

Mixing and/or Comminuting Apparatus

The invention relates to mixing and/or comminuting apparatus comprising a cylindrical container for receiving the material to be treated; at least one drivable stirrer member which is concentrically journaled relative to the container axis and which extends substantially up to the inner wall region of the container; and also at least one tool which is eccentrically and rotatably journaled relative to the container axis, which rotates with the stirrer member and which acts on the stirred material, with the tool being drivable with a speed of rotation and/or direction of rotation which are the same as or different from the speed of rotation and/or direction of rotation of the stirrer member, with a nozzle arrangement to which suckable and/or pumpable media can be supplied being provided in the region of at least one wall-side portion of the stirrer member, said nozzle arrangement rotating with the stirrer member and extending at least substantially over the axial length of the stirrer member.

When manufacturing many goods which are required for industrial and private needs it is necessary to mix various substances with one another. In a whole series of cases it is also necessary to bring about a chemical reaction in the mixed material. Troublefree mixing is in particular made additionally difficult when, in known manner, a liquid medium is to be introduced by a lance type spray nozzle. The danger of material balling together and forming lumps is in this case particularly great.

In an apparatus of the kind mentioned at the beginning known from DE-C-287 357, a drum is rotatably journaled in a fixed housing, and stirrers which can be driven by means of the drive of this inner drum are distributed at the periphery of the latter. In this case, the unit comprising the inner drum and the stirrers forms the stirrer member, and a comminution and a kneading of the product occurs simultaneously by means of the stirrers. Roof-like water supply channels are arranged between the stirrers and parallel thereto. In this known apparatus since the stirrers are simultaneously part of the stirrer member and tools, it is not simply possible to take into account in a constant manner the requirements which result from different composition and different condition if the product is to be treated in the sense of a treatment as ideal as possible of the product. Further, it is disadvantageous that the spraying-in occurs in a region in which the product to be treated is subjected to relatively small stirring or moving forces because of the distance present between the tools or the relevant parts of the stirrer member and the spraying-in place. Therefore, depending on the circumstances, one must expect the formation of tough phases, cakings and lumps at least with certain critical materials.

A mixing and comminution apparatus without nozzle arrangement is known from DE-A-32 02 308, which has otherwise a comparable structure as the apparatus of the kind mentioned at the beginning.

The object underlying the invention is to so construct an apparatus of the initially named kind in the simplest possible manner so that even when the requirement exists to carry out "in-spray processes" an ideal treatment of the material and an extremely uniform process product is always

obtained, independent of the composition and the instantaneous state of the material to be treated, while obtaining a short throughput or processing time, and avoiding the formation of lumps, cakings and tough phases.

This object is satisfied in accordance with the invention in that the nozzle arrangement is provided in the region of a wall-side stirring vane of the stirrer member; and in that the tool is arranged close to this stirring vane and in the working area of the nozzle arrangement.

Owing to the arrangement of the tool, separate from the stirrer member or the stirring vane and thus capable of being influenced independently therefrom, in the working region of the nozzles, it results a cooperation of the stirrer member, of the tool which can be driven independently therefrom, and of the nozzle arrangement which serves to spray onto the product to be treated, and it is always possible to maintain the best possible operating conditions in this cooperation, independently of the composition and the actual condition of the product to be treated. The arrangement and the design of the spraying-in arrangement produces a surprisingly regular distribution of the respectively sprayed medium, preferably a gaseous medium, in the product, and in a particularly advantageous manner, the processes of stirring, comminuting and spraying-in, which can be separately influenced, support mutually each other such that an unexpectedly advantageous result is obtained.

The nozzle arrangement preferably consists of a tube or pipe which extends parallel to the wall-side element of the stirrer member and which is provided with wall openings or with spray nozzles.

The nozzle pipe can be integrated in the wall-side stirrer vane of the stirrer member.

According to a preferred embodiment, the tool located in the working region of the nozzle arrangement is realised in the form of a chopper. This results in an additional mixing effect and simultaneously in a improvement of the chopping effect. Despite the operating conditions which are made more difficult by the spraying-in of material it is possible with this embodiment to achieve a minimisation of the throughput time while achieving a high quality of the product of the process.

The nozzle tube is preferably pivotably mounted so that the angle at which the particular medium is sprayed, which medium can be a liquid or a vapor, can be matched to the prevailing conditions in the sense of optimising the process.

Further advantageous developments of the invention are set forth in the subordinate claims.

An embodiment of the invention will now be explained in the following with reference to the drawing, the single figure of which shows a schematic sectional representation of an apparatus for mixing and/or comminuting.

As seen in the drawing a stirrer member 5 is arranged in a cylindrical container 1 and is rotationally fixedly connected to a support shaft 3 which is rotatably mounted by means of bearings 2 in the container concentric to the container axis 20. The stirrer member 5 is formed as a frame-like arrangement which extends substantially up the the inner wall region of the container 1. The frame-like stirrer member 5 includes at least one part 21 which extends

parallel to the container axis 20 and which is preferably designed as a stirrer vane, and also two lateral, radially extending support parts 22. As tool, provision is made for a chopper 6 with several individual members 18, which acts on the material to be treated, the chopper being rotatably mounted radially inside the stirrer vane 21 on the two lateral or end support parts 22 by means of bearings 7.

In addition to a first drive 4 for the stirrer member 5 a second drive 12 independent from this first drive is provided for the chopper 6. The output drive shaft 11 of the second drive or drive motor 12 is rotatably journaled in the support shaft 3 for the stirrer member 5 by means of bearings 14 and is connected with the chopper 6 via a schematically illustrated transmission 8, 9, 10, in the present case a belt transmission, which is shown as an example. The transmission is accommodated in a hollow chamber 13 of the right-hand end support part 23 for the stirrer member 5. The hollow chamber 13 is sealed with this arrangement in such a way that penetration of the material to be treated into the hollow chamber 13 on the one hand and the emergence of lubricant from the hollow chamber on the other hand is prevented.

A tube 19 connected with the stirrer vane 21, or integrated into the stirrer vane, is schematically shown in the drawing. A plurality of nozzle openings 17 or wall openings are formed in the wall of the tube. This nozzle tube 19 is fed with a liquid or vapor-like medium via a supply 16 such as bores or pipes extending within the stirrer member 5.

The nozzle pipe 19 can be mounted in the region of the upper or rear side of the stirrer vane 21 and is preferably freely rotatable so that the spray angle of the liquid to be

sprayed or of the vapor to be introduced can be varied in accordance with the prevailing circumstances.

The nozzle tube 19 which extends over the full axial length of the stirrer vane 21 is preferably positioned in such a way that the medium 17 emerging via the wall openings 17 passes directly into the region of influence of the chopper 6 adjacent the vane, which results on the one hand in an additional mixing effect, and on the other hand allows a more uniform granulate to be achieved as a consequence thereof.

By means of the apparatus of the invention a more economical process results if one solvent is to be replaced with another.

Thus a decisive and unexpected increase in the operating efficiency of the apparatus is achieved by a constructionally simple measure.



CLAIMS:

1. Mixing and/or comminution apparatus comprising a cylindrical container for receiving the material to be treated; at least one drivable stirrer member which is concentrically journaled relative to the container axis and which extends substantially up to the inner wall region of the container; and also at least one tool which is eccentrically and rotatably journaled relative to the container axis, which rotates with the stirrer member and which acts on the stirred material, with the tool being drivable with a speed of rotation and/or direction of rotation which are the same as or different from the speed of rotation and/or direction of rotation of the stirrer member, with a nozzle arrangement (17, 19) to which suckable or pumpable media can be supplied being provided in the region of at least one wall-side portion of the stirrer member, said nozzle rotating arrangement rotating with the stirrer member and extending at least substantially over the axial length of the stirrer member,
c h a r a c t e r i z e d in that
the nozzle arrangement (17, 19) is provided in the region of a wall-side stirrer vane (21) of the stirrer member (5); and in that the tool (6) is arranged adjacent to the stirrer vane (21) and in the working region of the nozzle arrangement (17, 19).
2. Apparatus in accordance with claim 1,
c h a r a c t e r i z e d in that
the nozzle arrangement (17, 19) comprises a tube (19) with wall openings (17) which extends parallel to the wall-side stirrer vane (21) of the stirrer member (5).



3. Apparatus in accordance with claim 2,
c h a r a c t e r i z e d in that
the tube (19) is equipped with a plurality of spray
nozzles.
4. Apparatus in accordance with claim 2 or 3,
c h a r a c t e r i z e d in that
the nozzle tube (19) is combined with the wall-side
stirrer vane (21) of the stirrer member (5) into a unit.
5. Apparatus in accordance with claim 4,
c h a r a c t e r i z e d in that
the nozzle tube (19) is integrated into the stirrer vane
(21).
6. Apparatus in accordance with one of the preceding
claims,
c h a r a c t e r i z e d in that
the tool (6) which is located in the working region of
the nozzle arrangement (17, 19) is constructed as a
chopper.
7. Apparatus in accordance with one of the preceding
claims,
c h a r a c t e r i z e d in that
the nozzle tube (19) is pivotably mounted.
8. Apparatus in accordance with one of the preceding
claims,
c h a r a c t e r i z e d in that
the nozzle tube (19) is fed via bores and/or lines (16)
in the container axle (20) and in the stirrer member
(5).



9. Apparatus in accordance with one of the preceding claims,
c h a r a c t e r i z e d i n t h a t
pumpable, in particular liquid or vapor-like media are
used as the media which are to be introduced through the
nozzles.