured quantities of sand, gravel, and cement, which goes into the drum. The correct amount of water is added, and he begins to drive away. At first starting up, his car's motor is burdened with the added load of the trailer and its charge, so he starts slowly. The start is so slow that the torque converter **3** is ineffective to drive, and merely idles. As his speed and momentum increase, say to fifteen miles per hour, the torque converter will begin to drive the wheels **4**, **4'**, **4***a*, and **4***a''*, and the drum **1**, and at normal road speeds the drum will continue to rotate, mixing its charge. Should it be necessary to brake the car suddenly, the torque converter can over run its drive shaft **30**, and the forward momentum of the trailer and its load will have a negligible effect upon the car, nor will there be an appreciable tendency to jack-knife the trailer and the car. Arrived at his destination, the load of concrete is dumped by use of the hand crank **53**, and as much or as little as is desired can be thus dumped. Finally, all concrete having been dumped, the interior of the drum receives water, and this washes out the drum during the return trip.

The A-frames **21**, from which the load is supported, distribute the load quite equally between the forward and rearward axles **23**, **24**. The forward leg of frame **21** is approximately centered midway of the length of forward spring **25**, and the rearward leg of the frame is approximately centered midway of the length of rearward spring **26**. The tilting axis **12** at the apices is generally midway between the two points where the legs join the chassis **2**. The circumferential track **11** is so located and the drum is so shaped that the loaded CG of the drum is a little forward of the tilting axis at **12**, when the whole is in the transporting position, wherefore the load bears upon its driving wheels, yet in the act of dumping the CG moves to the rear of the tilting axis at **12**, and substantially the entire load can be dumped, in controlled quantities, with no great effort. No power source is required, other than the road wheels, either for mixing or for dumping. The user need have no experience with mechanisms, and only needs to be sure to dump the load before it sets within the drum, and to place washing water within the drum after the load has been emptied.

The invention has been described as mounted upon a trailer chassis, and no doubt will be so mounted in most cases. However, the drum could be mounted upon the chassis of a truck—for instance, a truck having no power take-off, and smaller than the usual transit concrete truck. The road wheels can still be so connected as to drive the drum. When a chassis is referred to in the claims, this may be taken as the chassis of a trailer or the chassis of a truck, and in either case the drum is rotated from the road wheels, rather than from a power take-off.

What is claimed is:

1. A transit concrete mixer comprising a vehicle chassis mounted upon road wheels, a drum, means to support said drum from the chassis for rotation about the drum's axis and for tilting movement about a transverse axis, means for thus tilting the drum between a transporting position and a dumping position, an impositive drive means mounted upon the chassis in position to engage the drum externally, and constituting the sole means to rotate the same, when the drum is fully in its transporting position, said drive means being operatively connected to the road wheels, to be driven by the latter.

2. A transit concrete mixer comprising a vehicle chassis mounted upon road wheels, a drum, means to support

said drum from the chassis for rotation about the drum's axis and for tilting movement about a substantially horizontal axis transverse to the drum's rotational axis, means for thus tilting the drum between a transporting position and a dumping position, frictional means engaging the drum externally, when the drum is in its transporting position, for rotating the drum, and drive means interposed between said drum-rotating means and said road wheels, for effecting rotation of the drum while the vehicle is traveling along a roadway.

3. A transit concrete mixer as in claim 1, wherein the drive means includes means arranged to effect rotation of the drum only after attainment of a predetermined road speed by the vehicle.

4. A transit concrete mixer as in claim 3, wherein the drive means is a torque converter which becomes effective only upon attaining the predetermined road speed.

5. A transit concrete mixer as in claim 1, wherein the drive means include wheels mounted upon the chassis in position to engage the drum externally, and each rotative about an axis generally paralleling the drum's axis, the drum being mounted to locate its loaded center of gravity, when in its transporting position, somewhat to the same side of its tilting axis as said drum-engaging wheels.

6. A transit concrete mixer as in claim 5, wherein the driving wheels include pneumatically yieldable tires.

7. A transit concrete mixer as in claim 5, wherein the drum-supporting means has its tilting axis disposed adjacent the loaded center of gravity of the drum, and the drum is of such shape as to dispose that center of gravity to that side of the tilting axis such as will cause the drum to bear upon the driving wheels when it is in its transporting position, but will cause that center of gravity to shift towards the opposite side of the tilting axis as the drum approaches its dumping position.

8. A transit concrete mixer as in claim 1, wherein the tilting means comprise a stem directed coaxially of and external to the drum, a collar slidable along said stem,

and means on the chassis engaged with said collar and shiftable to effect elevation and lowering of the stem as the drum is shifted thereby between dumping and transporting positions.

9. A transit concrete mixer as in claim 1, wherein the tilting means comprise a stem extending coaxially of the drum, a collar slidable along said stem, a pair of nuts, one at each side of the chassis and guided for movement transversely of the chassis, each nut being operatively connected to said collar to shift the latter along the stem, away from and towards the drum, and a right-and-left threaded screw disposed transversely of the chassis and threaded within the respective nuts, to effect their separation and consequent movement of the drum towards its transporting position, or to effect their approach and consequent movement of the drum towards its dumping position.

10. A transit concrete mixer as in claim 1, wherein the chassis is supported by road wheels upon a forward and upon a rearward axle, and wherein the drum supporting means includes upright triangular frames at the opposite sides of the chassis, with the tilting axis at the upper apex thereof, the triangular frames being located to distribute the load substantially equally between the two axles.

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