

Aug. 24, 1954

E. A. EICKSTAEDT
TRANSIT CONCRETE MIXER DRUM

2,687,286

Filed April 19, 1952

2 Sheets-Sheet 1

FIG. 1.

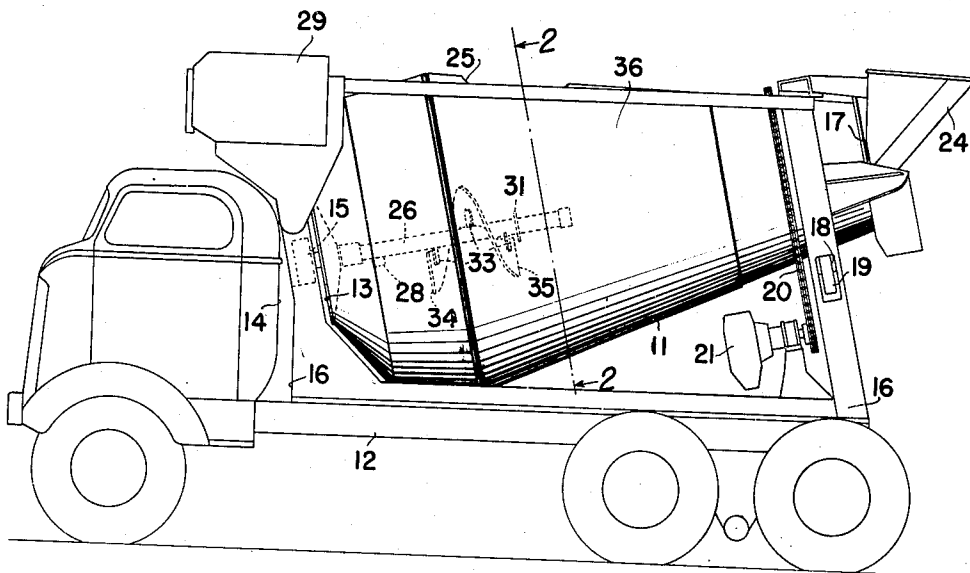
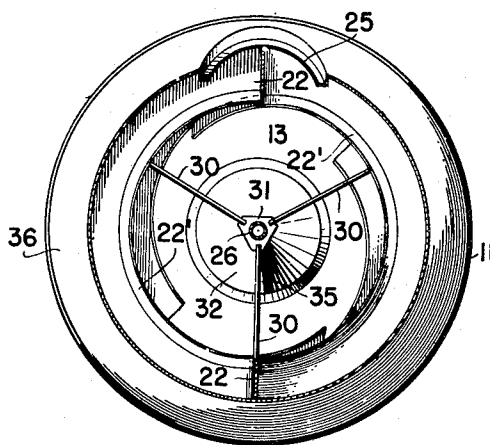


FIG. 2.



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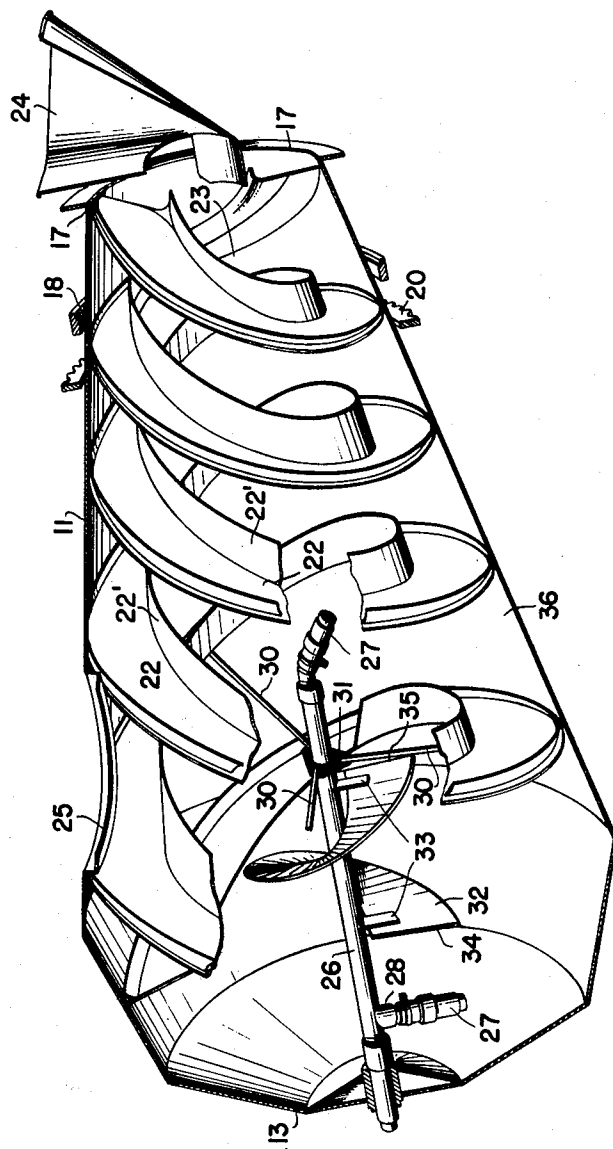
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FIG. 3.



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TRANSIT CONCRETE MIXER DRUM

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2 Claims. (Cl. 259—161)

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This invention relates to the mixing drums for concrete mixers of the type mounted on a motor truck or other transporting medium for mixing or agitating concrete while in transit. It provides a more efficient mixing drum by hastening the mixing operation and by eliminating non-uniform distribution of aggregates in the batch of concrete that is mixed.

Recently, the general shape of concrete mixer drums for truck mounted mixers has undergone substantial change in an effort to reduce the weight on the rear wheels of the truck and yet provide a drum of large carrying capacity. Previously, the load distribution caused excessive weight on the rear wheels and resulting damage to highways. The new drums are substantially longer and relatively narrower, more space being occupied forwardly of the truck to increase the weight on its front wheels, the rearward or discharge end remaining in an easily accessible position at the rear of the truck.

These drums like their more recent predecessors are mounted for rotation on an inclined axis and are provided with spiral blades secured to their perimetral walls and have end openings at the higher end for charging aggregates into the drum at the loading plant and for discharging the mixed concrete at the building site. The blades either propel the concrete making ingredients away from the open end, or toward it, depending on the direction of drum rotation.

I am aware of the fact that it has been proposed to provide within the spiral perimetral blades of concrete mixers, oppositely pitched spiral or slanting blades to produce counter movement of the aggregates being mixed. In stationary mixers, Greene Patent 1,713,222 exemplifies this type of structure and in truck mounted mixers, Jones Patent 1,952,922, Jaeger 1,861,416 and Jaeger et al. 1,928,380 suggest an analagous purpose.

The present invention in its preferred form utilizes the well known auger or helical ribbon, mounted on the axis of the mixing drum, but in a different manner from that of these prior patents so as to obtain an improved result in the mixing action of mixers of the type here involved.

In mixing drums of the type shown by Jaeger and Jones, it has been found totally unnecessary to provide an intermediate or axially disposed auxiliary mixing blade for the reason that these drums, being mounted on horizontal axes, have relatively large diameters compared to their lengths and thus there is ample free space throughout the lengths of the drums for the

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materials to tumble crosswise of the drums and become mixed. The auxiliary blading in fact appears to interfere with mixing rather than to aid it.

With inclined axis drums of relatively greater length and lesser diameter, it was feared that an intermediate auxiliary mixing blade would cause even greater interference with the desired mixing action because it would occupy a portion of this free mixing space, which is even more highly important here than it is with the horizontal axis type of drum. Experience has demonstrated, however, than an auxiliary blade, preferably of spiral shape mounted on the axis of the drum, generously spaced from the forward closed end and extending into the reduced conical portion of the discharge end of the drum, not only does not interfere with mixing, but greatly accelerates it, and in addition facilitates charging of the drum and eliminates "tailings" during discharge.

The invention herein claimed relates to the novel disposition and arrangement of the heretofore generally described auxiliary mixing element in conjunction with a particularly specified mixing drum, the details of which element and drum will be more particularly set forth in the following description.

Referring to the drawings, which illustrate a preferred embodiment of the invention,

Fig. 1 is a side elevation of a truck mixer having a mixing drum of the inclined axis type arranged for optimum distribution of load on the truck;

Fig. 2 is a section through the drum taken on the lines 2—2 of Fig. 1; and

Fig. 3 is an enlarged perspective view of the drum proper with the side wall and parts of the perimetral spiral blading broken away to expose the spiral ribbon surrounding the drum axis.

The drum of this invention, which is generally identified by the reference character 11 throughout all the views of the drawings, is illustrated in Fig. 1 as mounted on the rear of the motor truck 12, with the forward end closed by a head 13 closely adjacent the rear of the cab 14 of the truck. The drum 11 is mounted for rotation on an axis inclined to the horizontal, with its forward end supported by an axial bearing 15 mounted on frame members 16. The diameter of the drum is largest in the proximity of the closed forward end and decreases conically over the greater portion of its length to its elevated open end 17.

Spaced a short distance forward of the open end 17 of the drum is a drum track 18 arranged to ride on spaced rollers 19 mounted on the rear

of mixer frame 16. The drum is rotated by a chain and sprocket drive 20 from a source of power 21 disposed beneath the elevated end of the drum. With this arrangement the center of gravity of the drum is disposed as far forward as possible to reduce the load carried by the rear wheels of the truck.

Within the drum are two spiral blades 22 which extend from adjacent the closed head 13 to the opening 17. These blades are located 180° apart and are secured to the inner walls of the drum to rotate therewith. Preferably these blades have lips 22' on their inner edges on the sides facing the opening 17. The blades extend toward the center of the drum a sufficient distance to be effective in pushing material in their path, lifting it and translating it to the right or left, as shown in Fig. 3, depending on the direction of rotation of the drum, the drum drive transmission providing for reversal of direction of rotation. The core space between the spiral blading 22 tapers in size in accordance with the diameter of the drum, the depth of the blades 22 being substantially constant throughout their length.

The opening 17 at the rear of the drum is large enough to accommodate the ends of the blades 22 and provide a substantial space 23 therebetween through which material may be directed by a charging hopper 24. The drum is also provided with a hatch opening 25 on its side, the door closing which can be removed when it is desired to enter the drum for inspection or repairs.

Extending rearwardly from the closed forward end of the drum is the axially disposed water pipe 26, the rearward end of which is provided with a water nozzle 27 arranged to open and admit water under pressure but preventing concrete from getting back into the water line. Because of the length of the drum it is desirable to have two water outlets and hence a branch arm 28 extends laterally from the pipe 26 adjacent the closed end of the drum, said branch arm being provided at its outer end with a similar nozzle 27.

The water pipe 26 extending through the head 13 is rigidly mounted on the drum so as to rotate therewith and it derives its source of water from an exterior water tank 29 having connections swivelled on the exterior end of the pipe. The inner or rearward end of the pipe is supported by one or more radial rods 30 which are secured to the inside of the drum and to a bracket 31 mounted on the pipe. Thus the pipe 26 is rigidly mounted in the drum and on its axis.

The helical ribbon 32 is conveniently mounted on the water pipe 26 to which it is secured by the radial brackets 33 mounted on the water pipe. The ribbon as shown makes one complete turn in a distance such that its forward end 34 is substantially spaced from the forward head of the drum while its rearward end 35 extends a substantial distance into the conical portion 36 of the drum. The pitch of the ribbon 32 is opposite to that of the blades 22 so that when the blades are moving the material in one direction longitudinally of the drum, the helical ribbon moves material in its path in the opposite direction.

The dimensions and spacing of the helical ribbon 32 relative to the other elements of the drum are important if the ribbon is to be advantageous to the operation of the drum. With a one-turn helix having a diameter substantially equal to its length, as shown, and the diameter being

large enough for the member to be effective on the materials, the space between the forward end of the ribbon and the forward end of the drum should be of the same order as the diameter of the ribbon, and similar ample clearance should be maintained between the rearward end of the ribbon and the inner edges of the blades 22 opposite this end of the ribbon.

If the helical ribbon 32 extends either forwardly or rearwardly to cut down this clearance, it causes clogging of the movement of materials during mixing and actually retards rather than facilitates mixing. This appears to be caused by the fact that the material must be free to fall to prevent build-up of materials on the head and on the blades, material so building up remaining immobile during mixing.

Actually in a drum rated as a 5½ cubic yard mixer (because it can produce that quantity of mixed concrete), the maximum diameter of the drum is approximately seven feet. With this drum, the length of the helical ribbon, its diameter and its distance from the forward head of the drum is approximately equal, and is of the order of two feet. The depth of the blades 22 is of the order of one foot, or half the diameter of the helix, thus providing ample clearance between the blades and the helical ribbon throughout the length of the latter. Thus the ribbon is disposed in approximately the central portion of the core space between the blading 22.

During loading of the drum, the dry materials are directed by the charging hopper 24 into the space between the blades 22, and as they generally fall a considerable distance from above the hopper, they enter the drum with force and soon slide up against the closed head at the front of the drum. While materials are being charged, the drum is rotated so that the action of the blades is likewise to move materials toward the front head. In some operations called "shrink mixing" water is fed through the hopper with the materials and this obviates certain problems but is not a cure-all since it cannot be practiced in all cases. In other cases, water is not introduced until the mixer is in transit or at the job site, in which event loading is slower and mixing takes longer. Generally in the latter instance, the stones or larger aggregates are charged first, then the sand and finally the cement.

With the spiral blades pushing material forward, there is a tendency for the stones to segregate at the forward end of the drum. With the ribbon acting in the opposite direction, the flow of stones during charging is intercepted and they and other aggregates are directed to the side where they may be acted on by the spiral blades 22, thereby creating more vacant space for subsequent incoming materials to occupy. In addition to more rapid charging, the stones are distributed better throughout the batch and more uniform concrete is produced.

With a mixing drum as disclosed herein, a rated batch of concrete produced therein will completely submerge the lower end of the spiral ribbon 32, but the higher end will extend through the batch into the clear space above it. As mixing proceeds, with the perimetral blades 22 crowding the ingredients against the head 13, the ribbon 32 diverts the course of some of this material and moves it away from the head to the free space on top of the batch rearwardly in the drum. This facilitates mixing, prevents segre-

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gation of stones, and distributes the ingredients more evenly throughout the mix.

At the conclusion of the mixing operation, the direction of drum rotation is reversed and the blades 22 propel the mixture to and through the opening 17 at the higher end of the drum. As discharged proceeds, the mixture in the bottom of the drum is piled up ahead of the section of the blade pushing it rearwardly and the larger aggregates tend to roll in the opposite direction from the top of such piles over the pushing blade and into the space behind it. This resulted in "robbing" of these stones from the concrete which is discharged in the midst of the operation and a concentration of stones or "tailings" at the end of the discharge operation.

The provision of the member 32 obviates this latter difficulty because with the member 32 rotating with the drum, its action is opposite during discharge to what it is during charging and mixing, i. e., it propels material in its path forward as described above, the member 32 strikes off grout as well, and retains an even distribution of grout and stones in the drum.

Naturally as discharge proceeds and the level of the mixture in the drum is lowered, the member 32 becomes less effective in this latter respect. However, since a substantial portion of the ribbon extends into the conical section of the drum, where the drum diameter is reduced, the intercepting action of the ribbon, striking off grout as well as stones, is effective until the drum is substantially entirely discharged.

The invention having been described what is claimed is:

1. A rotatable concrete mixing drum adapted to be mounted on a transporting vehicle for mixing or agitating concrete in transit, said drum having one end closed and the opposite end open, bearing means supporting it with its axis of rotation inclined to the horizontal at a fixed angle and at least one spiral blade secured to its inner perimeter arranged to propel concrete toward its closed, forward end when the drum is rotated in one direction and to propel such concrete to its elevated open end when the drum is rotated in the opposite direction, means for rotating said drum in either direction selectively, the diameter of said drum being largest in the proximity of the closed end and decreasing in diameter over the greater portion of its length to the open end, and a spiral ribbon disposed about the axis of the drum and fixedly secured to the drum in order that it may rotate therewith, said ribbon having a pitch opposite to that of said spiral

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blade and a diameter such that the peripheral portion of said ribbon intercepts the concrete propelled by said blade during the discharge operation to strike off portions of the concrete mixture including stones and grout, segregation and retention of stones being thereby avoided, a substantial portion of said ribbon extending into the section of the drum of decreasing diameter whereby such intercepting action is effective until the drum is substantially entirely discharged, the final material discharged being a homogeneous mixture of stones and grout substantially devoid of tailings.

2. In a transit concrete mixer, an elongated mixing drum having a substantially frusto-conical discharge section extending for the major portion of its length and terminating in an open end, said drum being mounted for rotation on an axis of fixed inclination to the horizontal and having its lower end closed for the retention of materials being mixed; spiral blading secured to the inner perimeter of the drum and extending for substantially to its entire length, said blading being adapted to propel materials in the drum toward the closed end when the drum is rotated in one direction, and to move them toward the open end when the drum is rotated in the other direction; means for rotating the drum in either direction at will; and a helical ribbon rigidly mounted in the drum and around its axis of rotation, a substantial portion of the length of said ribbon extending into the frusto-conical portion of the drum, said ribbon having its pitch opposite to the pitch of said spiral blading and its lower end spaced from the closed end of the drum and its upper end spaced from the nearest section of the spiral blading to enable free tumbling of materials therebetween during mixing, the diameter of said ribbon being substantially equal to its length and of the order of twice the depth of said blading, whereby on rotation of the drum said ribbon is effective only on materials passing through the approximate central portion of the core space between said spiral blading.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,861,416	Jaeger	May 31, 1932

FOREIGN PATENTS

Number	Country	Date
333,492	Great Britain	Aug. 14, 1930
726,959	France	June 10, 1932