May 17, 1955 TAKEO MANABE 2,708,570

CONCRETE MIXER

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Fig. 1.

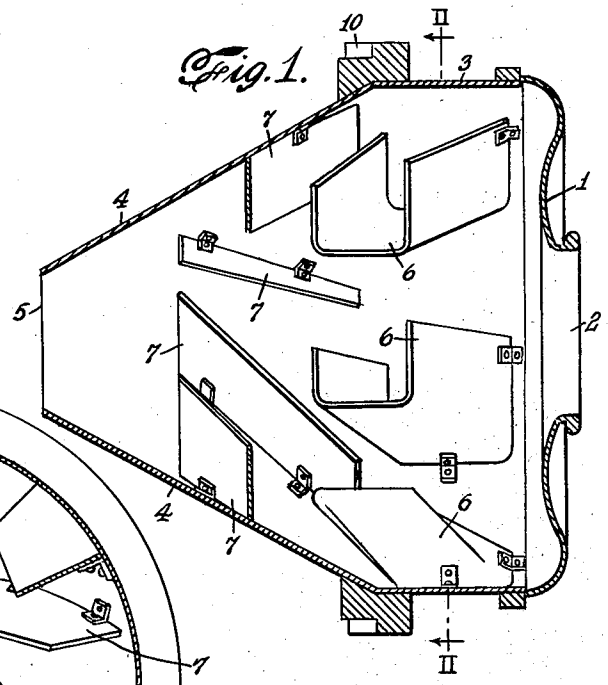
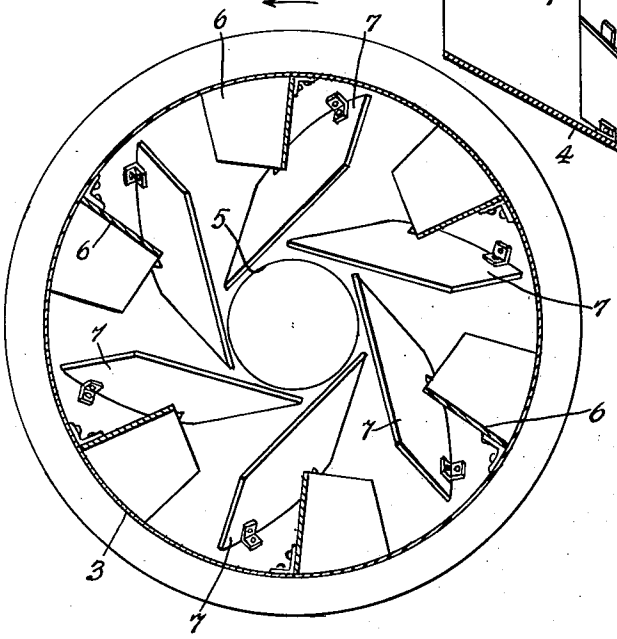


Fig. 2.



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CONCRETE MIXER

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2 Claims. (Cl. 259—175)

The present invention relates to improvements in concrete mixers of the tilting and rotary drum type provided at one end with a cylindrical drum having buckets inside, and at the other end with a conical mouth having helical blades inside. The buckets arranged inside the cylindrical drum are transversely inclined toward the conical mouth so that their openings are directed toward the blades which are fixed helically inside the conical mouth.

The object of the invention is to provide a new type of concrete mixer, especially adapted for mixing concrete of dry consistency (or very stiff concrete). When the mixing drum is rotated, the buckets arranged inside the cylindrical drum act to carry up the material to be mixed and drop it at the top, thereby causing a vertical circulation. Because of the transverse inclination of the buckets, the material is discharged toward the blades helically arranged inside the conical mouth. This forces the material back to the cylindrical drum to give it a transversely reciprocating movement, causing the passage of the material moving in the drum to become prolonged. Because of the difference in diameter of the cylindrical drum and the conical mouth, the material is moved alternately quickly and slowly in a peripheral direction to be mingled together. Thus, the chance of dispersion and collection of material in the mixing drum is augmented to such a degree, that rapid and effective mixing action is made possible. Such a process is particularly conducive for mixing concrete of dry consistency.

The accompanying drawing shows an embodiment of the invention. Fig. 1 is a longitudinal sectional view of the mixing drum. Fig. 2 is a cross sectional view taken approximately along the line II—II of Fig. 1.

Cylindrical drum portion 3 of the mixing drum is provided at one end with a dish shaped plate 1 having an aperture 2 at its center for receiving the supply of the material to be mixed. Cylindrical drum portion 3 is provided at its other end with a conical mouth 4, the slender end of which forms the opening 5 for discharge of concrete already mixed. The cylindrical drum portion 3 is provided interiorly with rectangular trough shaped buckets 6 radially secured at equal distances, and the conical mouth 4 is provided interiorly with longitudinal blades 7 corresponding to the buckets 6 in the cylindrical drum portion 3.

According to the present invention, the buckets 6 arranged interiorly of the cylindrical drum portion 3 are of a rectangular trough shape broader at their outer ends, i. e. at the ends secured to the wall of the cylindrical drum portion 3, and narrower at their inner or discharge ends, as shown in Fig. 1. The bottom surfaces of the buckets 6 are arranged radially to the cylindrical drum 3, as shown in Fig. 2, while both sides of the buckets are inclined laterally so that the openings of the buckets 6 are directed toward the conical mouth 4, as shown in Fig. 1. This causes the material in the buckets to be dropped into the conical mouth upon rotation of the mixing drum. The blades 7 arranged inside the conical mouth 4 are inclined

helically as shown in Fig. 1 so as to force the material back to the cylindrical drum portion 3 upon rotation of the mixing drum. The sides of the buckets 6 facing the conical mouth 4, are lower than the other sides so as to facilitate the acceptance of material into the buckets.

The mixing drum is rotatably and tiltably mounted in any convenient or conventional manner.

The concrete materials to be mixed, viz. water, Portland cement, sand and gravel, are charged into the mixing drum through a chute (not shown) communicating with the opening 2, and when the mixing drum is rotated, the bucket 6, in the lower portion of the cylindrical drum portion 3, raise the material in the lower portion of the drum. When the buckets 6 reach the upper portion of the drum during rotation of the drum, the material in the buckets is discharged downwardly into the conical mouth and its reciprocating movement is resumed. The buckets 6 being laterally inclined so that their openings are directed toward the conical mouth 4, as shown in Fig. 1, the material dropped from the buckets 6 falls to the bottom of the conical mouth 4 or on the blades 7 arranged inside the conical mouth 4, and by reason of the rotation of the mixing drum, is forced back to the cylindrical drum portion 3 or into the buckets 6 by the taper of the conical surface and the helical inclination of the blades 7. Because the sides of the buckets 6 facing the conical mouth 4 are lower than their opposite sides, the material flows easily into the buckets 6. Thus, the material forced back to the cylindrical drum portion 3 or into the buckets 6 is again carried up by the rotation of the mixing drum to repeat the aforesaid movement. The material in the mixing drum undergoes vertical motion in a radial direction, reciprocating motion in an axial direction, and differential motion in a circumferential direction because of the difference in diameter of the cylindrical drum 3 and the conical mouth 4. The material continues to circulate between the buckets 6 and the blades 7 during rotation of the mixing drum, and is repeatedly scattered and united while moving in the mixing drum so that it becomes intimately mixed.

It is known that buckets are used in the non-tilting drum type mixer, and that blades are used in the tilting conical type mixer. The former is good for mixing the material, but inconvenient and inefficient in discharging concrete already mixed. The latter is convenient for discharge of the mixture, but unsatisfactory for mixing the material. It has also been proposed to combine a conical drum at one end of a cylindrical drum. According to the present invention the buckets arranged interiorly of the cylindrical drum are laterally inclined toward the conical mouth of the drum so as to drop the material carried up by the buckets into the conical mouth. The blades arranged inside the conical mouth are helically inclined, and this, together with the inclination resulting from the taper of the conical mouth, forces the material back to the cylindrical part. The sides of the buckets facing the conical mouth are made lower than the opposite sides to facilitate acceptance of the material into the buckets. During rotation of the mixing drum the material circulates in the drum, traversing a zig-zag path between the buckets and the blades thereby causing the passage of material to be prolonged. The chance of dispersion and collection of material is augmented, and because of the difference in circumferential speed, the material is mingled back and forth so that the operation of mixing concrete may be rendered rapid and effective.

In mixing concrete, each of the materials is to be finely divided and evenly mingled together. The ingredients of concrete, viz. water, Portland cement, sand and gravel, differ respectively in their specific gravity and nature. Water and Portland cement easily form a paste, but it is not so easy to mix sand and gravel into a paste.

In the case of concrete containing much water (so-called concrete of wet consistency), it is comparatively easy to mix sand and gravel into a paste because of its good fluidity and adhesiveness, but in the case of concrete containing less water (so-called concrete of dry consistency), the mixing process is not quite so easy because of less fluidity and adhesiveness. Therefore, when mixing concrete of dry consistency, a great deal of time is required to obtain good mixing because of the singular use of the vertical motion produced by buckets in the cylindrical drum. In the case of the conical drum, good mixing cannot be obtained because the dropping of material is not actively produced. According to the present invention, however, the material in the mixing drum undergoes vertical, horizontal and differential movement at one and the same time. In addition, by reason of the circulation of the material along a zig-zag course in the mixing drum, its passage is prolonged. Further, by striking at the buckets and blades arranged at different angles in the drum, the dispersion and collection of material is made effective so that a rapid and perfect mixing for concrete of dry consistency may be obtained.

In ordinary concrete mixers of the non-tilting cylindrical drum type, the discharge of mixed concrete is effected by means of an inclined trough. Concrete of dry consistency is not easily discharged through such a delivery trough. It was proposed, therefore, to attach a conical drum at one end of the cylindrical drum in order to facilitate the discharge of concrete by tilting the drum on its axis. However, in this combined type, mixing is chiefly effected in the cylindrical drum, and the conical mouth serves mainly for discharge of the concrete. By inclining the buckets in the cylindrical part laterally, however, the material circulates in a zig-zag way between the cylindrical drum and the conical mouth to make the mixing action more rapid and more effective than any which could be produced by a mere combination of cylindrical and conical drums.

The allowable variation of mixture for concrete of dry consistency is set at 10% by ordinary concrete mixers. In accordance with the present invention, experiments conducted in accordance with American standard methods of testing concrete mixers, show that variation of mixture is lowered to from 3% to 4%. Of late, the use of concrete of dry consistency is being recommended especially for architectural and civil engineering on a large scale, but difficulty lies in mixing such concrete evenly. The present invention is useful for solving this problem.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:

1. A concrete mixer of the tilting type comprising a cylindrical drum having an axial inlet opening at one end and a conical discharge mouth portion at its opposite end, said cylindrical drum having radially projecting buckets disposed peripherally on its interior wall and adapted to scoop the concrete mix from the lower portion of the drum upon rotation thereof, and said conical portion having longitudinal blades disposed on its interior wall, the buckets arranged interiorly of the cylindrical drum being laterally inclined so that their discharge ends are directed toward the conical mouth, and all of the blades disposed inside the conical mouth being helically inclined in the direction of said buckets, whereby the material treated in the mixer is subjected to a vertical dropping motion, zig-zag motion between the buckets and blades, and differential motion in a peripheral direction.

2. A concrete mixer as defined in claim 1, wherein the buckets disposed inside the cylindrical drum have a rectangular trough shape narrowing toward their discharge ends and are positioned to discharge the concrete mix upon the inclined surface of said blades disposed on the interior walls of said conical portion, the sides of said buckets facing the conical discharge mouth portion being lower than the opposite sides of said buckets.

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