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Description

The invention concerns a mixer for a material, such as concrete, and comprising a stirring unit as well as a mixing vessel with a closable discharge opening.

A typical example of a mixer of this type is a concrete mixer. When a charge is to be mixed in such a concrete mixer, aggregates usually in the form of stone and sand are first added, and then the cement is added under continued dry mixing. Finally, optional additives plus water are added, and the mixing process now continues as a wet mixing until the concrete mix has obtained the desired state ready for use. Until then, frequently about 2.5 minutes will have elapsed from the moment when filling was initiated.

Then the discharge opening is opened to empty the vessel. At this time the concrete mix is in an almost stiff and very viscous state which impedes the discharge process and has as a result that the time it takes to discharge is relatively long. Thus, it is not unusual that the actual discharge alone takes about $\frac{3}{4}$ minut, or a consumption of time of the order of 30% of the actual charging and mixing time.

To this should be added the problem of emptying the vessel completely of concrete mix. Even with such a great consumption of time it has been found in practice that emptying of the known concrete mixers can very well leave residues of up to 2% for each emptying. This circumstance is not only extremely unfortunate for economic reasons, but may moreover have as a result that a disuniform and deficient quality is imparted to the concrete, because freshly added materials are uncontrollably mixed with residues from the preceding mixing cycles.

It has been attempted to solve the above problems by means of a mixer which is described and shown in the Swedish patent 225 460 (= DE-A-1683819). In this case, the vertical shaft of the stirring unit pivotably mounts an ejector in the form of a rectangular plate which extends vertically from the bottom of the vessel up to the maximum height of the mixture. The pivot shaft of the plate is located somewhere between the center of the mixing vessel and its side wall, there being provided a biased spring which is so adapted as to try to pivot the plate outwardly transversely to the direction of rotation of the stirring unit. However, the strength of the spring is not so great that it can overcome the resistance which the plate meets when it is driven through the material during the mixing process. During this process the plate is therefore automatically aligned in the direction of rotation.

When the vessel is to be emptied, the discharge opening in the bottom is opened, and the material then begins running out of the vessel in the normal manner. The level of the material hereby gradually sinks below the upper edge of the plate, so that the pressure of the material on the plate successively decreases, thereby causing it to begin pivoting outwardly and to be trans-

verse to the direction of rotation in the final phase where the vessel is empty or almost empty.

This structure can give a certain reduction in the discharge time with respect to the previously known art, but the time gained in this manner is relatively modest. The reason is that the plate per se is only capable of contributing to emptying the vessel by degrees in step with the material sinking in the vessel. Only in the final phase when the vessel is empty or almost empty is the plate reasonably effective.

During filling and initially also during the mixing process, the plate will almost be in the way and tend to increase the overall time required by the mixing process.

Another drawback of this known structure is that there is no or only limited space for its discharge plate in a concrete mixer which is based on a planet gear having mixing stars whose blades pass the center of the mixing vessel during the mixing process. Such a concrete mixer typically operates according to a counterflow mixing principle, where the flows of material take place in a manner quite different to the one of the known structure which employs an ordinary stirring unit rotatably mounted on a central axis. In the counterflow mixing principle the discharge plate will not be oriented in the manner which is required in the patent specification, viz. in the direction of rotation during the mixing process. On the contrary, the far more complicated flow state which is present in counter-flow mixing, will tend to make the discharge blade assume other positions where it may impede the intended flow and reduce the efficiency of the mixing process.

Accordingly, there is a need for a mixer of the type mentioned in the opening paragraph which has a device capable of providing faster emptying with less residues of material than known before both in an ordinary mixing process and in a counterflow mixing process.

This problem is solved according to the invention by means of a scraper mechanism which is caused to describe an orbital movement about a central axis in the vessel by the stirring unit in operation and which is adapted to raise at least one scraper blade above the material during mixing and to lower it down into it during emptying. This structure ensures that the scraper blade is entirely free of the material while the mixing vessel is filled and the material is mixed, so that this part of the process is in no way disturbed by the presence of the scraper blade. This property is of decisive importance in particular when mixing takes place according to the counterflow principle. During emptying the scraper blade is effective from the beginning. The discharge time is hereby minimized.

The mixing vessel typically has a round side wall and a bottom which closes it downwardly. In this case it is advantageous when the scraper blade in the lowered state forms a negative acute angle with a radius through the inner edge of the blade, and its outer edge is present at or in the vicinity of the side wall.

For the bottom to be scraped completely clean of residues, it is moreover expedient to position the scraper blade with its lower edge close to the bottom. Since the scraper blade is substantially transverse to the direction of rotation, it pushes the material along for each rotation. Owing to the negative acute angle with the radius, this material will simultaneously be pushed out toward the periphery, and when the scraper blade meets the discharge opening, which is usually positioned in an area at the side wall, the material drops out through this opening.

In counterflow mixing the blades of the mixing stars pass the center and thereby ensure that no residues are left in this area, even though the scraper blade itself does not extend beyond the center. The scraper blade, optionally in cooperation with conventional side scrapers, hereby ensures rapid and effective emptying and cleaning of the mixing vessel for each mixing cycle.

A very effective mixer is described in the applicant's European patent application 89 908 400.8 (=EP-A-0430967;= WO 90/00930) "A method and an apparatus for mixing materials". In this mixer, which operates according to the counterflow mixing principle, the stirring unit is based on a planet gear having a ring-shaped planet housing which is caused to rotate about a central axis by means of one or more motors during rotation. This planet housing rotatably mounts mixing stars which are in gear wheel engagement with the stationary sun wheel of the planet gear and therefore rotate with respect to the planet housing when this rotates about the central axis. The mixing stars carry blades which directly serve to mix the material.

In this structure, the scraper mechanism may advantageously be provided on the ring-shaped planet housing. Then the scraper mechanism and thereby the scraper blade will follow the rotation of the planet housing and always be at an unchanging relative distance - seen in vertical projection - from the rotating mixing stars and their blades. Both the mixing stars and the scraper blade must have a great radius of action in order to be able to touch all the material during the mixing process and afterwards to be able to discharge it rapidly and effectively. The mixing blades and the scraper blade will therefore work close to each other. The above arrangement effectively ensures that the blades and the scraper mechanism with its scraper blade do not collide with each other in operation.

When the scraper mechanism is provided on the planet housing, it may have a lifting rod in a preferred embodiment which is pivotally journaled on a pivot provided on the planet housing. The other end of the lifting rod then carries the scraper blade, and a drive mechanism is operative between the planet gear and the lifting rod to pivot the lifting rod up and down between a lower discharge position and an upper free position. This structure is simple and sturdy and is of a size permitting it to be easily incorporated in the restricted space between the mixing stars and the side scrapers.

In a particularly simple embodiment the drive mechanism may be a pneumatic or hydraulic drive cylinder. In another and particularly expedient embodiment of the drive mechanism, said mechanism consists of a combined rod and gear wheel connection which can be engaged and disengaged with the main gear wheel of the planet housing by a dynamic brake, thereby causing the scraper mechanism to lower and raise the scraper blade respectively. The only component to be directly activated in this connection, is the brake which is stationarily mounted on the mixing vessel. The brake can therefore easily be connected to a power supply, while it is somewhat more difficult to run a power supply to the above-mentioned pneumatic or hydraulic drive cylinder via the planet housing which is rotatably mounted in the mixing vessel.

The brake may be a pneumatic or hydraulic drive cylinder having a piston which, in the activated state, serves as a brake disc against another brake disc which is connected with the combined rod and gear wheel connection of the drive mechanism. In the activated state, the two brake discs transfer the necessary force by means of friction, whereby they simultaneously slidingly rotate with respect to each other. A brake lining may advantageously be interposed between the brake discs.

Also a conventional hydraulic brake or a magnet brake may be used as a brake.

The drive mechanism may generally be characterized in that it must be adapted to lower the scraper blade toward the bottom of the mixing vessel upon braking and to raise the scraper blade to its upper position when braking ceases.

The invention will be explained more fully by the following description of embodiments, which just serve as examples, and with reference to the drawing, in which

fig. 1 is a top view, with the uppermost portion removed, of a concrete mixer having a stirring unit which is built on the basis of a planet gear and operates according to the counterflow mixing principle,

fig. 2 is a lateral, partially sectional view and with a first embodiment of a scraper mechanism,

fig. 3 shows the same, but with another embodiment of a scraper mechanism, and with the mixing stars of figs. 1 and 2 omitted,

fig. 4 is a lateral, partially sectional view of the drive mechanism associated with the scraper mechanism of fig. 3, and

fig. 5 is an enlarged perspective view of the drive mechanism of fig. 4.

Figs. 1 and 2 show a concrete mixer which is generally designated 1. This concrete mixer is of the type

which is described in the applicant's European patent application 89 908 400.8 "A method and an apparatus for mixing materials". The concrete mixer comprises a mixing vessel 2 having a side wall 3 and a bottom 4. The mixing vessel serves to receive the material which is to be mixed, and which reaches the level N when the vessel is filled. Upwardly, the vessel is covered by a solid superstructure 5, which carries a stirring unit 6 and a central pipe 7 through which the materials to be mixed are fed to the mixing vessel. Further, the bottom 4 of the mixing vessel is formed with a discharge opening 8 (fig. 1) for removal of the mixed concrete.

The stirring unit is built on the basis of a planet gear 9 (fig. 2) having a ring-shaped planet housing 10 which is rotatably mounted on the superstructure 5. A top plate 11, secured upwardly on the superstructure 5, mounts two motors 12, each of which is connected with a gear 13 having an output shaft 14 with a gear wheel drive 15 which engages an outer toothed rim 16 on the planet housing 10. An isolating screen 17 for dampening the noise from the gear 13 is arranged around the gear 13.

Two output shafts 18 are mounted downwardly on the planet housing 10. A gear wheel 19, which engages the stationary sun wheel 20 of the planet gear, is arranged upwardly on each of the output shafts. The lower end of each output shaft 18 carries a mixing star 21 having inclined downwardly directed arms 22 whose lower ends mount mixing blades 23 close to the bottom 4.

Further, the planet housing 10 mounts side scrapers 24 which are pulled along the side wall 3 and serve to scrap off material that might stick to the side wall.

When the motors 12 are connected, they cause the ring-shaped planet housing 10 to rotate at a speed of rotation which is typically 10 revolutions per minute in the above European patent application. Simultaneously, the mixing stars 21 are caused to rotate against the flow in the direction shown by the arrows in fig. 1 because of the gear wheel engagement with the stationary sun wheel 20. The mixing stars have slightly different diameters and correspondingly rotate at slightly different speeds of rotation with 43 and 48 revolutions per minute, respectively. This results in the greatest possible mixing efficiency, since the mixing blades pass beyond the center of the mixing vessel and get in contact with all the material present in the mixing vessel. Thus, the mixing stars 21 have a considerable radius of action, and in combination with the side scrapers 24 they therefore restrict the space available in the vessel for incorporation of other components.

The mixing vessel 2 moreover accommodates a scraper mechanism 25 which is mounted on the planet housing 10 by means of a bracket 26. The bracket has a pivot 27 about which a lifting rod 28 can pivot up and down. A scraper blade 29, whose function will be described more fully below, is provided at the opposite end of the pivot 27 or the free end of the lifting rod 28. A pneumatic or hydraulic drive cylinder 30 operates

between the bracket 26 and the lifting rod 28. This drive cylinder is pivotally suspended from the bracket 26 by means of a pivot 31. The piston rod 32 of the cylinder is simultaneously connected with a point on the lifting rod 28 by means of another pivot 33. As shown, the pivot 31 of the drive cylinder is spaced above the pivot 27 of the lifting rod, so that the drive cylinder when activated will affect the lifting rod 28 with a torque around the pivot 27 and can thereby pivot the scraper 29 from the bottom position shown in fig. 2 to a position above the level of material N, and vice versa.

When a charge of materials is to be mixed to finished concrete, the motors 12 are connected first. The motors hereby cause the planet housing 10 to rotate via the gear wheel engagement between the gear wheel drives 15 and the toothed rim 16 on the planet housing. The side scrapers 24 are pulled along the side wall 3 of the mixing vessel at the same speed of rotation as the planet housing, and the mixing stars 21 with the mixing blades 23 are simultaneously caused to rotate with respect to the planet housing because of the gear wheel engagement between the gear wheel 19 of the mixing stars and the stationary sun wheel 20. The scraper blade 29 has been lifted by the drive cylinder above the level N which the material reaches when the vessel is filled. In this position the scraper blade does not interfere with the mixing process, which can therefore proceed optimally.

In the concrete mixer structure shown in fig. 2 the materials are fed through the central pipe 7. However, it is no condition of the present invention that the materials are fed in this manner. Other embodiments of the concrete mixer structure may e.g. have side openings (not shown) for the introduction of the materials.

The aggregates stone and sand are added first and are dry mixed. Then cement is added with continued dry mixing, and finally optional additives as well as water is added, and then the total amount of material is wet mixed until the mix is ready for use. The overall period of time spent on this part of the mixing cycle is typically about 2.5 minutes.

As soon as the actual mixing process has been completed, the discharge opening 8 is opened, and the drive cylinder 30 is activated. This initiates the discharge, which takes place without stopping the motors 12. The side scrapers 24 and the mixing stars 21 therefore continue to work in the same manner as during the actual mixing process.

The drive cylinder 30 now activated pivots the lifting rod 28 downwardly so that the scraper blade 29 is forced down toward the bottom 4 of the mixing vessel 2, as shown in fig. 2. The scraper blade 29 is now rotated in the concrete mix at the same speed as the planet housing 10. The scraper blade acts as a kind of plough which pushes the concrete mix in front of it around, while the concrete mix is moved out toward the lateral wall. The latter function is due to the fact that, as shown in fig. 1, the scraper blade 29 is positioned with an

obliquely rearwardly directed inclination with respect to the direction of rotation, or at a negative angle α with respect to a radius through the inner edge of the scraper blade.

The usually stiff concrete mix has a very viscous consistency and can therefore normally be discharged only slowly from the mixing vessel. Now the emptying takes place as a combined process, during which the scraper blade cooperates with the side scrapers and the blades of the mixing stars. The side scrapers pull down the concrete mix from the side wall 3 of the vessel, while the blades of the rotating mixing stars bring along the concrete mix, present above the central area of the bottom 4, in an outward direction, so that also this part of the concrete mix will be within the reach of the scraper blade 29, which therefore does not have to extend beyond the center.

The overall effect of the above-mentioned arrangement is very good. It has thus been found that a typical concrete mixing vessel can be discharged completely after just 3-5 rotations of the planet housing 10. The residues left in the mixing vessel are down to 0.1-0.2%, while residues of up to 2% for each emptying have frequently been left in corresponding concrete mixers without a scraper mechanism having a scraper blade. The reduction in the time spent on the discharge is considerable and is of the order of 10-15 seconds or 30-40%. The time spent on a total mixing cycle can hereby be reduced by about 10%, while the residues are reduced by more than 90%.

In the embodiment of the scraper mechanism shown in figs. 1 and 2 the compressed air or oil must be fed to the drive cylinder via a rotatable pipe joint, since the entire scraper mechanism is mounted on the planet housing 10 which rotates with respect to the mixing vessel 2 in operation. It is relatively difficult to establish such a rotatable pipe joint, in particular when the central area of the concrete mixer is occupied by the central pipe 7 for the charging of the materials. This drawback is remedied by the embodiment of the scraper mechanism which is shown in figs. 3, 4 and 5.

In this case, too, the scraper blade 29 is arranged at the end of a lifting rod 28 capable of pivoting up and down about a pivot 27 on a bracket 26 which is firmly mounted on the planet housing 10. This entire part of the scraper mechanism is therefore rotated in the mixing vessel at the same speed of rotation as the planet housing.

Spaced from the pivot 27, the lifting rod 28 is pivotally connected via a pivot 46 with a connecting rod 34, which is in turn pivotally connected with a moment arm 35 via another pivot 47. The moment arm 35 itself is moment-connected with a horizontal shaft 36 which is rotatably mounted in the planet housing 10. A screw spring 37 is wound around the shaft 36 and is biased by a spring force, which acts on the lifting rod 28 in the lifting direction via the moment arm 35 and the connecting rod 34 and has a sufficiently great strength to lift the

scraper blade 29 above the level of material N.

A first toothed segment 38 is fixed on the end of the shaft 26 disposed opposite the moment arm 35 and engages a second toothed segment 39 which is fixed on the underside of a toothed rim 40. This toothed rim 40 is in turn rotatably mounted on the planet housing 10 in an area below its toothed rim 16. The toothed rim is formed with a slot 44 which extends concentrically with the toothed rim 40 and the planet housing 10. A pin 45, which, as shown best in fig. 5, extends freely up into the slot 44, is moreover fixed on the planet housing 10. The rotation of the toothed rim 40 with respect to the planet housing 10 is hereby restricted to an angle whose size is determined by the relative displacement of the pin 45 in the slot 44 being stopped by the slot ends 44a and 44b, respectively.

A vertical shaft 41 is rotatably mounted on a stationary part of the mixing vessel. A gear wheel 42 engaging the toothed rim 40 is secured on the lower end of this shaft. The upper end of the shaft 41 is affected by a dynamic brake 43.

As shown in fig. 4, this brake is mounted on the top plate 11 which forms a fixed component of the mixing vessel 2. The brake 43 with associated parts therefore do not participate in the rotation of the planet housing 10 in operation.

In the case shown, the brake consists of a pneumatic or hydraulic drive cylinder 48 having a piston 49 which can be moved axially up and down in the cylinder 48, but is fixed against rotation with respect to it by means of a key and keyway connection 53. When the drive cylinder 48 is relieved of pressure, the piston 49 is pushed up into the upper end of the cylinder 48 by a compression spring 52. The piston serves as a first brake disc 49. The upper end of the shaft 41 is shaped as a second brake disc 50 having a brake lining 51. The drive cylinder receives compressed air or oil via a conduit 55 which is connected with the drive cylinder by means of a union 54. Further, a valve 56 is inserted into the conduit 55.

The brake described above may also be arranged in the manner that the piston or the first brake disc is mounted axially slidably, but fixed against rotation on the upper end of the shaft 36, while the second brake disc is stationarily secured in the drive cylinder. The drive cylinder shown in fig. 4 is single-acting with a compression spring 52 for the return movement. Instead, a double-acting cylinder may be used for displacing the piston in both directions.

In addition to the brake structure described above, also other brake types may be used, e.g. hydraulic brakes or magnet brakes. However, the brakes must be dynamic in all cases. They must therefore e.g. have two brake discs, one of which is to be mounted fixed against rotation in the brake and the other fixed against rotation on the shaft 41. When the brake is activated, and the brake discs have hereby been engaged mutually, they must be capable of transferring a sufficiently great friction.

tional moment to drive the scraper blade 29 via the scraper mechanism down through a concrete mix in the vessel to its bottom 4 against the action of the screw spring 37. However, the frictional moment must not be so great as to defeat this purpose, since the rotation of the planet housing 10 would then be impeded when the pin 45 hits the end 44b of the slot 44, and the planet housing 10 thereby brings along the toothed rim 40 in the rotary movement. Owing to the gear wheel engagement between the toothed rim 40 and the gear wheel 42, the shaft 41 now also begins rotating, so that the two brake discs will rotate slidingly with respect to each other and overcome the frictional moment which occurs because of the applied brake force.

It is noted that a brake moment similarly enabling a mutual movement between two brake parts can also be obtained in other ways, e.g. by means of a pump in a liquid circuit which is throttled when the brake is to be activated.

When a charge of material has been mixed to ready concrete, the discharge opening 8 in the bottom 4 of the vessel is opened, and also the valve 56 is opened, so that the piston or the first brake disc 49 is moved down to frictionally touch the brake lining 51 on the second brake disc 50. The two brake discs are now pressed against each other by a pressure which is determined by the pressure over the first brake disc 49 and its diameter. The braking moment is transferred via the second brake disc 50, the shaft 41 and the gear wheel 42 to the toothed rim 40. This stops the rotation of the toothed rim 40 with respect to the planet housing 10, which continues to rotate.

Till then, the scraper blade has been present in its upper position over the level of material N. This position is always maintained when the brake is not activated. The biased screw spring 37 will then have rotated the moment arm 35 in a clockwise direction (fig. 5) and will thereby have lifted the pivotable rod 28 and thus the scraper blade 29 above this level via the connecting rod 34. The first toothed segment 38 has simultaneously been rotated clockwise, so that the toothed rim 40, because of the toothed engagement between the first and the second toothed segments 38, 39, has been rotated counterclockwise with respect to the planet housing 10 until the pin 45 hits the end 44a of the slot 44.

When the toothed rim 40 is braked by the braking effect which occurs as described above when the brake 43 is activated, the toothed rim 40 now rotates clockwise with respect to the planet housing 10 until the pin 45 hits the other end 44b of the slot 44.

During the travel performed by the pin 45 between the two ends 44a, 44b of the slot 44, the first toothed segment now rotates counterclockwise because of the toothed engagement with the second toothed segment 39 on the toothed rim 40, so that the scraper blade 49 is lowered to the bottom 4 of the vessel against the spring force of the screw spring 37. The lifting height of the

scraper blade is determined by the length of the slot 44.

As will be seen, the scraper blade 29 is maintained in its upper position by means of a passive force applied by the biased screw spring 37 when the brake is not activated. This is the case when the concrete mixer stands still and during the part of the working cycle where charging and mixing takes place. The scraper mechanism uses no energy during this. On the other hand, when the brake is activated, the scraper blade is driven down to its lower position by means of an active force which is transferred from the planet gear and thereby from the motors 12. In this connection the brake just acts as a servomechanism.

A certain frictional loss between the brake discs occurs during the discharge process, but this loss is rather modest since the brake, in its capacity of a servomechanism, does not need any great braking pressure, and since the discharge process only accounts for a minor part of the overall mixing cycle time.

A particular advantage obtained by means of this second embodiment of the scraper mechanism is that it is only necessary to feed power to the brake in order to activate the scraper mechanism. Since the brake is stationarily mounted with respect to the mixer, the cumbersome rotatable pipe joint required in order to feed power to the first scraper mechanism embodiment shown in figs. 1 and 2 is avoided.

As mentioned before, the scraper mechanism of the invention provides a considerable reduction in the time it takes to empty the mixing vessel completely. This time can be reduced further by mounting two or more scraper mechanisms in the mixing vessel instead of just one.

The invention has been exemplified above by means of a concrete mixer. However, the invention may be applied in connection with many other mixers and for many other materials where rapid and complete emptying of the mixing vessel is desired.

Claims

1. A mixer (1) for a material such as concrete and comprising a stirring unit (6) as well as a mixing vessel (2) having a closable discharge opening (8), the mixer further comprising a scraper mechanism (25) which is caused to describe an orbital movement about a central axis in the vessel (2) by the stirring unit, characterized in that said scraper mechanism (25) is adapted to raise at least one scraper blade (29) to a position above the material during mixing and to lower said at least one scraper blade (29) into the material to a position close to the bottom (4) of the vessel (2) when discharge of the material is initiated.
2. A mixer according to claim 1, wherein the mixing vessel (2) has a round side wall (3) and a bottom (4) closing it downwardly, characterized in that the

scraper blade (29) in the lowered state forms a negative acute angle with a radius through the inner edge of the blade (29), the outer edge being present at or in the vicinity of the side wall (3).

3. A mixer according to claim 1 or 2, wherein the stirring unit (6) is built on the basis of a planet gear (9) having a ring-shaped planet housing (10), which is arranged concentrically around the central axis of the mixing vessel and can be caused to rotate about the axis by means of at least one motor (12), and on which at least one output shaft is rotatable mounted at a distance from the axis, said output shaft being gear wheel connected with the stationary sun wheel of the gear and having a mixing star (21) carrying one or more mixing blades at or in the vicinity of the bottom of the vessel, and on which one or more side scrapers (24) may moreover be mounted to scrape along the inner side of the side walls, **characterized** in that the scraper mechanism (29) is directly or indirectly mounted on the ring-shaped planet housing (10) at a distance from the axis.
4. A mixer according to claim 1, 2 or 3, **characterized** in that the scraper mechanism partly comprises a lifting rod (28) which carries the scraper blade (29) and is pivotally mounted on a pivot provided on the planet housing, partly a drive mechanism which works between the planet gear (9) and the lifting rod (28) and is capable of affecting the lifting rod (28) by a moment about the pivot.
5. A mixer according to claim 4, **characterized** in that the drive mechanism is a pneumatic or hydraulic drive cylinder.
6. A mixer according to claim 4, **characterized** in that the drive mechanism comprises; a connecting rod pivotally connected with the lifting rod (28) at one end; a moment arm pivotally connected at one end with the other end of the connecting rod; a horizontal shaft rotatably mounted in the planet housing (10) and having its one end moment-connected with the moment arm; one screw spring bias-wound about said shaft and applying a sufficiently great force to the moment arm to raise the lifting rod (28) to an upper position; a first tooth segment moment-connected with the other end of the shaft; a second tooth segment engaged with the first tooth segment; a toothed rim (40) carrying the second toothed segment and being rotatably mounted in the planet housing (10); a stop arrangement restricting the angle through which the toothed rim can rotate with respect to the planet housing to a predetermined size; one vertical shaft (41) rotatably mounted in a stationary part of the mixing vessel (2); a gear wheel arranged on the lower part of said

vertical shaft (41) and engaged with the toothed rim (40); and a dynamic brake (43) capable of applying a brake moment to the upper end of the vertical shaft (41) upon activation.

7. A mixer according to claim 6, **characterized** in that the brake is a pneumatic or hydraulic drive cylinder having first (49) and second (50) brake discs which, when the drive cylinder is activated, are pressed mutually slidably rotatably toward each other while overcoming a frictional force.
8. A mixer according to claim 6, **characterized** in that the brake is a hydraulic brake.
9. A mixer according to claim 6, **characterized** in that the brake is a magnet brake.
10. A mixer according to any of claims 6-9, **characterized** in that the drive mechanism is adapted to lower the scraper blade to its bottom position upon braking and to raise the scraper blade to its upper position upon cessation of the brake effect.

Patentansprüche

1. Mischer (1) für ein Material, wie zum Beispiel Beton und umfassend eine Rühreinheit (6) sowie einen Mischbehälter (2) mit einer verschließbaren Abgabeöffnung (8), wobei der Mischer ferner einen Kratzmechanismus (25) umfaßt, der zum Beschreiben einer Bahnbewegung um eine zentrale Achse in dem Behälter (2) durch die Rühreinheit veranlaßt wird, dadurch gekennzeichnet, daß der Kratzmechanismus (25) in der Lage ist, wenigstens ein Kratzblatt (29) in eine Position oberhalb des Materials während des Mischens anzuheben und das wenigstens eine Kratzblatt (29) in das Material in eine Position nahe des Bodens (4) des Behälters (2) abzusenken, wenn die Abgabe des Materials ausgelöst wird.
2. Mischer nach Anspruch 1, wobei der Mischbehälter (2) eine runde Seitenwand (3) und einen ihn nach unten abschließenden Boden (4) besitzt, dadurch gekennzeichnet, daß das Kratzblatt (29) in abgesenktem Zustand einen negativen spitzen Winkel mit einem Radius durch die Innenkante des Blattes (29) bildet, wobei die Außenkante an oder in der Nähe der Seitenwand (3) vorliegt.
3. Mischer nach Anspruch 1 oder 2, wobei die Rühreinheit (6) auf der Basis eines Planetengetriebes (9) mit einem ringförmigen Planetengehäuse (10) aufgebaut ist, welches konzentrisch um die zentrale Achse des Mischbehälters angeordnet ist und veranlaßt werden kann, sich um die Achse mittels wenigstens eines Motors (12) zu drehen und

bei welcher wenigstens eine Ausgangswelle in einer Entfernung von der Achse drehbar gelagert ist, wobei die Ausgangswelle durch ein Zahnrad mit dem stationären Sonnenrad des Getriebes verbunden ist und mit einem Mischstern (21), der eines oder mehrere Mischerblätter an oder in der Nähe des Bodens des Behälters trägt, und bei welcher ein oder mehrere Seitenkratzer (24) darüber hinaus angeordnet sein können, um entlang der Innenseite der Seitenwand zu kratzen, dadurch gekennzeichnet, daß der Kratzmechanismus (29) direkt oder indirekt auf dem ringförmigen Planetengehäuse (10) in einem Abstand von der Achse angeordnet ist.

4. Mischer nach Anspruch 1, 2 oder 3, dadurch gekennzeichnet, daß der Kratzmechanismus umfaßt teilweise eine Anhebestange (28), die das Kratzblatt (29) trägt und die schwenkbar an einem Gelenk gelagert ist, das an dem Planetengehäuse vorgesehen ist, teilweise einen Antriebsmechanismus, der zwischen dem Planetengetriebe (9) und der Anhebestange (28) arbeitet und in der Lage ist, die Anhebestange (28) durch ein Moment um das Gelenk zu beeinflussen.

5. Mischer nach Anspruch 4, dadurch gekennzeichnet, daß der Antriebsmechanismus ein pneumatischer oder hydraulischer Antriebszylinder ist.

6. Mischer nach Anspruch 4, dadurch gekennzeichnet, daß der Antriebsmechanismus umfaßt: eine Verbindungsstange, die schwenkbar mit der Anhebestange (28) an einem Ende verbunden ist; einen Momentenarm, der schwenkbar an einem Ende mit dem anderen Ende der Verbindungsstange verbunden ist; eine horizontale Welle, die drehbar in dem Planetengehäuse (10) gelagert ist und mit ihrem einen Ende mit dem Momentenarm momentverbunden ist; eine Schrauberfeder, die mit Vorspannung um die Welle gewickelt ist und eine hinreichend große Kraft an den Momentenarm anlegt, um die Anhebestange (28) in eine obere Position anzuheben; ein erstes Zahnsegment, das mit dem anderen Ende der Welle momentverbunden ist; ein zweites Zahnsegment, das mit dem ersten Zahnsegment in Eingriff steht; ein Zahnrand (40), der das zweite Zahnsegment trägt und drehbar in dem Planetengehäuse (10) gelagert ist; eine Stopanordnung, die den Winkel auf eine vorbestimmte Größe beschränkt, durch welchen der Zahnrand in bezug auf das Planetengehäuse drehen kann; eine vertikale Welle (41), die drehbar in einem stationären Teil des Mischbehälters (2) gelagert ist; ein Zahnrad, das auf dem unteren Teil der vertikalen Welle angeordnet ist und sich mit dem Zahnrand (40) in Eingriff befindet; und eine dynamische Bremse (43), die in der Lage ist, ein Brems-

moment an das obere Ende der vertikalen Welle (41) bei Aktivierung anzulegen.

7. Mischer nach Anspruch 6, dadurch gekennzeichnet, daß die Bremse ein pneumatischer oder hydraulischer Antriebszylinder ist, der erste (49) und Zweite (50) Bremsscheiben besitzt, welche, wenn der Antriebszylinder aktiviert ist, gegenseitig gleitend drehbar gegeneinander gedrückt werden, während eine Reibungskraft überwunden wird.

8. Mischer nach Anspruch 6, dadurch gekennzeichnet, daß die Bremse eine hydraulische Bremse ist.

9. Mischer nach Anspruch 6, dadurch gekennzeichnet, daß die Bremse eine Magnetbremse ist.

10. Mischer nach irgendeinem der Ansprüche 6 bis 9, dadurch gekennzeichnet, daß der Antriebsmechanismus in der Lage ist, das Kratzblatt in seine Bodenposition beim Bremsen abzusenken und das Kratzblatt in seine obere Position beim Aufhören des Bremseffektes anzuheben.

Revendications

1. Mélangeur (1) pour un matériau tel que du béton et comprenant une unité d'agitation (6) ainsi qu'une enceinte de mélange (2) munie d'une ouverture d'évacuation pouvant être obturée (8), le mélangeur comprenant en outre un mécanisme racleur (25) qui est amené à décrire un mouvement orbital autour d'un axe de symétrie de l'enceinte (2) grâce à l'unité d'agitation, caractérisé en ce que ledit mécanisme racleur (25) est conçu de manière à relever au moins une lame racleuse (29) jusqu'à une position située au-dessus du matériau lors de l'opération de mélange et à abaisser ladite au moins une lame racleuse (29), dans le matériau, jusqu'à une position proche du fond (4) de ladite enceinte (2), lorsque l'évacuation du matériau est initiée.

2. Mélangeur selon la revendication 1 dans lequel l'enceinte de mélange (2) comporte une paroi latérale ronde (3) et un fond (4) qui l'obture vers le bas, caractérisé en ce que la lame racleuse (29), dans sa position abaissée, forme un angle aigu négatif avec un rayon passant par l'arête interne de la lame (29), l'arête externe étant située sur, ou au voisinage de, la paroi latérale (3).

3. Mélangeur selon la revendication 1 ou 2 dans lequel l'unité d'agitation (6) est réalisée sur la base d'un train satellite d'engrenages (9) comportant un logement satellite en forme d'anneau (10), qui est disposé concentriquement autour de l'axe de symé-

trie de l'enceinte de mélange et qui peut être amené à tourner autour de l'axe à l'aide d'au moins un moteur (12), et sur lequel au moins un arbre de sortie est monté à rotation, à distance de l'axe, ledit arbre de sortie étant connecté par pignon à une roue planétaire fixe du train d'engrenages et comportant une étoile de roue mélangeuse (21), portant une ou plusieurs lames mélangeuses, sur, ou au voisinage du fond de l'enceinte, et sur laquelle peuvent en outre être montés un ou plusieurs racleurs latéraux (24), de manière à râcler le bord interne des parois latérales, caractérisé en ce que le mécanisme de râclage (29) est monté, directement ou indirectement, sur le logement satellite en forme d'anneau (10), à distance de l'axe.

4. Mélangeur selon la revendication 1, 2 ou 3, caractérisé en ce que le mécanisme racleur comprend partiellement une tige de soulèvement (28) qui supporte la lame racleuse (29) et qui est montée à pivotement sur un pivot prévu sur le logement satellite, partiellement un mécanisme d'entraînement qui travaille entre le train satellite (9) et la tige de soulèvement (28) et qui est capable de communiquer à la tige de soulèvement (28) un moment par rapport au pivot.
5. Mélangeur selon la revendication 4 caractérisé en ce que le mécanisme d'entraînement est un vérin à commande hydraulique ou pneumatique.
6. Mélangeur selon la revendication 4 caractérisé en ce que le mécanisme d'entraînement comprend : une tige de liaison reliée à pivotement, par une extrémité, à la tige de soulèvement (28); un bras de levier relié à pivotement par une extrémité, à l'autre extrémité de la tige de liaison ; un arbre horizontal monté à rotation dans le logement satellite (10) et comportant une extrémité reliée à levier avec le bras de levier; un ressort en spirale enroulé en rappel autour dudit arbre et appliquant une force suffisamment importante au bras de levier de manière à relever la tige de soulèvement (28) jusqu'à une position supérieure ; un premier segment denté, connecté à levier avec l'autre extrémité de l'arbre; un second segment denté en prise avec le premier segment denté ; une couronne dentée (40) portant le second segment denté et montée à rotation dans le logement satellite (10); un système de butée limitant, à une valeur prédéterminée, l'angle selon lequel la couronne dentée peut tourner par rapport au logement satellite ; un arbre vertical (41) monté à rotation dans une partie fixe de l'enceinte de mélange (2); un pignon disposé sur la partie inférieure dudit arbre vertical (41) et venant en prise avec la couronne dentée (40); et un frein dynamique (43) pouvant appliquer un moment de freinage à l'extrémité supérieure de l'arbre vertical (41)

lorsqu'il est mis en action.

7. Mélangeur selon la revendication 6 caractérisé en ce que le frein est un cylindre à commande hydraulique ou pneumatique comportant des premier (49) et second (50) disques de freinage qui, lorsque le cylindre de commande est actionné, sont appliqués mutuellement à glissement et rotation l'un vers l'autre tout en surmontant une force de frottement.
8. Mélangeur selon la revendication 6 caractérisé en ce que le frein est un frein hydraulique.
9. Mélangeur selon la revendication 6 caractérisé en ce que le frein est un frein magnétique.
10. Mélangeur selon l'une quelconque des revendications 6-9 caractérisé en ce que le mécanisme de commande est conçu de manière à abaisser la lame racleuse vers sa position inférieure lors du freinage et à relever la lame racleuse, vers sa position supérieure, lorsque cesse l'effet de freinage.

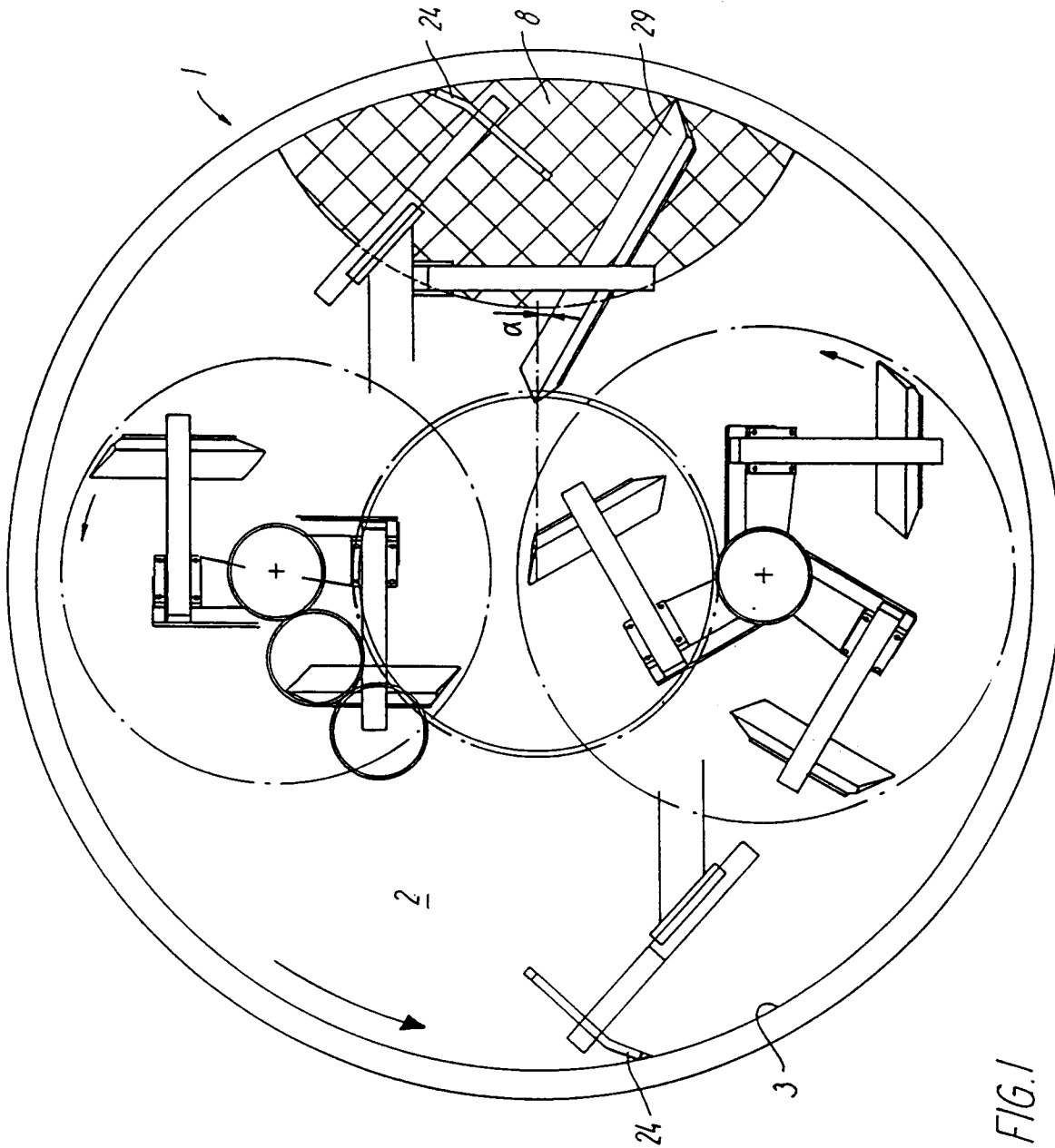


FIG. 1

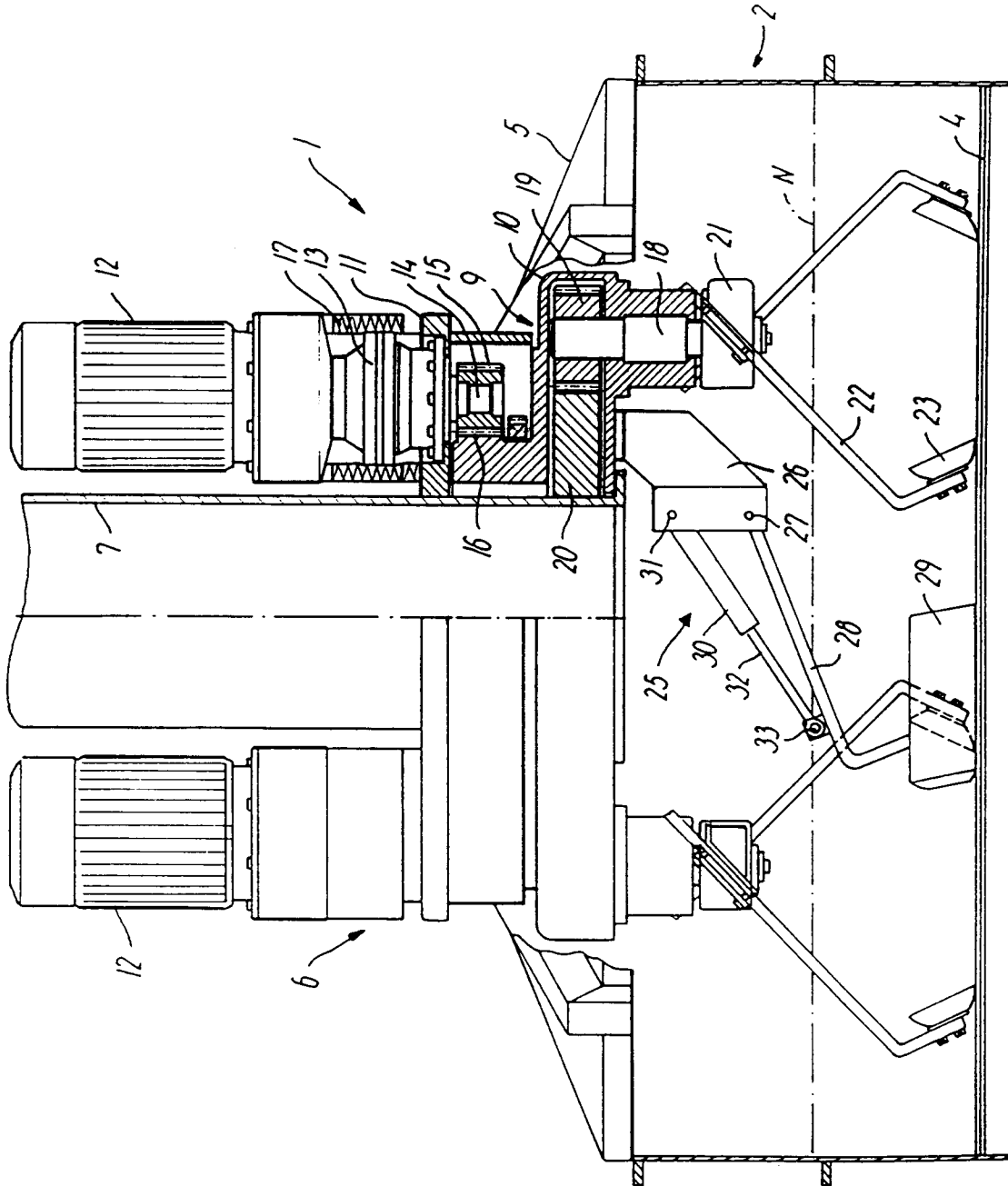


FIG. 2

