This invention relates to concrete mixers of the pan type wherein the shell of the mixer is in the form of a cylindrical open-top pan bounded by inner and outer circumferential vertical walls and a bottom wall, providing an annular mixing chamber within which paddles or blades circulate.

Hitherto concrete mixers of this type have suffered from the disadvantage that the mixing paddles have been driven by gearing situated in vertical alignment with the shaft constituting the axis about which the paddle arms revolve, and this has made maintenance difficult, due to the inaccessibility of the driving parts, and has also necessitated frequent cleaning of the mechanism, due to splashing from the incoming materials and also from the concrete being mixed. The present invention overcomes these disadvantages by positioning the gearing outside and below the top edge of the mixing pan, so that it is well clear of incoming materials, avoids splashing from the concrete being mixed, and may be maintained without removal.

Furthermore, it is well known that pan type concrete mixers suffer from the disadvantage that, due to the continuous movement of the paddles or blades through the material, the blade supports are subjected to considerable wear and tear which results in deformation and subsequent breakage thereof almost without warning. The disadvantage of replacing these supports is, particularly where the connecting brackets thereof are covered in hardened concrete, sometimes a difficult task and results in a loss of time and output on the building or other site.

It is therefore further among the objects of the present invention to provide a paddle or blade support assembly in which the problem of wear is considerably reduced or eliminated.

According to the present invention, a pan mixer of the type having a stationary pan formed by inner and outer cylinders providing an annular mixing chamber within which paddles or blades circulate, has the paddles or blades suspended through support assemblies from spider arms mounted to revolve about the central axis of the mixing pan and driven through transmission gearing by means preferably comprising a gear ring attached to the spider arms externally of the outer cylinder of the mixing pan.

In general, the spider arms are either secured to a shaft mounted to rotate in bearings fixed in the inner cylinder, or they are rotatably supported by bearings on a shaft fixed in the inner cylinder, and in both cases the free ends of the spider arms project beyond the perimeter of the outer cylinder, the gear ring being secured to the outer extremity of the arms.

The mixing paddles or blades are caused to rotate by means of the gear ring which meshes with a spur wheel fast on an output shaft of a reduction gear box, driven by an electric motor or other prime mover; both the prime mover and the gear box are positioned externally of the pan at a convenient level, the gear box having a vertically arranged output shaft.

Secured to the spider arms at points at, or closely adjacent, the perimeter of the outer cylinder are the blade support assemblies to which are attached the mixing blades, or the scraper blades, or both the mixing and the scraper blades.

The outer or free ends of the spider arms, and the gear ring supported therefrom, are covered either by a guard plate or by a cover supported wholly or partly from either the inner or outer cylinders, or from both.

A further feature of the invention is the provision of one or more plough blades which are effective to move the material outwards from a position adjacent the inner cylinder, where it is mixed less efficiently due to the relatively small diameter of the pan at this point, to a position where mixing is more efficiently carried out.

A still further feature is that, in order to avoid shock and high peak loading generally due to the practice of feeding materials into the pan at one fixed point, a feed chute is attached to a hub carrying the spider arms so that it rotates therewith, the feed end of the chute being arranged concentric with the axis of rotation of the spider arms, and the discharge end thereof being arranged below the level of the spider arms but above the working level of the material so that the materials are fed directly into the mixing chamber and are distributed throughout the whole of the annulus thereof.

A still further feature of the present invention is that each blade support assembly comprises a supporting arm, a first bracket member, to which the paddle or blade is attached, and which is fixed to one end of the supporting arm, a second bracket member fixed to the other end of the supporting arm for connection to its co-acting spider arm, a wear resistant sleeve which is split longitudinally surrounding the supporting arm and extending between the first and second bracket members, and means for securing the split sleeve in position on the supporting arm.

In a preferred arrangement the split sleeve is of tubular formation and the means for securing the split sleeve in position on the supporting arm comprise semicircular projections formed on the bracket members and a locking key associated with one or both projections, the projections being arranged at 90° from the split joint of the tube.

The present invention presents the advantage over existing arrangements of improved accessibility for maintenance due to the fact that all the gearing is external to the shell of the mixer. Furthermore, the bearings of the central vertical shaft are arranged so that they can be withdrawn with their housings. The possibility of torsional oscillation is reduced because the number of rotating parts is small, and because the load from the mixing elements is applied close to the point of power input.

The invention is illustrated by way of example in the accompanying drawings in which,

FIGURE 1 is a plan view of a pan mixer according to the invention with the guard plate or cover removed,

FIGURE 2 is a cross-section corresponding to FIGURE 1,

FIGURE 3 is a perspective view, with some of the parts broken away for clarity, of a blade support assembly,

FIGURE 4 is a longitudinal section through the support assembly,

FIGURE 5 is a section on the line A—A of FIGURE 4, and

FIGURE 6 is a section on the line B—B of FIGURE 4. Referring to FIGURES 1 and 2 of the drawings a concrete mixer of the pan type comprises an annular cylindrical mixing chamber consisting of an outer cylinder 2, an inner cylinder 3 and a floor or base 4. The outer surface of the inner cylinder 3, the inner surface of the outer cylinder 2, and the inner surface of the floor or base 4, are lined with renewable lining plates.

The centre or dead space formed by the inner cylinder 3 contains a central vertical shaft 5 which can rotate freely in bearings 6 and 7 movably housed in
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A hub 8 is fixed to the central shaft 5 in order to rotate with it. Alternatively, the shaft 5 may be fixed within the inner cylinder 3 and the hub 8 arranged to rotate freely on the shaft.

The hub 8 has fixed thereto radially arranged spider arms 9 supporting at their free ends a circumferential flange 10, each spider arm 9 carrying one or more blade supporting assemblies indicated generally at 11 to which are attached mixing blades 12 and/or scraping blades 13 which project downward into the mixing chamber 4. A spur toothed gear wheel 14, which is built up from several identical and interchangeable segments, is attached to the circumferential flange 10 of the spider. The gear wheel 14 meshes with a spur toothed gear pinion 15 fixed to the vertical output shaft 16 of a worm or spur gear reduction box 17, the input shaft of which is driven by a prime mover 18, for example, an electric or hydraulic motor, or a diesel engine.

The whole mixing pan is covered by a guard or cover 19 which may be conical or dome-shaped, and be in one or more parts. The guard or cover 19 serves to enclose the mixing pan and in addition protects the gearings 14, 15 which is located outside and below the top edge of the mixing chamber, in which position the gearing also evades any splashing from the concrete being mixed in the chamber.

The materials to be mixed are fed into the annular mixing chamber 1 by means of a feed chute 20 which is supported on the hub 8 by means of brackets 21 so that it rotates therewith. The inlet end 22 of the feed chute 20 extends through the guard or cover 19 and is arranged concentric with the axis of rotation of the hub 8, whereas the discharge 23 thereof is arranged at a position slightly above the working level of the material in the mixing chamber. Thus, in use, the material is fed to the mixing chamber in such manner that it is distributed around the whole annulus of the mixing chamber and is not liable to enter into contact with the spider arms, or the working parts of the mixer. This arrangement also avoids the disadvantage of known mixers, where the materials are fed into the mixing chamber at one fixed point in the annulus thereof, since it avoids the setting up shock loads on the driving mechanism.

The concrete is discharged from the mixing chamber 1 through one or more openings in the floor or base 4 thereof. The or each opening is sealed during a mixing period by means of a door 24 which fits flush with the pan bottom 4. The or each door 24 may be of semi-circular or of fan shaped formation and is adapted to open radially about a vertically disposed hinge pin 25, to a position indicated at 24c, under the action of a ram 26 the piston rod 27 of which is connected to a link 28 fast on the hinge pin 25.

Water for the mixing process is admitted to the mixing chamber, from a meter or measuring tank, via a pipe 29 fitted with nozzles, which pipe extends upwardly through the inner cylinder 3 and either partially or completely circles the inner cylinder 3 in a position at any upper edge thereof.

Thus, in use, the materials to be mixed are passed into the mixing chamber 1 through the feed chute 20 and are distributed throughout the whole of the annulus thereof, and the water to be used in the mixing operation is passed into the chamber through the nozzles in the water pipe 29. During this operation the blades 12 and 13 are caused to rotate to effect mixing.

The mixing blades 12 serve to mix the material and the scraper blades 13, which are arranged adjacent the inner surface of the outer cylinder 2, as well as effecting a certain degree of mixing, serve to move the material inwardly to the paths of the mixing blades 12.

It has been found that when using mixing blades and scraper blades only, a certain amount of segregation of the material takes place because, in a mixer of this type in which the inner wall of the mixing chamber is of relatively small diameter compared with the outer wall, the mixing blades nearest the axis of rotation has a much slower peripheral speed than those nearer the outer wall. The result of this is that the materials being mixed nearest the inner wall of the chamber are subjected to less efficient mixing action and consequently segregate. In order to overcome this disadvantage, one or more plough blades 30, which are supported on spider arms 9 via support assemblies 11, are arranged adjacent the inner cylinder 3 to move the maximum amount of materials outwards from the inner wall of the mixing chamber into the faster, and therefore more efficient mixing zone of the chamber, and at the same time serve to lift the materials and turn them over to obtain a blend with the materials which are directed inwardly by the scraper blades 13 adjacent the outer wall of the mixing chamber.

Although the invention has been illustrated to show each of the blades, i.e. the mixing blades 12, or the scraper blades 33, or the plough blades 30, mounted on a separate spider arm 9, it will be understood that each spider arm may support any convenient number of blades according to requirements.

Referring to FIGURES 3 to 6 of the drawings, each support assembly 11 comprises a supporting arm 31 of circular cross-section, a first bracket member 32, to which the paddle or blade 12, or 13 or 30 is attached, which is fixed at one end of the supporting arm 31, and a second bracket member 33 fixed at the other end of the supporting arm 31. The bracket 33 is provided with holes 33' to receive a hinge pin 33" by which the bracket 33 is adapted to be hingedly attached to one of the spider arms 9.

A wear resistant tubular sleeve 34, which is of a hard or a hardened metal, and is split longitudinally to present two semi-circular sections, is provided to encase the supporting arm 31 and to extend between the two brackets 32 and 33.

The sleeve 34 is supported on the arm 31 in such manner that the joints thereof lie perpendicular to the direction of movement of the arm so that an unbroken arcuate face of the sleeve is directed towards the material being mixed and takes the brunt of the wear caused by frictional engagement with the material.

In order to hold the sleeve 34 in position, the brackets 32 and 33 are formed respectively with semi-circular projections 35 and 36 which are arranged, in use, at 90° to the split joint of the sleeve 34.

To position the sleeve 34, one half section is placed against the supporting arm 31 and turned so that it is held in the projections 35 and 36, the second half section is then placed on the top surface of supporting arm 31, and the whole sleeve is then turned through 90° so that the split joint is at 90° to the projections 35 and 36. The sleeve is held in this position by means of a locking key 37 which is passed through a slot formed in the projection 36 and into a slot formed by notches 38 provided in the ends of the two half sections of the sleeve 34. The locking key 37 is secured in this position, by means of a bolt 39, to a radially directed flange 40 formed on the projection 36 adjacent the slot. Thus, it will be seen that the locking key 37 prevents rotation and thus removal of the sleeve 34.

As will be seen from the drawing, the sleeve 34 is formed at each end, and is provided with at least two projections, with notches 38 to provide slots for receiving the locking key 37 in four different positions. The reason for this is that, as will be obvious, the lower end of the sleeve, and the leading face of the lower end of the sleeve, will be subjected to the most wear and it is a distinct advantage of the present invention that the wearing surface can be changed for each sleeve used. Thus, when the first wearing surface is worn the sleeve is turned, by releasing the locking key
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7. A pan type mixer comprising an annular pan providing a mixing chamber; a vertical shaft substantially coaxial with said pan; a spider structure comprising a plurality of radially disposed spider arms mounted on said shaft for rotation about the axis thereof above the level of material to be mixed in said chamber; a plurality of supporting arms connected to and depending from said spider arms respectively into said mixing chamber; a plurality of blades connected to the respective supporting arms and being adapted to circulate within said mixing chamber on rotation of said spider structure; and a plurality of wear resistant sleeves surrounding and being secured to the respective supporting arms and extending between the connections of said supporting arms to said spider arms and the connections of said blades to said supporting arms.

8. A pan type mixer according to claim 7 in which said wear resistant sleeves are of tubular formation and are split longitudinally each to present two sleeve halves; and means for securing said sleeve halves in pairs on said supporting arms.

9. A pan type mixer according to claim 8 including semi-circular projections on the connections between said supporting arms and said spider arms and blades respectively for receiving the ends of said sleeve halves.

10. A pan type mixer according to claim 9 including locking means for preventing rotation and thus removal of said sleeve halves, said locking means comprising a locking key passing through a slot formed in one of said semi-circular projections and into a corresponding slot formed in one end of the associated split sleeve.

11. A pan type mixer according to claim 10 including a radially extending flange formed on said semi-circular projection adjacent said slot formed therein and to which flange said locking key is bolted to retain it in its locking position.

12. A pan type mixer according to claim 11 in which said sleeve is formed with four slots which are provided by notches arranged in the ends thereof adjacent the joints of said sleeve halves.

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