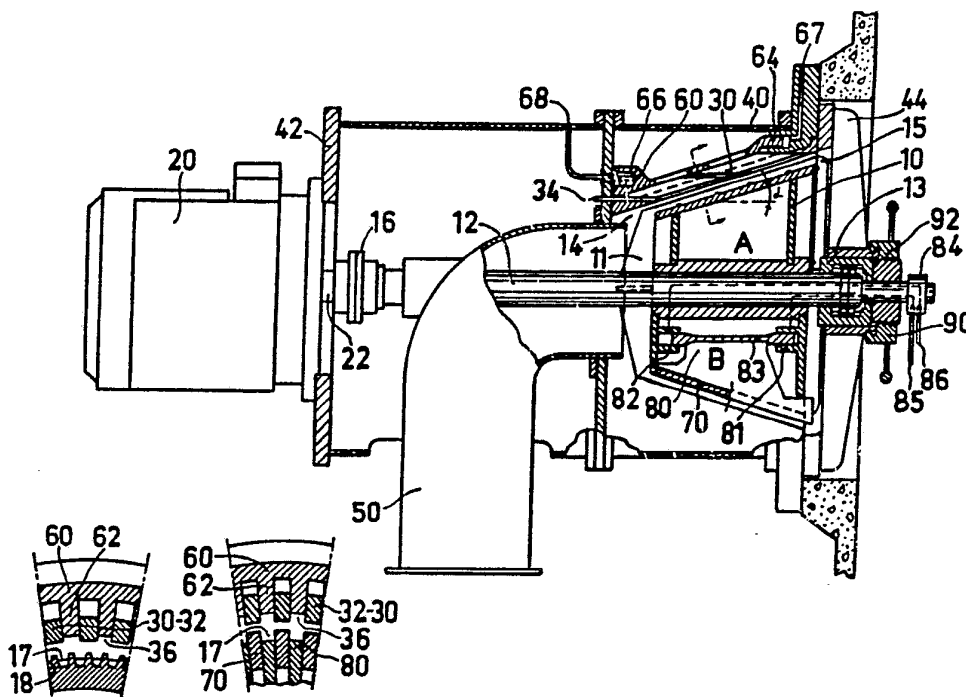




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

|  |           |   |
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| <p>(51) International Patent Classification<sup>4</sup> :<br/>B01F 7/00, B02C 2/00<br/>D21D 1/30</p>   | <p>A1</p> | <p>(11) International Publication Number: WO 89/ 07486<br/>(43) International Publication Date: 24 August 1989 (24.08.89)</p>   |
| <p>(21) International Application Number: PCT/SE89/00003<br/>(22) International Filing Date: 11 January 1989 (11.01.89)<br/>(31) Priority Application Number: 8800416-3<br/>(32) Priority Date: 9 February 1988 (09.02.88)<br/>(33) Priority Country: SE<br/><br/>(71) Applicant (for all designated States except US): SUNDS DEFIBRATOR AKTIEBOLAG [SE/SE]; S-851 94 Sundsvall (SE).<br/>(72) Inventor; and<br/>(75) Inventor/Applicant (for US only) : REINHALL, Rolf, B. [SE/SE]; 834,171st Place, N.E., Bellevue, WA 98008 (US).<br/>(74) Agent: ILLUM, Leif-Otto; Svenska Cellulosa Aktiebolaget SCA, Kungsgatan 33, S-111 56 Stockholm (SE).</p> |           | <p>(81) Designated States: AT (European patent), AU, DE (European patent), FI, FR (European patent), GB (European patent), JP, NO, SE (European patent), US.<br/><br/>Published<br/>With international search report.</p> |

(54) Title: DEVICE FOR TREATING MATERIAL MIXTURES



(57) Abstract

The device comprises two conically shaped inner and, respectively, outer treating members (10, 30), which are rotatable relative to one another and between themselves form a gap. Through this gap the material is intended to pass. The treating surfaces of the members (10, 30) are provided with bars (18, 70, 32) and grooves (17, 36). A cleaning member (60) is provided to clean the grooves (36) in the outer treating member (30). The cleaning member (60), therefore, is provided with wings, which are fitting into the grooves (36), and the member (60) is axially movable for variation of the depth of the grooves (36). A corresponding inner cleaning member (83) with wings (80) possibly can be arranged in the inner treating member (10).

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Device for treating material mixtures

This invention relates to a device for treating material mixtures. The device comprises two conically shaped outer and, respectively, inner treating members, which are rotatable relative one another.

By means of these treating members different materials are mechanically processed, dispersed and/or mixed. Organic or inorganic fibre or particle materials, for example, can be dispersed in gaseous or fluid medium such as air, steam, water etc. Also chemicals such as colourants, bleaching agents, binding agents etc. can be admixed.

Conventional mixing members comprise a number of variants comprising rotating and counter-rotating disc-shaped or conically shaped rotation bodies, which are provided with treating planes of different patterns comprising recesses and elevations, which produce the turbulence and agitation required for the function in question.

When certain chemicals, for example binding agents are added to fibre mixtures, normally difficulties arise due to coatings on and clogging of the different groove patterns of the treating members, which coatings and clogging are difficult to remove and after a certain operation time prevent functioning of the mixer.

The mixer then regularly has to be taken out of operation for cleaning, which causes repeated stoppages and results in production disturbances.

The only way of overcoming these interruptions has been to instal an extra number of mixing apparatuses, to which the fibre flow is transferred during the time when the clogged machines are cleaned and restored to operational state.

This procedure is expensive both in respect of manual service and extra investments.

The present invention eliminates these difficulties, in that the device is provided with mechanical cleaning members, which during operation of the mixer either continuously or intermittently remove material accumulated thereon and thereby maintain the mixer efficiency at maximum level.

The principle of the invention can be applied to disc-shaped as well as conically shaped treating planes.

A conical embodiment of a device according to the invention is described in greater detail in the following with reference to the accompanying drawings, in which Fig. 1 is a longitudinal section of the device in two different embodiments A and B, Fig. 2 is a cross-section of the rotary and stationary treating surfaces, with an axially movable cleaning member placed in the stator, embodiment A, Fig. 3 shows an embodiment according to Fig. 2, but with cleaning members inserted also into the rotary treating member, embodiment B.

The device according to the embodiment shown comprises a rotor 10 supported by an axle 12 mounted in an axially movable bearing housing 13 and supported at the driving end by an axially movable gear clutch 16, which is rigidly connected to a driving motor 20 via the shaft 22 thereof.

The rotor 10 is enclosed by a stator 30, which comprises longitudinal bars 32 and intermediate grooves 36 and is rigidly secured in a stand 40 enclosing the device. Said stand supports by an upper portion the driving motor 20. The bearing housing 13 is supported by a yoke bearing 44 connected to the lower portion of the stand.

The rotor 10 is axially movable by means of a control device 90 attached to the yoke bearing 44, which device can adjust the bearing housing 13 to the desired axial position and thereby vary the gap between the rotor 10 and stator 30.

The fibre material to be treated is supplied through a pipe line 50 opening at the smaller end of the conical rotor 10, where the material by means of a carrier 11 mounted on the rotor is slung out to the inlet opening 14 between rotor 10 and stator 30.

The fibre material is caused by bars 18 (Fig. 2) or 70 (Fig. 3) on the rotor 10 to assume a rotation speed, which is substantially the same as that of the rotor, for example 3000 rpm at 50 cps and 3600 rpm at 60 cps. This rotation acts on the fibre mixture with centrifugal forces, which at the example cited amounts to the magnitude 2500-4000 g, by which forces the fibre mixture during its passage through the mixer is pressed against the enclosing stator 30.

Owing to the high centrifugal force, the fibre mixture is concentrated to a considerably higher density in the fibre layer closest to the stator 30 and the grooves 36 arranged in the longitudinal direction. The air following along with the fibre suspension to the greatest part goes off in the grooves 17 of the rotor 10 between the rotor bars 18,70 out to the outlet 15 of the mixer.

The concentrated fibre mixture closest to the conically shaped stator surface 30 with the angle  $\alpha$  is applied with a discharging force in the direction to the outlet 15 corresponding to the  $\alpha$ -sine component of maintained centrifugal force.

The chemical addition required for the process is supplied either at the inlet 50 or directly between rotor and stator near the feed opening 14 via a number of supply nozzles 34 uniformly distributed over the inlet surface.

The chemical supplied, which can be in liquid or aerosol state, is thereby spraid instantaneously about the circumference of the rotor 10 and by maintained centrifugal force slung out to the concentrated fibre layer of the mixer stator where it is absorbed at the passage of the material through the mixer.

In order to prevent the stator grooves 36 in the manner described from being filled with fibres and, for example, added binding agent, the stator 30 is provided with an axially movable enclosing outer cleaning member 60, which is provided with wings 62 (Fig. 1 A, Fig. 2). Said wings 62 are adapted to partially fill the grooves 36 between the rigidly secured stator bars 32. When this outer cleaning member 60 is moved axially in the direction to the outlet 15 of the mixer, the inner flank of the wings 62 is moved radially inward to and past the inner surface of the rigidly secured stator bars 32, whereby the grooves 36 between the bars 32 are filled entirely with the movable wings 62. Fibre and binding agent deposits accumulated in the grooves 36 thereby are pushed out to the gap between the rotor 10 and stator 30, where they by action of the rotor bars 18 are broken off from the wings 62 and removed with the treated material. The outer cleaning member 60 with wings 62 thereafter is moved back to the inlet of the mixer, whereby the groove space 36 is restored, free from previous coatings.

The movable cleaning member 60 at the example cited is caused to carry out its reciprocatory movement by means of a pressure medium, which is supplied alternately to ring pistons 64 and 66, supporting the member, through the passageways 67, 68.

The frequency of the movement is adjusted to demand for maintaining maximum mixing effect. If required, a corresponding cleaning device can be applied also on the rotor 10 where an axially movable inner cleaning member 80 is attached to similar ring pistons 81 and 82, which by supply of pressure medium via a swivel 84 mounted on the axle 12 and passageways 85 and 86 in the axle is caused to carry out a reciprocatory movement. The frequency is also here adjusted to demand. This embodiment is shown in Fig. 1 B.

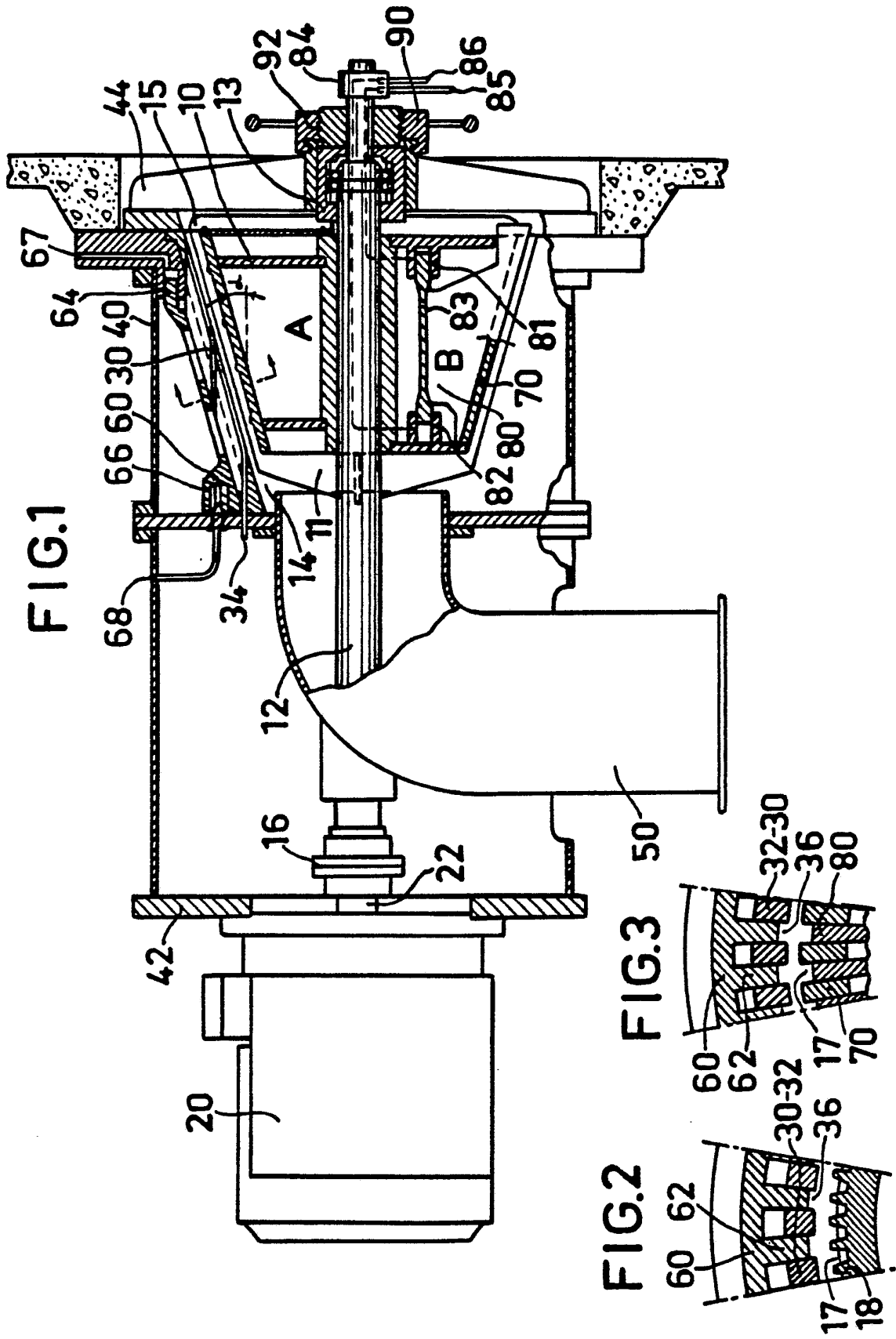
The invention, of course, is not restricted to the embodiments shown, but can be varied within the scope of the claims.

Claims

1. A device for treating material mixtures, comprising two conically shaped inner and, respectively, outer treating members (10,30), which are rotatable relative one another and between themselves form a gap for the passage of the material from an inlet (50) to an outlet (15), where the treating surfaces of the members (10,30) are provided with longitudinal bars (18,70,32) and intermediate grooves (17,36), characterized in that the bottom of the longitudinal grooves (36) in at least the outer treating member (30) is defined by a cleaning member (60) provided with wings (62), which are fitting in between the bars (32) of the treating member (30), and the outer cleaning member (60) is axially movable for variation of the depth of the grooves (36).
2. A device as defined in claim 1, characterized in that the outer treating member is a stator (30), and the inner treating member is a rotor (10).
3. A device as defined in claim 1 or 2, characterized in that an inner cleaning member (83) also provided with wings (80) is arranged to co-operate with the inner treating member (10), in that its wings (80) are fitting in between the bars (70) of the inner treating member (10), and the inner cleaning member (83) is axially movable.
4. A device as defined in any one of the preceding claims, characterized in that the cleaning members (60,83) are supported by ring pistons (64,66,81,82) and moved by means of a pressure medium.
5. A device as defined in any one of the claims 2-4 where the material inlet (50) is located centrally at the narrow portion of the rotor (10), characterized in that the rotor is provided with a carrier (11) intended to sling the material to the gap opening between the rotor (10) and stator (30).

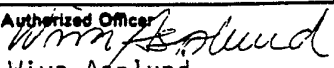
6. A device as defined in claim 5, characterized in that a device for the supply of a treating agent is located in the material inlet (50).

7. A device as defined in any one of the claims 2-5, characterized in that a device for the supply of treating agent is located in the stator (30), which supply device has the form of a number of nozzles (34) opening in the gap near its inlet opening (14).



# INTERNATIONAL SEARCH REPORT

International Application No PCT/SE 89/00003

|  |  |                                     |
|--|--|-------------------------------------|
| <b>I. CLASSIFICATION OF SUBJECT MATTER</b> (if several classification symbols apply, indicate all) <sup>6</sup>  |  |                                     |
| According to International Patent Classification (IPC) or to both National Classification and IPC <sup>4</sup>   |  |                                     |
| B 01 F 7/00, B 02 C 2/00, D 21 D 1/30  |  |                                     |
| <b>II. FIELDS SEARCHED</b>   |  |                                     |
| Minimum Documentation Searched <sup>7</sup>  |  |                                     |
| Classification System  | Classification Symbols   |                                     |
| IPC <sup>4</sup>   | B 01 F 3/06, /12, 7/00, /02, /10, /12; B 02 C 2/00, /04, /08, /10, 7/11, /12; D 21 B 1/00, /12, /14, /30; D 21 D 1/00, /04, /30, /34, /36, /38 .../... |                                     |
| Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched <sup>8</sup>   |  |                                     |
| SE, NO, DK, FI classes as above  |  |                                     |
| <b>III. DOCUMENTS CONSIDERED TO BE RELEVANT <sup>9</sup></b>   |  |                                     |
| Category <sup>9</sup>  | Citation of Document, <sup>11</sup> with indication, where appropriate, of the relevant passages <sup>12</sup>   | Relevant to Claim No. <sup>13</sup> |
| A  | SE, A, 134 912 (C LAVISTE, ÖSTRAND)<br>18 March 1952<br>see page 1, column 1, line 41 -<br>page 2, column 1, line 6, figures 1<br>and 2                | 1                                   |
| A  | EP, A1, 0 225 486 (THE SULLIVAN CORPORATION)<br>16 June 1987<br>see abstract, figure 3   | 1                                   |
| <p><sup>10</sup> Special categories of cited documents:</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"A" document member of the same patent family</p> |  |                                     |
| <b>IV. CERTIFICATION</b>   |  |                                     |
| Date of the Actual Completion of the International Search  | Date of Mailing of this International Search Report  |                                     |
| 1989-04-17   | 1989 -04- 20   |                                     |
| International Searching Authority  | Signature of Authorized Officer  |                                     |
| Swedish Patent Office  | <br>Wiva Asplund   |                                     |

**FURTHER INFORMATION CONTINUED FROM THE SECOND SHEET**

II

Fields searched (cont)

US Cl. 241: 244, 245, 247, 250, 291, 293, 294

**V.  OBSERVATIONS WHERE CERTAIN CLAIMS WERE FOUND UNSEARCHABLE <sup>1</sup>**

This international search report has not been established in respect of certain claims under Article 17(2) (a) for the following reasons:

1.  Claim numbers..... because they relate to subject matter not required to be searched by this Authority, namely:

2.  Claim numbers..... because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3.  Claim numbers..... because they are dependent claims and are not drafted in accordance with the second and third sentences of PCT Rule 6.4(a).

**VI.  OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING <sup>2</sup>**

This international Searching Authority found multiple inventions in this international application as follows:

1.  As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims of the international application.

2.  As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims of the international application for which fees were paid, specifically claims:

3.  No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claim numbers:

4.  As all searchable claims could be searched without effort justifying an additional fee, the International Searching Authority did not invite payment of any additional fee.

**Remark on Protest**

The additional search fees were accompanied by applicant's protest.

No protest accompanied the payment of additional search fees.