Oct. 21, 1952 C. I. LONGENECKER 2,614,819

DRUM FOR INCLINED AXIS CONCRETE MIXERS

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Fig. 1.

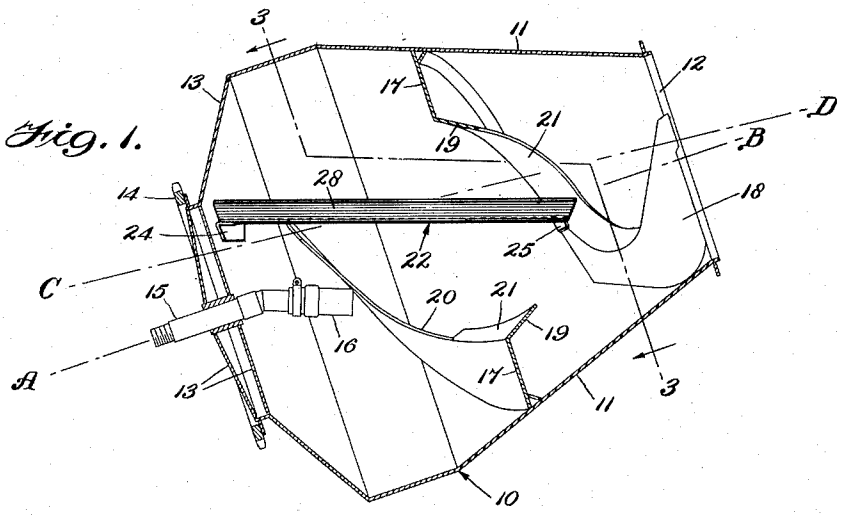


Fig. 2.

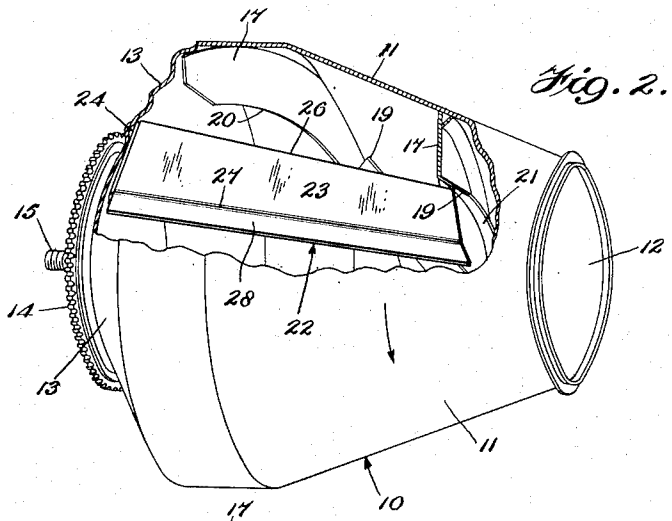
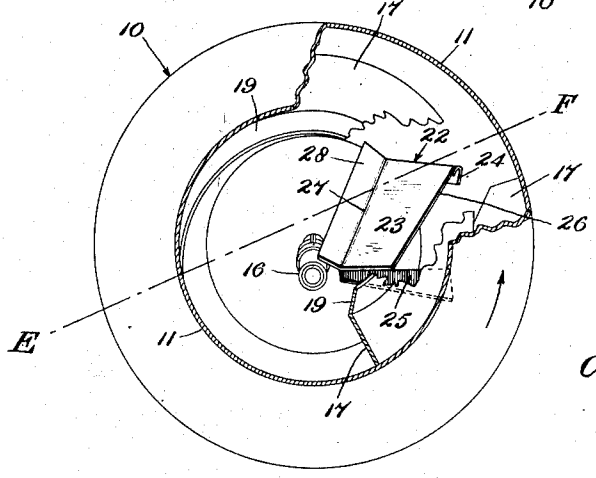


Fig. 3.



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DRUM FOR INCLINED AXIS CONCRETE MIXERS

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3 Claims. (Cl. 259—175)

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The invention relates to concrete mixing apparatus of the inclined axis rotatable drum type, and has for its principal object to provide an improved blading arrangement for the drums thereof, whereby to enhance the mixing action obtainable therein when they are employed in the production and discharge of plastic concrete mixtures in accordance with the teachings of U. S. Patent No. 2,303,902 granted December 1, 1942.

As is well known to those skilled in this art, the drums of mixing apparatus of this character usually are of coniform shape; are mounted for power-driven rotation about their longitudinal axis, which is fixedly inclined to the horizontal at an angle on the order of 20°; are closed at their larger, lower end while their smaller, higher end is provided with a material-transfer opening, through which discharge is prevented during the mixing period by an appropriate readily movable closure structure; and their perimetric walls carry a plurality of internal helically arranged mixing blades which function during rotation of the drum to agitate and commingle the concrete-making materials, as well as to move them toward one end or the other of the drum, depending upon the direction of rotation of the latter.

Briefly, the aforementioned patent pointed out that prior thereto the usual practice of the art was to rotate the drum in such direction during mixing that the helical blades would propel the materials away from the open end and toward the closed end of the drum, and to reverse the direction of rotation of the drum, and consequently the direction of longitudinal movement of the mixture, to effect discharge of the latter from the open end of the drum. It further pointed out that certain disadvantages of this standard procedure could be avoided, and better and faster mixing and discharge attained, through unidirectional operation of the drum during both the mixing and the discharge periods, whereby perimetral portions of the batch were always moved upwardly away from the closed end and toward the open discharge end of the drum by the helical blades, and throughout the mixing period the so-elevated materials "cascaded" downwardly toward the closed end in the open core space defined generally by the inward edges of said blades.

While extensive experience with mixers operated in accordance with the principles disclosed in said Patent No. 2,303,902 has substantiated the claimed superiority of its mode of mixing and discharge over the prior practice, I have found

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that the mixing action in such drums may be still further improved through the provision of one or more supplemental blades disposed within the core space and extending longitudinally thereof throughout at least a major portion of the length of the drum. Such supplemental blades may be supported by the drum shell and/or the helical blades carried thereby so as to rotate with the drum, and they are so set with reference to the inclined axis of the drum that as they reach the mid-point in their arc of upward travel they are substantially horizontal. The principal action of such blades is to impart agitation and motion to the material in the core space in a direction generally transverse of the drum, although as they pass beyond said mid-point and become transversely inclined they also incline downwardly somewhat toward the discharge end and thus may move some of the material more or less rearwardly in the drum.

One exemplification of the invention is illustrated in the accompanying drawing forming part of this specification, in which like reference characters designate like parts in all the views, and in which:

Figure 1 is a central longitudinal sectional view of a well known form of mixing drum for an inclined-axis concrete mixer of the truck-mounted type, showing the essential conventional elements thereof as well as a supplemental mixing blade mounted in the core space in accordance with the invention;

Fig. 2 is a plan view of the parts shown in Fig. 1, partly broken away and in section; and

Fig. 3 is a cross sectional view on approximately the planes indicated by the line 3—3 in Fig. 1, looking in the direction of the arrows.

Since the mounting for the drum, the mechanism for driving the same, and the devices for feeding the materials to and/or controlling the discharge of the mixture from the drum constitute no part of the invention, and are not essential to an understanding thereof, they have not been illustrated. However, they may be similar to or the equivalent of those set out in the above-mentioned Patent No. 2,303,902.

Referring to said drawing in greater detail, the drum 10 comprises a coniform shell 11, the smaller end of which is open to provide a material-transfer opening 12 through which the materials may be charged into and discharged from the drum. The larger end of the shell is closed by a header structure 13 which carries a sprocket 14 by means of which the drum may be rotated about its longitudinal axis A—B, which as will be

noted, is inclined to the horizontal at an angle of approximately 20°. A water supply pipe 15 passes axially through the header 13, and its inner end carries a valved discharge nozzle 16, whereby the water necessary for the concrete mixture may be introduced into the drum. A plurality of helical mixing and conveying blades 17 (usually two in number) are suitably secured to the inner circumferential surface of the shell 11, projecting inwardly therefrom toward the drum axis and extending longitudinally of the drum throughout at least a major portion of its length. At the higher, smaller end of the drum these blades terminate in sections 18 shaped and disposed to facilitate discharge of the mixture through the transfer opening 12 when the closure structure associated therewith (but not here shown) is opened. The rearward portions of the helical blades 17 may be provided with flanges 19 extending angularly from the inward edges 20 of the blades, for assisting in the mixing, conveying and discharging functions of the latter; and the inward surfaces 21 of these flanges, together with the inward edges 20 of the unflanged portions of the blades, in general define the above mentioned central core space of the drum in which the forward "cascading" of the materials takes place.

Ordinarily each batch of materials treated in a drum of this character occupies at least 50%, and usually more, of the volumetric capacity of the drum, but of course it should never be completely filled as some free space is necessary in which the materials may tumble and cascade in order to attain proper commingling thereof. As set forth in said prior Patent No. 2,303,902, when a drum containing a batch of concrete-making materials equivalent to say 60% of the volumetric capacity of the drum is rotated in the direction indicated by the arrows in Figs. 2 and 3 of the present drawing, the helical blades 17, acting more or less as a screw conveyer, continuously move perimetral portions of the said batch upwardly and toward the right, as viewed in Fig. 1; and, assuming the closure structure to be in operative position relative to the opening 12, when such portions are discharged from the sections 18 of the blades they gravitationally cascade downwardly and forwardly (or toward the left) in the central core space. These movements of the materials result in the upper surface of the batch assuming a downward longitudinal slope from the rear end of the drum, somewhat as indicated by the line C—D in Fig. 1; and because of the rotational effect of the drum on the materials, said upper surface also assumes a transverse slope, when viewed in cross section, approximately as indicated by the line E—F in Fig. 3.

As above stated, I have ascertained from actual trial that the mixing action thus attained may be further improved by the use of one or more supplemental blades disposed in and extending throughout at least a major portion of the length of the central core space; and one such blade 22 is illustrated in the present drawing. As will be readily understood therefrom, the elongated generally rectangular, but slightly rearwardly tapering, body portion 23 of this blade is flat and extends from the header structure 13, to which it may be attached by an angle bracket 24, to adjacent the discharge section 18 of one of the helical blades 17, by which it may be supported through the medium of a bracket 25. The outer longitudinal edge 26 of this supplemental blade coincides generally with the outer limit of the central core space as defined by the flanges 19 and

edges 20 of the helical blades, and the inward longitudinal edge portion of the blade 22 is bent as at 27 to provide an angularly disposed lip 28 extending throughout the length of the blade, in the region of the drum axis.

In the drawing the blade 22 is shown as having reached the mid-point of its sector of upward travel (when the drum is rotating counterclockwise as viewed in Fig. 3), and it is so angularly positioned in relation to the inclined axis of rotation of the drum that at this time the body portion 23 is approximately horizontal, as will be clear from Fig. 1. It is at about this time that the blade emerges from the top of the batch, its breaking of the surface occurring first at its forward end adjacent the header 13 and, due to the longitudinal slope C—D of the batch surface, progressing rearwardly to the end supported by the bracket 25. In general its action is to lift portions of the batch and spill them transversely of the drum, over the edge of the lip 28, although as the rotation continues and the blade assumes something of a rearward downward slant, it may impart some rearward movement toward the opening 12 to any material remaining upon it. The supplemental blade imposes little if any interference with the normal cascading of the materials forwardly down the slope C—D, and its demonstrated effect is to appreciably improve the mixing action and reduce the mixing time.

What is claimed is:

1. In concrete mixing apparatus of the class described, the combination of a drum having a longitudinal axis inclined to the horizontal and about which the drum is rotatable, the lower end of said drum being closed and the higher end thereof having a material-transfer opening; helically arranged mixing and conveying blades secured to and extending inwardly from the perimetric wall of said drum and adapted through rotation of the latter about its said inclined axis to continuously move perimetral portions of a batch of material in the drum away from the closed end of the latter and upwardly toward said material-transfer opening, the inward edge portions of said helical blades defining a central core space in the drum in which the elevated portions of the material may cascade downwardly from the higher end of the drum toward the lower end thereof; and an elongated substantially flat supplemental mixing blade disposed in and extending longitudinally of said core space to one side of the drum axis for imparting movement to portions of the cascading material in a direction transverse to the drum axis, one end of such blade adjoining and being secured to the closed end of the drum while its other end is supported adjacent said material-transfer opening, the outward longitudinal edge of said blade being disposed substantially along the outer limit of said core space as defined by said inward edge portions of the helical blades, and the inward longitudinal edge of the supplemental blade lying in the region of the drum axis.

2. In concrete mixing apparatus of the class described, the combination of a drum having a longitudinal axis inclined to the horizontal and about which the drum is rotatable, the lower end of said drum being closed and the higher end thereof having a material-transfer opening; helically arranged mixing and conveying blades secured to and extending inwardly from the perimetric wall of said drum and adapted through rotation of the latter about its said inclined axis to continuously move perimetral portions of a

batch of material in the drum away from the closed end of the latter and upwardly toward said material-transfer opening, the inward edge portions of said helical blades defining a central core space in the drum in which the elevated portions of the material may cascade downwardly from the higher end of the drum toward the lower end thereof; and an elongated supplemental mixing blade disposed in and extending longitudinally of said core space to one side of said drum axis, said blade comprising a substantially rectangular flat body member one end of which adjoins and is secured to the closed end of the drum while the other end of said body member is disposed and supported adjacent said material-transfer opening, the outward longitudinal edge of said body member being substantially coincident with the outer limit of said core space as defined by said inward portions of the helical blades, and the inward longitudinal portion of said body member lying in the region of said drum axis and having an angularly disposed lip extending therealong.

3. In concrete mixing apparatus of the class described, the combination of a drum having a longitudinal axis inclined to the horizontal and about which the drum is rotatable, the lower end of said drum being closed and the higher end thereof having a material-transfer opening; helically arranged mixing and conveying blades secured to and extending inwardly from the perimetric wall of said drum and adapted through rotation of the latter about its said inclined axis to continuously move perimetral portions of a batch of material in the drum away from the

closed end of the latter and upwardly toward said material-transfer opening, the inward edge portions of said helical blades defining a central core space in the drum in which the elevated portions of the material may cascade downwardly from the higher end of the drum toward the lower end thereof; and a substantially flat supplemental mixing blade disposed in said core space to one side of said drum axis and rotatable with the drum, said supplemental blade extending longitudinally of the core space throughout a major portion of the length of the latter, and being so longitudinally angularly disposed with respect to said drum axis that at the mid-point in the sector of upward travel of such blade it will occupy a substantially horizontal position whereby substantially all of the movement imparted to the portions of the material acted upon by said blade will be in a direction transverse to the drum axis.

CHARLES I. LONGENECKER.

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