

PATENT SPECIFICATION

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COMPLETE SPECIFICATION

Improvements in and relating to Concrete Mixers

We, STOTHERT & PITT LIMITED, a Company organised under the laws of Great Britain, of Bath, Somerset, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to concrete mixers and like mixing machines.

10 In concrete mixers one of the problems with which the operator is constantly faced is that each time a batch of concrete is discharged from a revolving mixing drum a small deposit remains on the interior surface of the drum and also on the blades or the buckets attached to the interior periphery of the drum. With some mixes however much trouble the operator may go to wash out the drum and keep the buckets or blades clean, it is virtually impossible to do so to prevent a deposit forming on the surfaces of the buckets or blades as the case may be. The result is that concrete will gradually build up on the blades or the buckets and thereby reduce the mixing efficiency of the machine.

25 Numerous proposals have been made to overcome this problem of the concrete adhering to the metal surfaces of the mixing drum. In one arrangement the mixing chamber and other parts not directly cleaned by the blades of the mixing paddle are provided with an interior lining of rubber, the presence of the rubber coating, preferably of soft rubber, being intended to prevent the build up of particles of cement which would otherwise occur.

35 In another proposal, to facilitate cleaning, the interior of the drum is provided with a rubber lining capable of being turned inside out, while in a further proposal the wall of the drum consists of an endless moving band.

40 The present invention is concerned with what is known as a free-fall mixer wherein the mixing action is obtained by relatively stationary buckets or blades fixed to the interior of the drum and as the drum revolves the weight of the material being mixed causes it to pour from the buckets or blades when they reach the upper portion of the drum.

In this type of mixer its range of usefulness has hitherto been restricted since it is dependent upon the mix being sufficiently wet to enable it to flow sufficiently freely since where the proportion of water is low the adhesion is considerably higher thereby preventing it from flowing.

The present invention overcomes this difficulty by constructing the blades or buckets of flexible material, e.g. rubber, whereby they are capable of flexing substantially throughout their entireties with change in shape when under load and by fixing the blades or buckets to the inside of the periphery of the mixing drum with the major portion of each blade or bucket extending inwardly towards the centre of the drum so as to permit of deflection or change in shape of individual blade or bucket elements due to variation in their effective loading as the drum revolves. This construction it will be found will prevent or reduce the build-up of concrete on the surfaces of the blades or buckets.

In carrying out the invention as applied to a non-tilting concrete mixer drum we have obtained satisfactory results in which the buckets are each formed throughout of a sheet of rubber moulded or otherwise formed to a shape including a back and sides and secured to a perimeter of the drum by fixing cleats. The rubber, which may vary from $\frac{1}{8}$ —1" in thickness according to the size of the bucket, may be attached to the cleats by means of large faced washers having means such as a central collar or flange so that when threaded on the fixing bolts with the collars facing inwardly they will act as spacers. It follows that, on tightening the nuts of the fixing bolts, the bosses will limit the closing movement and thus grip the rubber firmly before making contact one with the other.

The invention is illustrated in the accompanying drawings in which Figure 1 is a diagrammatic side view of a mixing drum of the non-tilting type, provided with flexing buckets in accordance with the invention.

Figure 2 is a transverse vertical section of

the mixing drum showing only two of the buckets.

Figure 2A is a detail view of one of the buckets and showing the fixing means.

5 Figure 3 is a detail sectional view and Figure 4 an elevation showing the means of fixing the buckets to the drum.

10 Figures 5—6, 7—8, 9—10 are respectively a front and end-on view of the buckets showing the deflection produced when passing through the three sectors marked respectively No. 1, No. 2, No. 3 in Fig. 1.

Figures 11—12 illustrate the application of the invention to a concrete mixing drum of the tilting type, where the axis of the drum during mixing is mounted to rotate about an axis at an angle to the horizontal and for discharge is tilted to an angle below the horizontal, Figure 11 being a perspective view with part of the wall of the drum broken away to show the interior.

Referring first to Figures 1, 2 and 2A there is shown a mixing drum as fitted to a non-tilting drum mixer, the drum being indicated generally at D and having its axis A—A arranged horizontally, the drum D being provided with a driving band B by which it is caused to rotate. The drum D has annular side walls C providing an inlet opening O¹, and a discharge outlet O², both the feed of raw material through opening C¹ and discharge through the opening O², being effected by means of a chute, which is moved into position within the drum when required to perform the charging or discharging operations.

35 It is well known in free-fall mixers for concrete and like materials, i.e. those which rely upon the weight of material being mixed to cause it to pour from the buckets or blades, and in other mixers where the mixing action is obtained by the movement of the material, due to the action of gravity, over buckets or shaped blades, that the range of mixes of concrete that can be mixed efficiently is limited by the adhesion of the concrete to the buckets and blades preventing it from flowing properly.

According to this invention the buckets or blades within the mixing drum are formed of a material, preferably rubber, so that they are individually capable of flexing substantially throughout their entireties with change in shape during the actual mixing operation, i.e. as the drum revolves. In the arrangement shown, the buckets indicated generally at 1 are formed of 55 thick sheet rubber including a back wall 2 and side walls 3 and 4, the rubber buckets being secured to the inside wall of the drum D by L-shaped cleats 5 (see also Figure 3) and collars 6 having deep or large shaped flanges 7 mounted on fixing bolts 8 which are passed through holes in the vertical limbs of the brackets 5. The flanges 7 hereinafter termed the fixing washers, are of sufficient size to grip the sheet rubber over a fairly wide area so as to prevent 65 the latter being torn away due to load imposed

on the rubber, as hereinafter explained. In practice, satisfactory results have been obtained by using four sets of large faced fixing washers, one along each of the side walls 3, 4 and two along the back wall 2 at least one being adjacent the corner thereof as in Figure 2. It will be appreciated that the mixing action within the drum D is caused by the buckets 1 picking up the material from the bottom of the drum and, after being elevated due to the drum revolving, pouring it when they reach a position near the top. Filling of the buckets commences just as each bucket is leaving "Sector No. 1". At this point there is little, if any, deflection in the contour of the back and side walls of the bucket due to the weight of material picked up. As the bucket enters "Sector No. 2", towards the end of which discharge of the contents of the bucket commences, due to the weight of the material bearing against the back wall 2 it is deflected slightly from the normal as indicated by the broken lines in Figures 9 and 10 and continues in this condition until the contents have been discharged when they fall back to the bottom of the drum.

Due to the constant rotation of the drum it will be appreciated that material is falling downwards to the bottom of the drum in a constant cascade where it will encounter empty buckets arriving in Sector No. 1. The material cascading on to the empty buckets, deflects the free edge of each oncoming bucket forwards and downwards after which it springs back again to its neutral position. This flexing motion of the buckets is shown in Figures 7 and 8 of the drawings, the deflected position being indicated in broken lines, the full line indicating the natural shape of the outer or free edge of the bucket from which it will be seen that the deflection produced is quite appreciable.

During and after the passage of the buckets through Sector No. 2 which the buckets enter full of material, it will be appreciated that there is a further deflection of the bucket walls in returning to the normal, due to the release of its contents, and this assists in ejecting from it the remnants of the material in the bucket at a greater velocity than would occur in the case of the normal steel sheet bucket with a rigid wall. On leaving Sector No. 2 the buckets pass through Sector No. 3 where recovery is complete.

In addition to the constant change in shape of the continuously revolving rubber buckets, the rapid deflection of each bucket and its recovery in Sector No. 1 and at the intermediate sector following Sector No. 2 will be found to assist mixing by reason of the self cleaning action of the individual buckets due to material being ejected from the buckets at a greater velocity than would apply if gravity were the only force acting on it. This self cleaning action is also apparent on the inside

of the drum since the repeated flexing action of the buckets prevents the mix from adhering to the metal surface to the same extent as occurs in the standard type of mixer.

- 5 Referring now to Figure 11 and 12 there is shown a revolving drum tilting mixer, the drum comprising a head section H and a conical portion F, the head H including a hollow spigot S by means of which it is mounted to rotate, the spigot S in accordance with standard practice being capable of angular adjustment so that it is capable of displacement from the mixing and rotating axis indicated by the lines M—M through the horizontal to a suitable angle where the contents are discharged by gravity.

- The action of this mixer is that, due to the direction of rotation, a pair of blades 15, 16 carries material up towards the top of the drum where it is cascaded to the bottom and again lifted by the oncoming set of blades. In accordance with this invention, by forming the blades 15, 16 of thick sheet rubber, the blades will assume a different shape when carrying the load of material and spring back to normal when it is discharged, the discharged material falling on to another set of blades, thus causing them to deflect and rectify themselves with a flicking action, thus speeding the mixing action and ridding the blades of build up. Here again the flexible blades reduce the build up on the inside of the drum shell.

- It will be found that by fitting concrete mixers with flexible buckets or blades, preferably of thick sheet rubber, in accordance with this invention, it enables the range of concrete mix which can be handled and which depend upon the gravity flow or gravity fall of material to be appreciably extended, by enabling them to mix the more adhesive and less free flowing materials more effectively by preventing or minimising the build up of material and on the buckets or blades.

What we claim is:—

1. A mixing machine for mixing concrete and like materials comprising a mixing drum, mounted to revolve about a substantially horizontal axis, a series of blade or bucket elements formed of flexible sheet material capable of flexing substantially throughout their entireties with change in shape when under load, and means fixing the blade or bucket elements to the inside of the periphery of the drum with the major portion of each blade or bucket element extending inwardly toward the centre of the drum so as to permit of deflection or change of shape of individual blade or bucket elements due to variation in their effective loading as the drum revolves.

2. A machine for mixing concrete and like materials, as claimed in Claim 1, in which the blade or bucket elements are formed of thick sheet rubber.

3. A machine for mixing concrete and like materials as claimed in Claims 1 or 2 in which the bucket or blade elements are secured to the interior wall of the drum by relatively large faced washers.

4. A machine for mixing concrete and like materials as claimed in Claim 3 wherein the fixing washers for the buckets are spaced one on each of the forward edges of the side walls and two along the back wall at least one being adjacent a corner thereof.

5. A concrete or like mixing machine substantially as described and illustrated with reference to Figures 1—10 of the accompanying drawings.

6. A modification of the concrete or like mixing machine as claimed in Claim 5 having blade elements instead of bucket elements substantially as described and illustrated in Figures 11 and 12 of the accompanying drawings.

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- 90 This invention relates to concrete mixing apparatus.

- In concrete mixers one of the problems with which the operator is constantly faced is that each time a batch of concrete is discharged from the mixing drum a small deposit remains on the interior surface of the drum and also on the blades or buckets attached to the interior periphery of the drum. However much trouble the operator may go to to wash out the drum and keep the buckets or blades clean, it is virtually impossible to do so to prevent a deposit

forming on the surfaces of the buckets or blades as the case may be. The result is that concrete will gradually build up on the blades or the buckets and thereby reduce the mixing efficiency of the machine.

The present invention has for its object to overcome this difficulty by constructing the blades or buckets of flexible material, e.g. rubber, so that the flexure due to load and/or material from other buckets falling on those blades or buckets when at the bottom of the mixing drum as the latter rotates, would operate to prevent or reduce the build-up of concrete on their surfaces.

According to the present invention, therefore, concrete mixing apparatus comprises a drum provided with interior blades or buckets



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of the drum since the repeated flexing action of the buckets prevents the mix from adhering to the metal surface to the same extent as occurs in the standard type of mixer.

- 5 Referring now to Figure 11 and 12 there is shown a revolving drum tilting mixer, the drum comprising a head section H and a conical portion F, the head H including a hollow spigot S by means of which it is mounted to rotate, the spigot S in accordance with standard practice being capable of angular adjustment so that it is capable of displacement from the mixing and rotating axis indicated by the lines M—M through the horizontal to a suitable angle where the contents are discharged by gravity.

- The action of this mixer is that, due to the direction of rotation, a pair of blades 15, 16 carries material up towards the top of the drum where it is cascaded to the bottom and again lifted by the oncoming set of blades. In accordance with this invention, by forming the blades 15, 16 of thick sheet rubber, the blades will assume a different shape when carrying the load of material and spring back to normal when it is discharged, the discharged material falling on to another set of blades, thus causing them to deflect and rectify themselves with a flicking action, thus speeding the mixing action and ridding the blades of build up. Here again the flexible blades reduce the build up on the inside of the drum shell.

- It will be found that by fitting concrete mixers with flexible buckets or blades, preferably of thick sheet rubber, in accordance with this invention, it enables the range of concrete mix which can be handled and which depend upon the gravity flow or gravity fall of material to be appreciably extended, by enabling them to mix the more adhesive and less free flowing materials more effectively by preventing or minimising the build up of material and on the buckets or blades.

What we claim is:—

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1. A mixing machine for mixing concrete and like materials comprising a mixing drum, mounted to revolve about a substantially horizontal axis, a series of blade or bucket elements formed of flexible sheet material capable of flexing substantially throughout their entireties with change in shape when under load, and means fixing the blade or bucket elements to the inside of the periphery of the drum with the major portion of each blade or bucket element extending inwardly toward the centre of the drum so as to permit of deflection or change of shape of individual blade or bucket elements due to variation in their effective loading as the drum revolves.

2. A machine for mixing concrete and like materials, as claimed in Claim 1, in which the blade or bucket elements are formed of thick sheet rubber.

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forming on the surfaces of the buckets or blades as the case may be. The result is that concrete will gradually build up on the blades or the buckets and thereby reduce the mixing efficiency of the machine.

The present invention has for its object to overcome this difficulty by constructing the blades or buckets of flexible material, e.g. rubber, so that the flexure due to load and/or material from other buckets falling on those blades or buckets when at the bottom of the mixing drum as the latter rotates, would operate to prevent or reduce the build-up of concrete on their surfaces.

According to the present invention, therefore, concrete mixing apparatus comprises a drum provided with interior blades or buckets

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formed partly or entirely of rubber or like flexible material or surfaced with the same.

- 5 In carrying out the invention as applied to a non-tilting concrete mixer drum we have obtained satisfactory results in which the buckets are each formed throughout of a sheet of rubber moulded or otherwise formed to standard shape, i.e. including a back and sides and secured to the perimeter of the drum by 10 fixing cleats. The rubber, which may vary from $\frac{3}{4}$ —1" in thickness according to the size of the bucket, may be attached to the cleats by means of washers having means such as a central collar or flange so that when threaded on the fixing 15 bolts with the collars facing inwardly they will act as spacers. It follows that on tightening the nuts of the fixing bolts, the bosses will limit the closing movement and thus grip the rubber firmly before making contact one with the 20 other.

A similar arrangement may be used in the case of the blades of a mixing drum which is mounted to tilt so that during mixing it rotates

either about a horizontal axis or an axis at an angle to the horizontal but to discharge is 25 caused to tilt about its axis of rotation when the conical end points downwardly to discharge.

If necessary the rubber blades or buckets may be provided with internal reinforcement 30 or stiffening means. Provision may be made to increase the flexing in certain directions since clearly in the case of a bucket it may be desirable to provide for greater flexing in one direction (the sides) than in others. 35

We also contemplate providing the interior of the drum with a lining or facing of rubber or like resilient material or with an independent skin which can be flexed when struck or when pressure is applied thereto. Clearly also part 40 of the drum itself may be formed of rubber with the same object in view.

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