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Van Ginneken

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[54] **MIXER**

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[51] **Int. Cl.** **B01f 7/04**

[58] **Field of Search** 259/2, 7, 8, 12, 29, 5, 259/6, 21, 22, 41, 42, 72, 91, 92; 68/96, 242

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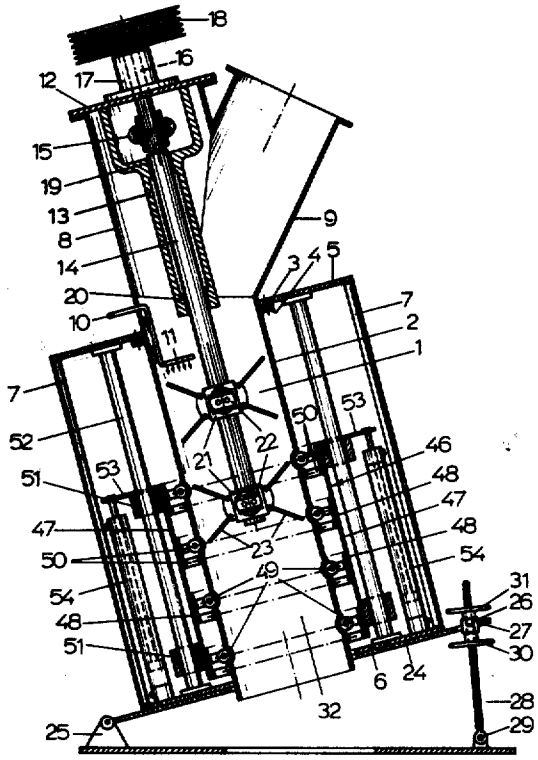
[57] **ABSTRACT**

A mixer, comprising an elongated, substantially cylindrical, upright sleeve, which forms the wall of a mixing chamber, a supply inlet for solid material and a supply inlet for liquid debouching in said mixing chamber, said sleeve accommodating a central mixing shaft coupled to a drive means and bearing blade holders with blades fitted therein. The blade holders are each rotatable through 360° about an axis of rotation which is perpendicular to the mixing shaft and may be fixed in any position by a locking member. The mixer may further comprise an adjusting device with which the angle enclosed by the central axis of the sleeve and the vertical is adjustable.

20 Claims, 4 Drawing Figures



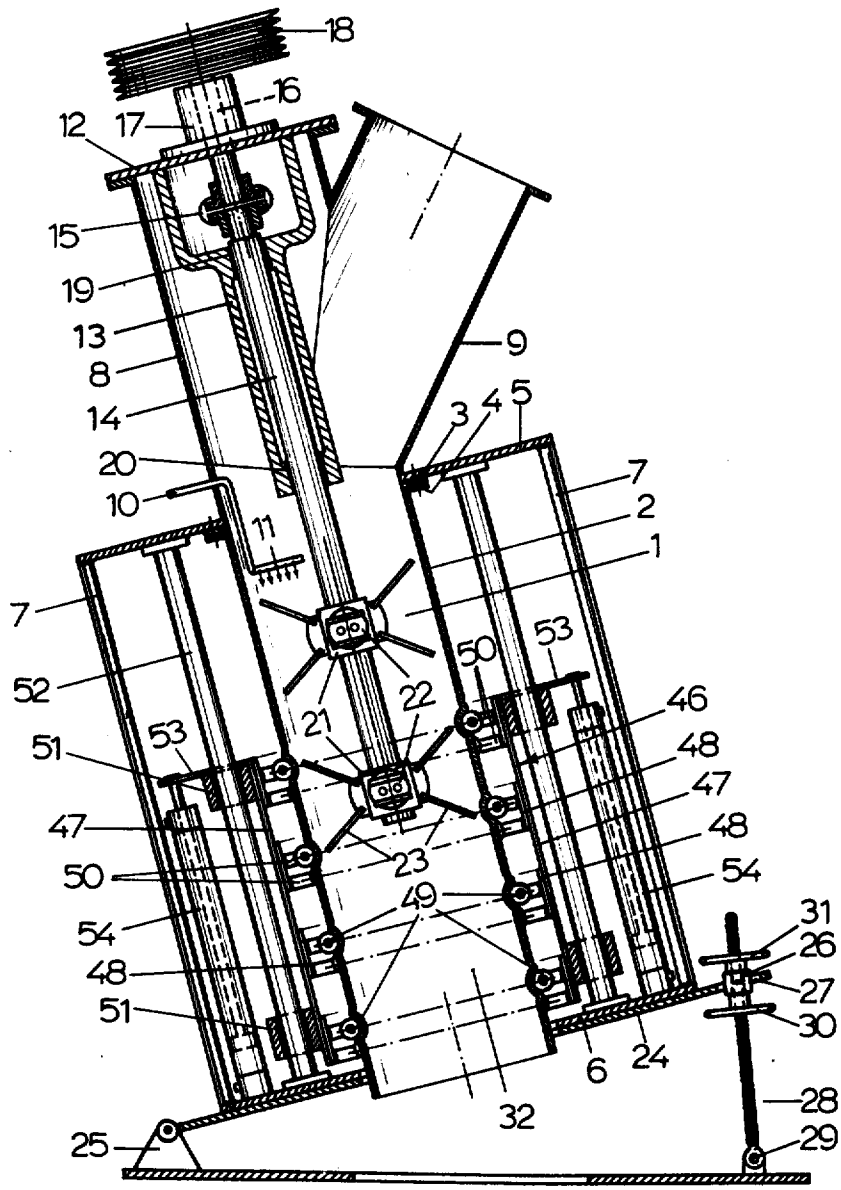

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fig.1

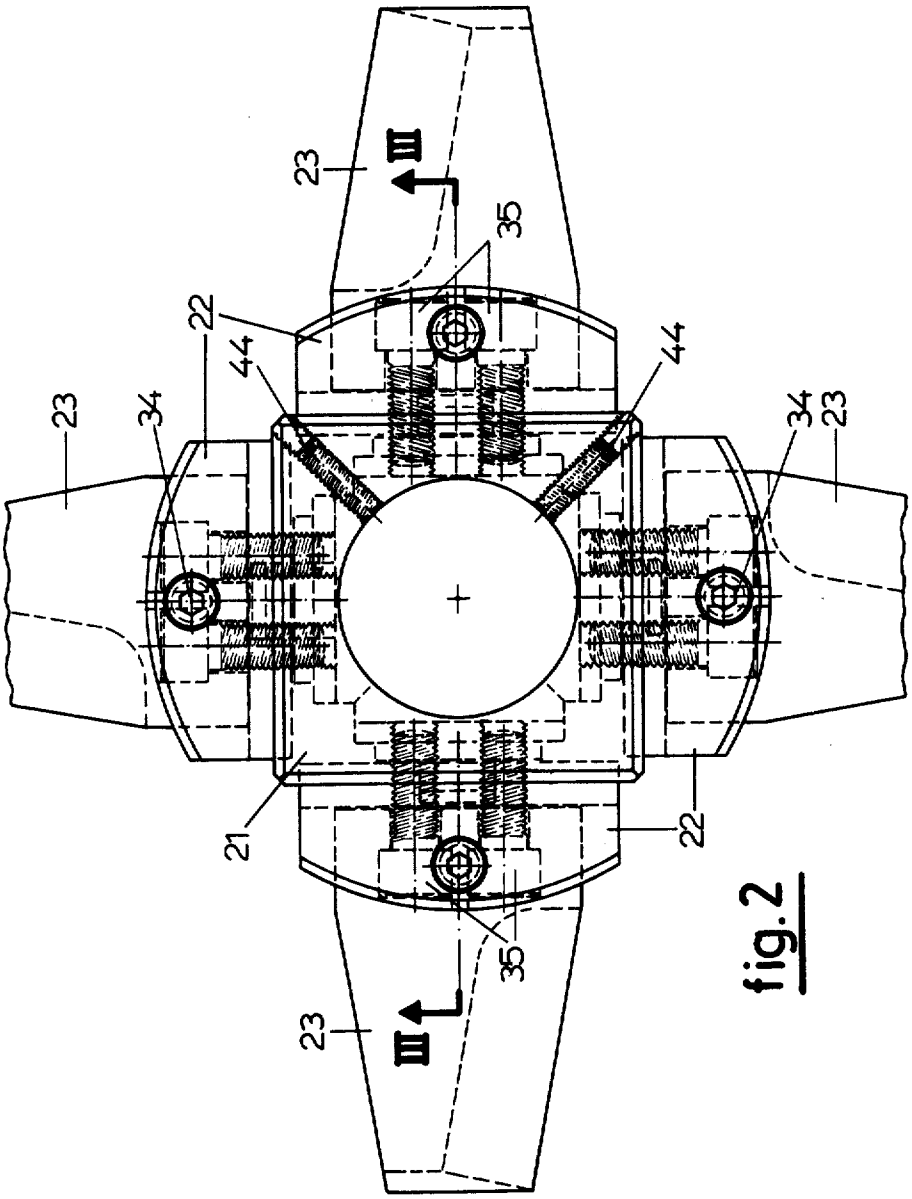

fig.2

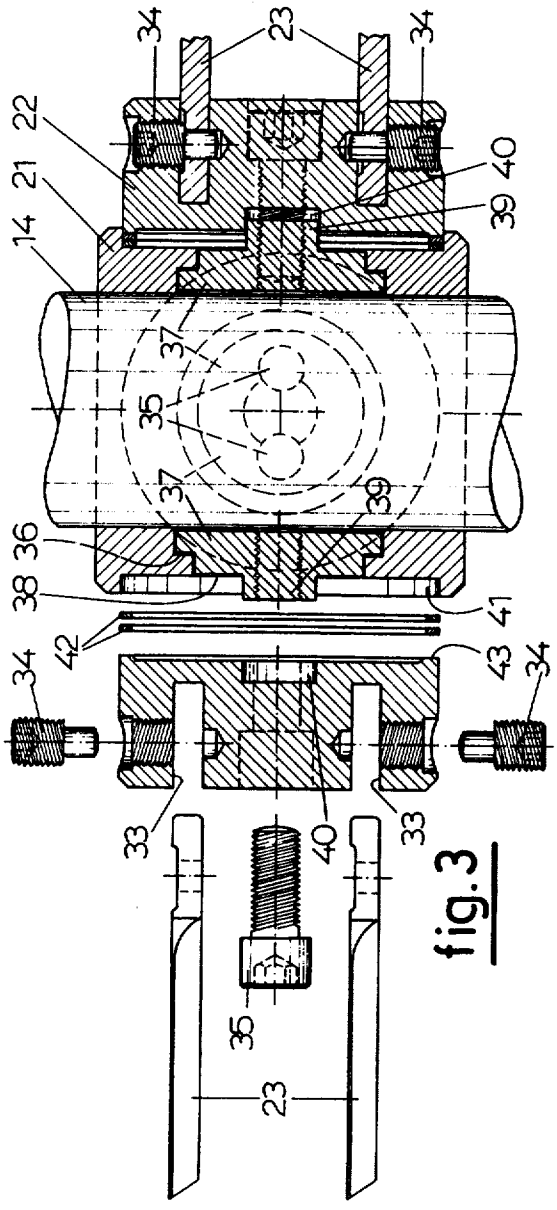
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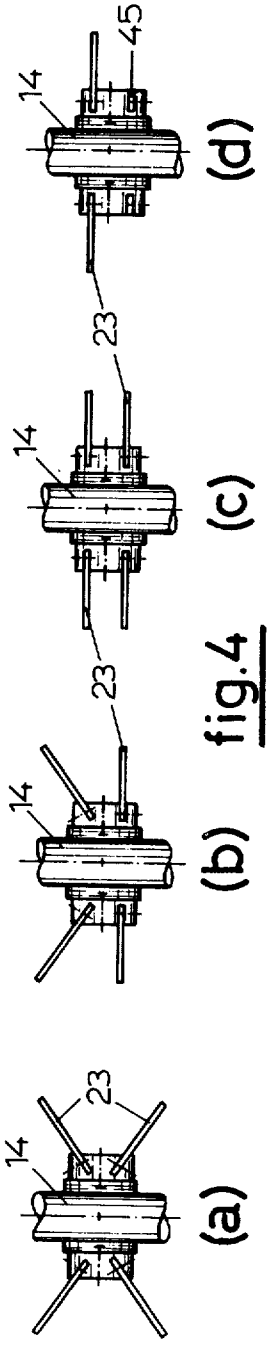
fig.3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(d)
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(c)
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(b)
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(a)

fig.4

MIXER

BACKGROUND OF THE INVENTION

The invention relates to a mixer, comprising an elongated, substantially cylindrical, upright sleeve, which forms the wall of a mixing chamber, a supply inlet for solid material and a supply inlet for liquid debouching in said mixing chamber, said sleeve accommodating a central mixing shaft coupled to a drive means and bearing blade holders with blades fitted therein.

Mixers of this kind are already known and are applied, for example, for continuously mixing a powdered solid matter with a liquid or for granulating powdered products by mixing them with a liquid.

With these known mixers it is difficult, and frequently even impossible, to influence the characteristics of the resultant mixture, for example to modify the size of the particles of the mixture.

Furthermore, depending on the nature of the products to be mixed, the wall of the mixing chamber of these known mixers may become more or less extensively encrusted, which impairs the mixing efficiency.

SUMMARY OF THE INVENTION

It is a first object of the present invention to provide a mixer which allows the properties of the resultant mixture to be extensively influenced.

It is a further object of the invention to provide a mixer in which the residence time of the material supplied may be adjusted.

It is another object of the invention to provide a mixer which allows the size of the resultant particles to be effectively adapted to the demands.

It is yet another object of the invention to provide a mixer in which the development of deposits on the wall of the mixing chamber is prevented.

According to the invention, the blade holders are each rotatable through 360° about an axis of rotation which is perpendicular to the mixing shaft and may be fixed in any position by a locking member. The residence time of the material supplied into the mixer can thus be effectively influenced.

Further, at least one blade holder block may be mounted upon the mixing shaft, which block bears, distributed over its periphery, a plurality of said blade holders each having slots wherein the end of a blade is detachably lockable by means of a locking member, each blade holder being secured by bolt means to a retaining member which is rotatable through 360° about an axis of rotation perpendicular to the mixing shaft, said retaining member being accommodated in a chamber in the blade holder block and being secured against outward displacement by means of a collar of the blade holder block, said retaining member being lockable with the aid of said bolt means in each angular position with respect to the blade holder block.

The blade holder block may have a cylindrical bore through which the mixing shaft extends, said blade holder block being lockable in each position with respect to said mixing shaft.

In order to attain an excellent granulating effect in the mixer, the blades may extend solely in the upper part of the sleeve and a free granulating space may be situated underneath these blades in the sleeve.

As a result of the collisions of the blades with the powdered particles and with the liquid particles, and of the impingements of these particles on each other, excellent mixing of the powder with the liquid is achieved in the zone of the blades, which may rotate at high speed, such as, for example, 1,000 to 3,000 r.p.m. Under the effect of gravity, the rapidly rotating particles of the mixture move in a helical path through the free space underneath the blades in the sleeve towards the lower end of the sleeve. Since the particles of the mixture perform a rolling motion in this free space in the sleeve during their helical downward course along the inner wall of the sleeve, the particles are at the same time built up to form a granulate.

The angle of inclination of this spiral is a function of a number of controllable factors of the mixer, such as the speed of rotation of the mixing shaft, the direction of rotation of the blades, the number and the angular positions of the blades, the quantities of powder and of liquid supplied per unit time, and the weight by volume of the mixture obtained.

To the measure that the angle of inclination of the spiral is smaller, the particles of the mixture will roll along the inner wall of the sleeve for a more prolonged period of time, causing their diameter to increase and their shape to become more regular.

The height of the free granulating space underneath the blades is related to and is therefore somewhat limited by the diameter of the sleeve. In order to increase the helical path transversed by the particles in the granulating space independent of the dimensions of this granulating space, the central axis of the sleeve may enclose an acute angle with the vertical instead of being vertical itself.

To this end, an adjusting device may be provided allowing this angle to be adjusted. Preferably, the sleeve is supported by a pivot plate which comprises a passage opening for said sleeve and which is pivotally supported on one side by stationary brackets so as to pivot about a horizontal swivel axis, while, on the opposite side of the pivot plate, supports which can pivot about an axis parallel to the swivel axis of the pivot plate are fitted in slots in the pivot plate, a screw spindle extending through each support, which screw spindle can pivot about an axis which is parallel to the swivel axis of the pivot plate, each screw spindle bearing a displaceable check nut underneath the support and a displaceable retaining nut above the support.

The effect of gravity upon the particles of the mixture may be reduced by properly adjusting the angle of inclination of the sleeve. This feature is of special significance if no high speed of the mixing shaft can be applied in view of the brittleness of the powder supplied into the mixing chamber.

Optimum granulating results can be attained by an angular displacement of the blade holders in combination with an inclined position of the sleeve.

The mixer may furthermore be provided with an elongated, substantially cylindrical, upright sleeve of flexible material, such as rubber, which forms the wall of the mixing chamber, deforming means being in contact with the outer surface of said sleeve and being displaceable by displacement means with respect to said sleeve in the longitudinal direction of the mixing shaft.

The periodic local deformation of the flexible sleeve wall causes this wall to be cleaned, since such deposits as may be formed upon this wall are thus very rapidly eliminated.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic vertical section through an embodiment of the mixer according to the invention.

FIG. 2 is a top view of a blade holder block with blade holders and blades of the mixer according to FIG. 1.

FIG. 3 is a section according to the line III—III in FIG. 2, wherein the various parts are shown separately from each other.

FIG. 4 illustrates schematically a number of blade holder blocks with various designs of blade holders and blades.

DESCRIPTION OF A PREFERRED EMBODIMENT

FIG. 1 illustrates an embodiment of the mixer according to the invention by way of example. This mixer comprises a mixing chamber 1, the wall of which is constituted by an elongated, substantially cylindrical sleeve 2 of flexible material, such as rubber. The deflected upper end 3 of the flexible sleeve 2 is clamped between a retaining ring 4 and a metal top plate 5. This top plate 5 is connected to a metal bottom plate 6 by means of steel sections 7. The bottom plate 6 comprises a central passage opening through which the sleeve 2 projects downwardly.

A cylindrical upper member 8 made of sheet-metal is mounted on the top plate 5. This upper member 8 is in line with and has the same diameter as the underlying flexible sleeve 2 and is provided with a lateral supply pipe 9 through which the powdered component of the mixture to be formed is supplied. The liquid component is supplied on a lower level into the upper portion of the mixing chamber 1 through one or more supply pipes 10 which end in spray openings 11.

A mounting plate 12, attached to the upper member 8, supports a bearing sleeve 13 for a mixing shaft 14 which protrudes centrally into the sleeve 2 and which is connected at its upper end by an elastic coupling 15 to a drive shaft 16. This drive shaft 16 passes through the mounting plate 12 and through a bushing 17 fixed thereon. The drive shaft 16 is connected to a rope pulley 18 which may be driven by means of ropes (not shown) by a driving means, for example an electromotor. As an alternative, this motor can also be connected directly to the drive shaft 16. The bearing sleeve 13 accommodates bearings 19, 20 for the mixing shaft 14.

The mixing shaft 14 carries a number — two, in the embodiment shown — of downwardly spaced blade holder blocks 21, each of which is equipped with four blade holders 22 into which blades 23 are fitted.

The bottom plate 6 is mounted on a pivot plate 24, likewise provided with a passage opening for the sleeve 2 which is in line with the passage opening in the bottom plate 6. The pivot plate 24 is supported on one side in a pivotal manner by stationary brackets 25 and may pivot about a horizontal swivel axis. On the opposite side of the pivot plate 24, supports 26, which may pivot about an axis which is parallel to the swivel axis of the pivot plate 24, are fitted in slots 27 in the pivot plate 24, which slots 27 are perpendicular to this swivel axis. A screw spindle 28 extends through each support 26 and may pivot at 29 about an axis which is parallel to the swivel axis of the pivot plate 24. Each screw spindle 28 bears a displaceable check nut 30 underneath the support 26 and a displaceable retaining nut 31 above the support 26. The pivot plate 24 may be pivoted with the aid of the check nut 30 and the retaining nut 31, allowing the angle which the central axis of the sleeve 2 makes with the vertical to be set between, for example, 0° and 60°.

As shown in particular in FIG. 1, the blade holder blocks 21 with the blade holders 22 and the blades 23 fitted therein extend solely in the upper zone of the sleeve 2, a free granulating space 32 being thus provided underneath these blades 23 in the sleeve 2.

Under the influence of gravity, the rapidly rotating particles of the mixture move in the free space 32 underneath the blades 23 in such a way as to follow a helical course towards the lower zone of the sleeve 2, the particles performing a rolling motion along the wall of the sleeve 2 and being built up to form a granulate. The granulated particles which leave the sleeve 2 at the underside are still moist and, in many cases still possess insufficient strength. Therefore, these particles may be conveyed to a dryer (not shown).

The blade holder blocks 21 mounted on the mixing shaft 14 have an at least substantially square outer circumference. Alternatively, this outer circumference may also have the form of an equilateral triangle or of another equilateral polygon.

A blade holder 22 is fixed to each side of each blade holder block 21. Each blade holder 22 has two slots 33, wherein the end portion of a blade 23 is detachably locked with the aid of a bolt 34 having a smooth end which fittingly projects through a hole in the end portion of the blade. Each blade holder 22 is secured by means of two bolts 35 to a retaining member 37 which is rotatable through 360° about an axis of rotation perpendicular to the mixing shaft 14. This retaining member 37 is accommodated in a chamber in the corresponding blade holder block 21 and is secured against outward displacement by means of a collar 36 of the blade holder block 21. Furthermore, the retaining member 37 may be locked in each angular position with respect to the corresponding blade holder block 21 with the aid of the bolts 35.

Each retaining member 37 fits with a central centering ring 39, which projects from the end face 38, in a recess 40 in the corresponding blade holder 22. Each side of each blade holder block 21 is provided with a cylindrical recess 41, the central axis of which is perpendicular to the mixing shaft 14 and into which a cylindrical end of the corresponding blade holder 22 is fittingly inserted.

In the embodiment according to FIG. 3, filling rings 42 are arranged between the bottom of the cylindrical recess 41 in the blade holder block 21 and a projecting outer annular flange 43 of the corresponding blade holder 22. When tightening the bolts 35, for the fixation of a blade holder 22 in a given angular position with respect to the blade holder block 21, the central portion of this blade holder 22 becomes slightly bent as a result of the presence of the flange 43, causing the slots 33 in the blade holder 22 to become somewhat narrower on the outside. The blades are thus very effectively secured in their slots 33, and vibration is prevented.

The filling rings 42 can be used, for example, when the blades 23 have become shorter under the influence of wear and the amount of play between their end and the sleeve 2 has become too large, which has a harmful effect upon the mixing quality.

Further, if a blade holder 22 which bears obliquely positioned blades 23 (FIGS. 4*a* and 4*b*) is rotated with respect to the blade holder block 21 from the position shown in FIGS. 4*a* and 4*b*, respectively, there results an increase in the circle described by the ends of these blades 23 in the course of rotation of the mixing shaft 14. In order to obviate the risk of the ends of these blades 23 coming into contact with the sleeve 2, shorter blades 23 should be mounted, or one or more of the filling rings 42 that were used should be removed.

Each blade holder block 21 has a cylindrical bore through which the mixing shaft 14 extends. Each blade holder block 21 is displaceable along the mixing shaft 14 and can be fixed in each position with respect to this mixing shaft 14 by means of bolts 44.

At most two blades 23 can be fastened in each blade holder 22. Several blade positions are shown in FIGS. 4*a–d*.

In the embodiment according to FIG. 4*a*, the blade holders 22 bear, in the position shown, one blade 23 pointing obliquely upwards and one blade 23 pointing obliquely downwards.

In the embodiment according to FIG. 4*b*, the blade holders 22 bear one blade 23 pointing obliquely upwards and one horizontal blade 23. As an alternative (not shown), one blade 23 of the blade holders 22 can point obliquely downwards, the other blade 23 being horizontal.

In FIG. 4*c*, the blade holders 22 bear two horizontal blades 23, and in FIG. 4*d* the blade holders 22 are equipped with only one blade 23 in horizontal position. The other slot 33 of the blade holders 22 receives a filling piece 45 which is detachably locked with a bolt 34 in the same manner as a blade 23.

It is possible to equip a blade holder block 21 with two blade holders according to FIG. 4*a* or FIG. 4*b*, and with two blade holders according to FIG. 4*c* or FIG. 4*d*. Use can also be made of other combinations of different sets of blades 23 for each blade holder block 21.

The downwardly moving material is brought into turbulence by the rotating blades 23. The measure of this turbulence can be influenced by such factors as the choice of the blades 23, their shape and their angular position. The obliquely positioned blades 23 convey the product to the centre of the mixing chamber 1, while the horizontal blades 23 mainly have a centrifugal effect and convey the material to the wall of the sleeve 2. The material thus assumes the aforementioned helical course along the wall of the mixing chamber 1. The pitch of the spiral can be adjusted in several ways, a.o. by rotating the blade holders 22 with respect to the corresponding blade holder blocks 21.

Another important factor which affects the speed eventually assumed by the product in the mixing chamber 1 consists in the choice of the leading edge of the blades 23. With the blades 23 rotating with their sharp side in front, less energy is consumed than with the blades rotating with the blunt side in front, as less turbulence occurs.

The mixing chamber 1 will generally be filled only partially with the initial material and the mixture obtained therefrom, the balance being made up by turbulent air which contributes toward cooling the product. The particles can float freely in the turbulent air, in which way it is reached that the liquid particles are not rubbed into the powder particles but are enveloped by the powder particles. A mixture is thus obtained which consists of externally dry particles.

In the embodiment according to FIG. 1, use is made of a support 46 which is coaxial with respect to the sleeve 2 and which is composed of a number of upright strips 47 parallel to the mixing shaft 14, which are connected to each other by means of a number of support rings 48. This support 46 bears a plurality of rollers 49, each of which has an axis of rotation which crosses the mixing shaft 14 perpendicularly. The support rings 48, which are coaxial with the sleeve 2, are each equipped with two roller groups comprising a plurality of rollers 49 that are uniformly distributed over the circumference of the wall of the sleeve 2. The rollers 49 in successive roller groups are arranged in staggered and overlapping positions with respect to each other. Each roller 49 is journalled on a bearing strip 50 which is secured to the corresponding support ring 48. The support 46 comprises guide bushings 51 which are fastened to upright strips 47 and which are slidably mounted on guide rods 52 that are parallel to the mixing shaft 14. These guide rods 52 are rigidly secured between the top plate 5 and the bottom plate 6. The support 46 is provided with lateral strips 53 which are engaged by the piston rods of a number of cylinder and piston assemblies 54 which are mounted on the bottom plate 6 and which can impart a reciprocating movement to the support 46 and therefore to the rollers 49.

The rollers 49, the circumference of which may be adapted to the shape of the wall of the sleeve 2 and which are in contact with the sleeve 2, bring about a local inward bend in the flexible sleeve 2 during their reciprocating movement.

When the mixer is in operation, the cylinder and piston assemblies 54 are so controlled that they impart a continuous reciprocating movement to the support 46 and to the attached roller groups. Each roller 49 induces at its location of contact with the sleeve 2 an inward bend in the sleeve 2. Since the flexible material, specifically rubber, of which the sleeve 2 is made, although deformable is virtually not compressible, the sleeve 2 will slightly protrude immediately above and below the inward bend that has been formed.

Protruding ridges are further formed in the flexible sleeve 2 between the rollers 49 of the groups. Since the rollers 49 in successive groups are mutually staggered in the manner described, the protruding ridges and the inward bends of the flexible sleeve 2 are always staggered in the same way with respect to each other.

During the upward and downward movement of the support 46 with the attached roller groups, an inward bend and a protrusion will be alternately formed all along the sleeve 2. The product which has become encrusted on the sleeve 2 is broken up when its location is inward bent, after which the same product is virtually compressed just thereafter, when a protrusion is formed at the same location. This very effectively results in the detachment of the deposit from the sleeve 2.

I claim:

1. A mixer, comprising an elongated, substantially cylindrical, upright sleeve of flexible material, such as rubber, which forms the wall of a mixing chamber, a supply inlet for solid material debouching at the upper end of said sleeve, supply means for liquid being provided underneath said supply inlet, said sleeve accommodating a central mixing shaft coupled to a drive

means, said mixing shaft bearing blade holders with blades fitted therein, said blade holders each being rotatable through 360° about an axis of rotation which is perpendicular to the mixing shaft and being fixable in any position by a locking member, said blades extending solely in the upper part of said sleeve and a free granulating space being situtated underneath said blades in said sleeve, deforming means being in contact with the outer surface of said sleeve and being displaceable by displacement means with respect to said sleeve in the longitudinal direction of the mixing shaft.

2. A mixer according to claim 1, wherein the central axis of the sleeve encloses an acute angle with the vertical.

3. A mixer according to claim 1, further comprising an adjusting device with which the angle enclosed by the central axis of the sleeve and the vertical is adjustable.

4. A mixer according to claim 3, wherein the sleeve is supported by a pivot plate which comprises a passage opening for said sleeve and which is pivotally supported on one side by stationary brackets so as to pivot about a horizontal swivel axis, while, on the opposite side of the pivot plate, supports which can pivot about an axis parallel to the swivel axis of the pivot plate are fitted in slots in the pivot plate, a screw spindle extending through each support, which screw spindle can pivot about an axis which is parallel to the swivel axis of the pivot plate, each screw spindle bearing a displaceable check nut underneath the support and a displaceable retaining nut above the support.

5. A mixer according to claim 1, wherein at least one blade holder block is mounted on the mixing shaft, which block bears, distributed over its periphery, a plurality of said blade holders each having slots wherein the end of a blade is detachably lockable by means of a locking member, each blade holder being secured by bolt means to a retaining member which is rotatable through 360° about an axis of rotation perpendicular to the mixing shaft, said retaining member being accommodated in a chamber in the blade holder block and being secured against outward displacement by means of a collar of the blade holder block, said retaining member being lockable with the aid of said bolt means in each angular position with respect to the blade holder block.

6. A mixer according to claim 5, wherein the outer circumference of the blade holder block has substantially the form of an equilateral triangle or polygon.

7. A mixer according to claim 6, wherein the outer circumference of the blade holder block is substantially square.

8. A mixer according to claim 6, wherein each side of the blade holder block is provided with a cylindrical recess, the central axis of which is perpendicular to the mixing shaft and into which a cylindrical end of the corresponding blade holder is fittingly inserted.

9. A mixer according to claim 8, wherein at least one filling ring is arranged between the bottom of the cylindrical recess in the blade holder block and a projecting outer annular flange of the corresponding blade holder.

10. A mixer according to claim 5, wherein the blade holder block has a cylindrical bore through which the mixing shaft extends, said blade holder block being lockable in each position with respect to said mixing shaft.

11. A mixer according to claim 5, wherein each blade holder bears at most two blades.

12. A mixer according to claim 5, wherein a filling piece is detachably locked by a locking member in a slot of the blade holder.

13. A mixer, comprising an elongated, substantially cylindrical, upright sleeve of flexible material, such as rubber, which forms the wall of a mixing chamber, a supply inlet for solid material debouching at the upper end of said sleeve, supply means for liquid being provided underneath said supply inlet, said sleeve accommodating a central mixing shaft coupled to a drive means, said mixing shaft bearing blade holders with blades fitted therein, said blade holders each being rotatable through 360° about an axis of rotation which is perpendicular to the mixing shaft and being fixable in any position by a locking member, said blades extending solely in the upper part of said sleeve and a free granulating space being situated underneath said blades in said sleeve, rollers with axes of rotation perpendicular crossing the mixing shaft, being in contact with the outer surface of the sleeve, which rollers are arranged in downwardly spaced successive groups, each comprising a plurality of rollers uniformly distributed over the circumference of the wall of the sleeve, corresponding rollers in successive roller groups being arranged in staggered and overlapping positions with respect to each other, said rollers being journalled on a common support which is coaxial with respect to the sleeve and which is equipped with guide bushings which are slidably mounted on guide rods that are parallel to the mixing shaft, a plurality of cylinder and piston assemblies engaging the support to impart a reciprocating movement to the same.

14. A mixer, comprising an elongated, substantially cylindrical, upright sleeve, which forms the wall of a mixing chamber, a supply inlet for solid material and a supply inlet for liquid debouching in said mixing chamber, said sleeve accommodating a central mixing shaft coupled to a drive means, at least one blade holder block being mounted on the mixing shaft, which block bears, distributed over its periphery, a plurality of blade holders, each having slots, wherein the end of a blade is detachably lockable by means of a locking member, each blade holder being secured by bolt means to a retaining member which is rotatable through 360° about an axis of rotation perpendicular to the mixing shaft, said retaining member being accommodated in a chamber in the blade holder block and being secured against outward displacement by means of a collar of the blade holder block, said retaining member being lockable with the aid of said bolt means in each angular position with respect to the blade holder block, said blades extending solely in the upper part of the sleeve and a free granulating space being situated underneath said blades in said sleeve.

15. A mixer according to claim 14, further comprising an adjusting device with which the angle enclosed by the central axis of the sleeve and the vertical is adjustable.

16. A mixer according to claim 15, wherein the sleeve is supported by a pivot plate which comprises a passage opening for said sleeve and which is pivotally supported on one side by stationary brackets so as to pivot about a horizontal swivel axis, while, on the opposite side of the pivot plate, supports which can pivot about an axis parallel to the swivel axis of the pivot

plate are fitted in slots in the pivot plate, a screw spindle extending through each support, which screw spindle can pivot about an axis which is parallel to the swivel axis of the pivot plate, each screw spindle bearing a displaceable check nut underneath the support and a displaceable retaining nut above the support.

17. A mixer, comprising an elongated, substantially cylindrical, upright sleeve of flexible material, such as rubber, which forms the wall of a mixing chamber, a supply inlet for solid material and a supply inlet for liquid debouching in said mixing chamber, said sleeve accommodating a central mixing shaft coupled to a drive means, at least one blade holder block being mounted on the mixing shaft, which block bears, distributed over its periphery, a plurality of blade holders, each having slots, wherein the end of a blade is detachably lockable by means of a locking member, each blade holder being secured by bolt means to a retaining member which is rotatable through 360° about an axis of rotation perpendicular to the mixing shaft, said retaining member being accommodated in a chamber in the blade holder block and being secured against outward displacement by means of a collar of the blade holder block, said retaining member being lockable with the aid of said bolt means in each angular position with respect to the blade holder block, deforming means being in contact with the outer surface of said sleeve and being displaceable by displacement means with respect to said sleeve in the longitudinal direction of the mixing shaft.

18. A mixer according to claim 17, further comprising an adjusting device with which the angle enclosed by the central axis of the sleeve and the vertical is adjustable.

19. A mixer according to claim 18, wherein the sleeve is supported by a pivot plate which comprises a passage opening for said sleeve and which is pivotally supported on one side by stationary brackets so as to pivot about a horizontal swivel axis, while, on the opposite side of the pivot plate, supports which can pivot about an axis parallel to the swivel axis of the pivot plate are fitted in slots in the pivot plate, a screw spindle extending through each support, which screw spindle can pivot about an axis which is parallel to the swivel axis of the pivot plate, each screw spindle bearing a displaceable check nut underneath the support and a displaceable retaining nut above the support.

20. A mixer, comprising an elongated, substantially cylindrical, upright sleeve of flexible material, such as rubber, which forms the wall of a mixing chamber, a supply inlet for solid material and a supply inlet for liquid debouching in said mixing chamber, said sleeve accommodating a central mixing shaft coupled to a drive means, at least one blade holder block being mounted on the mixing shaft, which block bears, distributed over its periphery, a plurality of blade holders each having slots, wherein the end of a blade is detachably lockable by means of a locking member, each blade holder being secured by bolt means to a retaining member, which is rotatable through 360° about an axis of rotation perpendicular to the mixing shaft, said retaining member being accommodated in a chamber in the blade holder block and being secured against outward displacement by means of a collar of the blade holder block, said retaining member being lockable with the aid of said bolt means in each angular position with respect to the blade holder block, rollers with axes of rotation perpendicularly crossing the mixing shaft being in contact with the outer surface of the sleeve, which rollers are arranged in downwardly spaced successive groups, each comprising a plurality of rollers uniformly distributed over the circumference of the wall of the sleeve, corresponding rollers in successive roller groups being arranged in staggered and overlapping positions with respect to each other, said rollers being journalled on a common support which is coaxial with respect to the sleeve and which is equipped with guide bushings which are slidably mounted on guide rods that are parallel to the mixing shaft, a plurality of cylinder and piston assemblies engaging the support to impart a reciprocating movement to the same.

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