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(11) **EP 0 907 409 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention
of the grant of the patent:
12.12.2001 Bulletin 2001/50

(51) Int Cl.7: **B01F 7/06**
// D21C9/10

(21) Application number: **97924040.5**

(86) International application number:
PCT/FI97/00325

(22) Date of filing: **29.05.1997**

(87) International publication number:
WO 97/46309 (11.12.1997 Gazette 1997/53)

(54) **METHOD AND APPARATUS FOR MIXING A SECOND MEDIUM WITH PULP**

VERFAHREN UND VORRICHTUNG ZUM MISCHEN VON EINEM ZWEITEN MEDIUM MIT EINER
PULPE

PROCEDE ET DISPOSITIF POUR MELANGER UN SECOND MILIEU A UNE PULPE

(84) Designated Contracting States:
AT DE FI FR SE

(74) Representative: **HOFFMANN - EITLE**
Patent- und Rechtsanwälte
Arabellastrasse 4
81925 München (DE)

(30) Priority: **03.06.1996 WOPCT/FI96/00330**
20.12.1996 FI 965137

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(43) Date of publication of application:
14.04.1999 Bulletin 1999/15

(73) Proprietor: **SULZER PUMPEN AG**
8401 Winterthur (CH)

Remarks:

The file contains technical information submitted
after the application was filed and not included in this
specification

(72) Inventors:
• **PELTONEN, Kari**
FIN-48400 Kotka (FI)
• **VESALA, Reijo**
FIN-48300 Kotka (FI)

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EP 0 907 409 B1

Description

[0001] The present invention relates to a method and apparatus for mixing a second medium with a first medium. The method and apparatus of the invention are especially suitable for mixing different chemicals, both fluid and gaseous ones, or steam with a so-called first medium, which is composed of both solid and fluid matter, like for example, cellulose fibre suspensions of the wood-processing industry or mixtures of, e.g., different beet chips (such as potato and sugar beet) and water.

[0002] Prior art mixers used for this purpose are disclosed, e.g., in US patents 5,279,709 and 5,575,559 and in patent applications EP-A-92921912, EP-A-9100973, WO-A-96/32186, and WO-A-96/33007. It is a characteristic feature of all mixers of the art that they employ a rotatable rotor in order to provide a sufficient mixing efficiency. The rotatable rotor specifically refers to a member which is connected to the drive through a shaft and most usually receives its power from the electricity supply of the mill. Furthermore, the mixer construction is usually such that a certain pressure loss occurs in the mixer. In practice, it means that the power compensation corresponding to the pressure loss caused by the mixer has been taken into account when selecting a pump which operates at some stage of the process and precedes the mixer. So, in practice, power is lost in the pump for compensating the pressure loss of the mixer as well as in the mixer itself for rotating its rotor.

[0003] The method and apparatus in accordance with the invention eliminate one of the power-losing factors mentioned above. The rotor of the mixer is arranged to rotate freely in the flow, whereby the mixer naturally causes a certain pressure loss. However, a thorough research work has given such results that the pressure loss has not increased, at least not essentially, when compared with a motor-driven rotor. Furthermore, in spite of considerable power savings, no change in the mixing result can be found, at least not for the worse.

[0004] So-called static mixers are known in the art, but they are mostly of the type disclosed in, e.g., US patents 4,030,969, 5,492,409, and 5,556,200, in which a throttling effect of some degree is arranged in the flow channel, whereby the flow rate increases and the pressure is reduced. The chemical or equivalent to be mixed is then conveyed to this lower-pressure zone, and the turbulence effect, also developed by throttling, then mixes the chemical or equivalent with the actual flow material. Another alternative is disclosed in, for example, US patents 4,936,689 and 5,564,827, where the flow channel is provided with obstacles to flow so as to create turbulence. It is a characteristic feature of both types of mixers that the turbulence created is of local nature only and short in duration.

[0005] By the method and apparatus in accordance with the present invention, the kinetic energy originating from the pressure losses caused by the throttling device may be forwarded to the mixing zone in a more control-

led manner and to a wider area, which will substantially grow the efficient mixing volume and substantially lengthen the mixing time.

[0006] It is a characteristic feature of the method in accordance with the invention of mixing a second medium with a first medium, in which method the first medium is introduced into a casing of a mixing apparatus, where it is mixed and discharged therefrom, that the rotor of the mixer disposed in the casing is rotated by a medium flow entering the casing.

[0007] It is a characteristic feature of the apparatus according to the invention, for mixing a second medium with a first medium, which apparatus comprises a mixer casing with an inlet and an outlet, both of these having a flange, and with a rotor, that the rotor is freely rotatable.

[0008] Other aspects characteristic of the method and apparatus of the invention will become apparent from the attached claims.

[0009] The method and apparatus in accordance with the invention are described more in detail below, by way of example, with reference to the enclosed drawings, in which

Fig. 1 is an axial section view of an apparatus in accordance with a preferred embodiment of the invention,

Fig. 2 is an axial section view of an apparatus in accordance with a second preferred embodiment of the invention, and

Fig. 3 is an axial section view of an apparatus in accordance with a third preferred embodiment of the invention.

[0010] Fig. 1 shows an apparatus in accordance with a preferred embodiment, comprising a casing 10, which in its simplest form is cylindrical in the direction of flow of the medium, but it may also be cylindrical in the direction of the rotor shaft. The casing 10 of the mixer may also be of some other, more complicated shape, if such is considered reasonable. The casing 10 is provided with an inlet 12 and an outlet 16, with flanges 14 and 18, respectively, the outlet being preferably tangential to the direction of rotation of the rotor, and with a rotor 20 arranged rotatably within the casing 10. The mixer is attached through its flange 14 to a so-called inlet piping, i.e., the flow channel of the incoming fiber suspension, and through its flange 18 to a so-called outlet piping, i.e. the flow channel of the fiber suspension being discharged from the mixer. The rotor 20 is formed of a shaft 22 mounted on bearings to a wall of the casing 10, the shaft being preferably perpendicular to the axis X of the casing 10. However, also other positions of the shaft 22 at different angles with respect to the axis X are feasible and, in some cases, even recommended. In fact, it is quite possible that the rotor shaft is congruent or at least

parallel with the inlet axis. In that case, the rotor blades should be helical in order for the rotor to rotate. At least two blades 24 are attached to that end of the shaft 22 which extends to the inside of the casing 10, so that an open space remains in the center of the rotor 20 when the blades 24 rotate. The embodiment shown in Fig. 1 is provided with five blades 24, and they are substantially rectangular in cross section while the main axis is radial. The most essential thing, with regard to the shape of the blades is, however, that it makes the rotor rotate and also brings about the desired mixing effect. The blades 24 extend preferably to a distance of about 10 to 80 mm from the wall of the casing 10. The rotor 20 may be disposed in the casing 10 either centrally so that the distance of the circle of rotation C of the blades 24 from the wall of the casing 10 is equal on both sides of the rotor 20 or eccentrically so that the clearance between the circle of rotation C and the wall of the casing 10 is smaller on one side of the rotor 20 than on the other side. The rotor 20 or, more specifically, the rotor blades may be, e.g., such in shape that the shape of the surface of revolution is substantially spherical or cylindrical. Also other shapes of the surface of revolution are feasible as long as they are fitted together with the cross-sectional shape of the casing. The casing may also be provided with ribs 26 and 28 which, together with the rotor 20, cause a turbulence which brings about an adequate mixing effect in the suspension flow. The rib 26 is so arranged in connection with the inlet 12 that it directs the axial flow from the inlet 12 to the casing 10 of the mixer to one side of the casing 10, thereby ensuring rotation of the rotor 20. In other words, besides a bevel guide member, as in Fig. 1, rib 26 may also be, e.g., a plate disposed perpendicularly to the axis of the flow path, covering part of the flow path. The most essential thing is that the member deviates the mass center of the flow from the axis of the flow channel.

[0011] The freely rotatable mixer shown in Fig. 1 is as such applicable for use with the heat exchanger illustrated in Fig. 6 of PCT/FI96/00330, in which two heat exchangers are connected in series so that the tube between the heat exchangers is provided with a mixing member. According to our experiments, the mixer by no means needs to fluidize pulp; "stirring" is sufficient for thorough mixing of pulp particles with each other, no matter of what size they are at this stage. In any event, as a final result of mixing there is a pulp plug in a new order at the inlet of the heat exchanger, being distributed in a new manner onto the heat transfer surfaces of the latter heat exchanger. The mixer may be, e.g., an apparatus similar to the one shown in Fig. 1 or an apparatus where the mixing member is a circular or elliptic ring, which rotates freely in the flow under the effect of the flow.

[0012] Fig. 1 further illustrates how the casing of the mixer may be provided with an auxiliary, i.e., a control valve 30, either as an integral part of the mixer or, alternatively, attached to the mixer flange 14. The control

valve 30 shown in Fig. 1 is a conventional gate valve, but also other forms of valves are applicable. One task of the valve 30 is naturally to control the flow, whereby locating the rotor 20 near the valve 30 also contributes to the operation of the valve 30, ensuring that fibers cannot adhere to the gate or other valve member and thereby gradually cause the valve opening 32 to become clogged. Another task of the valve 30 is essential to the mixer, namely, it directs the flow in an eccentric form into the mixer casing 10. By ensuring that the flow entering the casing 10 is eccentric, especially respective of the rotor shaft, one may be sure that the rotor 20 rotates in all circumstances in the direction of arrow A.

[0013] Fig. 1 also illustrates how either the mixer casing 10 or the inlet piping may be provided with a conduit 38, 38' for adding a chemical, dilution liquid, steam, or other material to the flow. The valve potentially attached to the flange 14 of the casing 10 can be considered to be a part of said inlet piping. Location of a chemical feed conduit is chosen optimally in accordance with both the mixer operation and the medium to be mixed. For example, when liquid is fed, it is advantageous to direct the incoming liquid jet in the direction of rotation of the rotor in order not to decelerate rotation. Correspondingly, the inlet conduit for gas is preferably disposed in the lower section of the casing and the outlet in the upper section thereof in order for the gas flow from the inlet to the outlet to proceed reliably. In the above described example, where mixing was used only for equalization of temperature differences in pulp, such a conduit is naturally unnecessary. It has to be noted that preferably the mixing conduit 38 has to be located far enough from the outlet 16 of the casing 10 of the mixer so that the chemical or equivalent has an adequate time to mix well enough with the pulp prior to being discharged from the mixer. It could be a guideline that the mixing conduit 38 should be disposed against the direction of rotation of the rotor at an angular distance of at least 90 degrees, preferably 180 degrees, from outlet 16. Naturally, it has to be noted that the medium to be mixed also sets its own limits to the location of the mixing conduit.

[0014] Fig. 2 illustrates a mixing apparatus in accordance with a second preferred embodiment. The same reference numerals as in Fig. 1 have been used where applicable, except that all reference numerals of Fig. 2 start with number 1. In fact, there are not many differences in comparison with the embodiment shown in Fig. 1. In the embodiment of Fig. 2, a valve 130 is illustrated as a member which is clearly separate from the casing 10 of the mixer, which member is attached to a flange 114 of the casing. Another difference is to locate the outlet 116 of the casing 10 at an angle of 90 degrees, or if a widening of the outlet is taken into account, at an angle of approximately 100 degrees with respect to the inlet piping. Furthermore, the outlet 116 is provided with an outlet pipe 140 which widens preferably in the direction of flow just like a diffuser pipe. The purpose of the widening of the outlet duct 140 is to recover dynamic pres-

sure from the flow being discharged from the casing 10 of the mixer.

[0015] Fig. 3 shows a mixing apparatus in accordance with a third preferred embodiment. The same reference numerals as in Fig. 1 have been used where applicable, except that all reference numerals of Fig. 3 start with number 2. In the embodiment of Fig. 3, the outlet 216 of the mixer is disposed opposite to the inlet 212 of the mixer. Further, the outlet 216 is provided with an outlet pipe 240, as in Fig. 2. Unlike the outlet pipe 140 of Fig. 2, which is an integral part of the mixer casing 10, the outlet pipe 240 of Fig. 3 is attached to the flange 218 of the outlet 216 of the casing 10. Naturally, the location and way of attachment of the outlet pipe are not dependent on each other, but a detachable outlet pipe may be disposed also in a mixer discharged from its side as in Fig. 2, and a stationary outlet pipe also in an arrangement as shown in Fig. 3.

[0016] The apparatus according to the preferred embodiments of the invention described above functions so that throttling, effected by either a valve or a rib, on the inlet side of the mixer controls the velocity of the fiber suspension jet entering the mixer, to be preferably in the range of 5 to 30 m/s, more preferably in the range of 10 to 20 m/s. The combination of the flow being deviated from the central flow direction and said flow velocity makes the rotor 20 arranged in the casing 10 rotate. When operating, the mixer causes a pressure loss of the order of 0.5 to 3.5 bar, preferably 0.5 to 2.5 bar, most of the pressure loss being caused by throttling arranged at the inlet of the mixer by means of a valve or a rib 26. In other words, the pressure loss is controllable, by adjusting the inlet side throttling. On the other hand, the total pressure loss caused by the mixer may be reduced by shaping the outlet pipe of the outlet side of the mixer optimal, i.e., such that it will recover part of the dynamic pressure.

[0017] As can be seen from the few exemplary, preferred embodiments described above, a totally new type of mixer has been developed which is advantageous in terms of economy. Although use of the method and apparatus have been presented hereinabove very generally in mixing of a fiber suspension, they are well applicable up to a consistency of 15 %. On the other hand, speaking of fiber suspensions may appear restricted; so, it is worth mentioning that the mixer in accordance with the invention may correspondingly be used, e.g., in various applications of the food industry, for treating mixtures of solid materials and liquids, for example, in treatment of beet chips.

Claims

1. A method of mixing a second medium i.e. fluid or gaseous chemicals or steam with pulp i.e. suspensions of solids and liquid, in which method the pulp is introduced into the casing (10) of a mixing appa-

ratus, where it is mixed with the second medium and discharged therefrom,

wherein

the rotor (20) of the mixer, disposed in the casing is rotated by means of the pulp flowing through the casing (10) and is effective for mixing the pulp with the second medium.

2. A method as recited in claim 1, **characterized in that** said second medium to be mixed is introduced into the casing (10) of the mixer upstream of the rotor (20) or into the inlet piping (38) preceding the mixer.

3. A method as recited in claim 1, **characterized in that** the mass center of the medium flow entering the casings (10) of the mixer is deviated from the central flow, for leading the flow suitably, to make the rotor (20) of the mixer rotate.

4. A method as recited in claim 1, **characterized in that** the flow entering the mixer casing (10) is throttled, for controlling the flow rate so as to make it suitable for rotating the rotor of the mixer.

5. A method as recited in claim 1, **characterized in that** the flow entering the casing (10) of the mixer is throttled so as to achieve a desired pressure difference.

6. A method as recited in claim 5, **characterized in that** the pressure difference is adjusted to a range of 0.5 to 2.5 bar.

7. A method as recited in claim 4, **characterized in that** the velocity of the medium flow entering the casing of the mixer after throttling is 10 to 20 m/s.

8. A method as recited in claim 1, **characterized in that** dynamic pressure is recovered from the flow being discharged from the mixer.

9. A method as recited in claim 1, **characterized in that** said second medium to be mixed is steam, water, oxygen, chlorine dioxide, or some other equivalent matter.

10. A method as recited in claim 1, **characterized in** creating turbulence by means of said rotor together with ribs (26, 28) provided on the casing (10) for mixing said second medium with the pulp.

11. An apparatus for mixing a second medium i.e. fluid or gaseous chemicals or steam with pulp i.e. suspensions of solids and liquid, comprising a mixer casing (10) with an inlet (12) attached from its flange (14) to an inlet piping and an outlet (16) having a flange (18), and with a rotor (20), said casing (10)

or said inlet piping of the mixer being provided with a conduit (38, 38'; 138, 138'; 238, 238') for feeding a second medium into said pulp, wherein the rotor (20) is freely rotatable, effective for mixing the pulp with the second medium and structurally arranged so that it can be rotated by means of the pulp flowing through the casing (10).

12. An apparatus as recited in claim 11, **characterized in that** the inlet (12) of the casing (10) is provided with members (26, 126, 226; 30, 130, 230) for throttling the flow.
13. An apparatus as recited in claim 12, **characterized in that** the throttling member is a rib (26, 126, 226) disposed in the vicinity of the inlet in the casing, for deviating the mass center of the flow entering the casing (10) from the central flow.
14. An apparatus as recited in claim 12, **characterized in that** the throttling member is a valve (30, 130, 230) disposed in the vicinity of the inlet (12), for deviating the mass center of the flow entering the casing (10) from the central flow.
15. An apparatus as recited in claim 14, **characterized in that** the valve (30, 130, 230) is arranged either as part of the mixer casing (10) or to be attached to the flange (14) of the casing (10) of the mixer or to serve otherwise as part of the inlet piping of the mixer.
16. An apparatus as recited in claim 11, **characterized in that** the casing is provided with at least one mixing member (26, 28; 126, 128; 226, 228).
17. An apparatus as recited in claim 16, **characterized in that** at least one of the mixing members (26, 28; 126, 128; 226, 228) is arranged against the direction of rotation of the rotor at an angular distance of at least 90 degrees from the outlet (16) of the casing (10).
18. An apparatus as recited in claim 15 or 16, **characterized in that** the mixing member is a rib (26, 28; 126, 128; 226, 228) attached to a wall of the casing (10).
19. An apparatus as recited in claim 11, **characterized in that** the outlet (116, 216) of the casing (10) is provided with a diffuser-like outlet pipe, which recovers dynamic pressure.
20. An apparatus as recited in claim 11, **characterized in that** the rotor is formed of a shaft mounted on bearings in the casing and of blades, which leave the rotor center open.

21. An apparatus as recited in claim 11, **characterized in that** the inlet and outlet (12, 16) are so disposed respective of each other that the direction of the flow changes about 100 degrees at most when the flow passes through the apparatus.

22. An apparatus as recited in claim 11, **characterized in that** the outlet (16, 116, 216) is tangential to the direction of rotation of the rotor.

Patentansprüche

1. Verfahren zur Mischung eines zweiten Mediums d. h. von flüssigen oder gasförmigen Chemikalien oder Dampf mit Faserstoff, d. h. Suspensionen von Feststoff und Flüssigkeit, bei welchem Verfahren der Faserstoff in das Gehäuse einer Mischvorrichtung eingeführt wird, wo er mit dem zweiten Medium gemischt und daraus abgeleitet wird, **dadurch gekennzeichnet, dass** der im Gehäuse angeordnete Läufer (20) des Mischers mit Hilfe des Faserstoffs rotiert wird, der durch das Gehäuse (10) fließt, und zur Mischung des Faserstoffs mit dem zweiten Medium wirksam ist.
2. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass** das zweite zu mischende Medium stromaufwärts vom Läufer (20) in das Gehäuse (10) des Mischers oder in die, dem Mischer vorangehende Zulaufleitung (38) eingeführt wird.
3. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass** der Schwerpunkt des in das Gehäuse (10) eintretenden Mediumstroms von der zentralen Strömung verlagert wird, um die Strömung derart zu leiten, dass sie geeignet ist, den Läufer (20) des Mischers in Drehung zu versetzen.
4. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass** die in das Mischergehäuse (10) eintretende Strömung zur Regelung der Strömungsgeschwindigkeit gedrosselt wird, um sie fürs Drehen des Mischerläufers geeignet zu machen.
5. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass** die in das Gehäuse (10) des Mischers eintretende Strömung gedrosselt wird, um eine erwünschte Druckdifferenz zu erreichen.
6. Verfahren nach Anspruch 5, **dadurch gekennzeichnet, dass** die Druckdifferenz in einen Bereich von 0,5 bis 2,5 bar eingestellt wird.
7. Verfahren nach Anspruch 4, **dadurch gekennzeichnet, dass** die Geschwindigkeit des in das Gehäuse des Mischers eintretenden Mediumstroms nach der Drosselung 10 bis 20 m/s ist.

8. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass** aus der aus dem Mischer abgeleiteten Strömung dynamischer Druck zurückgewonnen wird.
9. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass** es sich beim zweiten zu mischenden Medium um Dampf, Wasser, Sauerstoff, Chlordioxid oder einen anderen entsprechender Stoff handelt.
10. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass** mit Hilfe des Läufers zusammen mit am Gehäuse (10) vorgesehenen mit Rippen (26, 28) Turbulenz erzeugt wird zur Mischung des zweiten Mediums mit dem Faserstoff.
11. Vorrichtung zur Mischung eines zweiten Mediums d. h. von flüssigen oder gasförmigen Chemikalien oder Dampf mit Faserstoff, d. h. Suspensionen von Feststoff und Flüssigkeit, umfassend ein Mischergehäuse (10) mit einem Einlass (12), der über seinen Flansch (14) an einer Zulaufleitung befestigt ist, und einem Auslass (16), der einen Flansch (18) hat, und mit einem Läufer (20), welches Gehäuse (10) oder welche Zulaufleitung des Mixers mit einem Stutzen (38, 38'; 138, 138'; 238, 238') versehen ist zur Zuführung eines zweiten Mediums zum Faserstoff, **dadurch gekennzeichnet, dass** der Läufer (20) frei drehbar, zur Mischung des Faserstoffs mit dem zweiten Medium wirksam ist und konstruktionsmäßig so arrangiert ist, dass er mit Hilfe des Faserstoffs rotiert werden kann, der durch das Gehäuse (10) fließt.
12. Vorrichtung nach Anspruch 11, **dadurch gekennzeichnet, dass** der Einlass (12) des Gehäuses (10) mit Organen (26, 126, 226; 30, 130, 230) zur Drosselung der Strömung versehen ist.
13. Vorrichtung nach Anspruch 12, **dadurch gekennzeichnet, dass** das Drosselorgan eine nahe dem Einlass im Gehäuse angeordnete Rippe (26, 126, 226) ist zur Verlagerung des Schwerpunkts der in das Gehäuse (10) eintretenden Strömung von der zentralen Strömung.
14. Vorrichtung nach Anspruch 12, **dadurch gekennzeichnet, dass** das Drosselorgan ein nahe dem Einlass (12) angeordnetes Ventil (30, 130, 230) ist zur Verlagerung des Schwerpunkts der in das Gehäuse (10) eintretenden Strömung von der zentralen Strömung.
15. Vorrichtung nach Anspruch 14, **dadurch gekennzeichnet, dass** das Ventil (30, 130, 230) entweder als Teil des Mischergehäuses (10) oder zur Befestigung am Flansch (14) des Gehäuses (10) des Mi-

schers angeordnet ist oder um sonst als Teil der Zulaufleitung des Mixers zu dienen.

16. Vorrichtung nach Anspruch 11, **dadurch gekennzeichnet, dass** das Gehäuse zumindest mit einem Mischorgan (26, 28; 126, 128; 226, 228) versehen ist.
17. Vorrichtung nach Anspruch 16, **dadurch gekennzeichnet, dass** zumindest eines der Mischorgane (26, 28; 126, 128; 226, 228) der Drehrichtung des Läufers gegenüber mit einem Winkelabstand von zumindest 90 Grad vom Auslass (16) des Gehäuses (10) angeordnet ist.
18. Vorrichtung nach Anspruch 15 oder 16, **dadurch gekennzeichnet, dass** das Mischorgan eine Rippe (26, 28; 126, 128; 226, 228) ist, die an einer Wand des Gehäuses (10) befestigt ist.
19. Vorrichtung nach Anspruch 11, **dadurch gekennzeichnet, dass** der Auslass (116, 216) des Gehäuses (10) mit einem diffusorartigen Ablaufrohr versehen ist, das dynamischen Druck zurückgewinnt.
20. Vorrichtung nach Anspruch 11, **dadurch gekennzeichnet, dass** der Läufer aus einer Welle, die auf Lagern im Gehäuse montiert ist, und aus Blättern gebildet wird, die das Läuferzentrum offen lassen.
21. Vorrichtung nach Anspruch 11, **dadurch gekennzeichnet, dass** der Einlass und Auslass (12, 16) in Hinsicht aufeinander auf solche Weise angeordnet sind, dass sich die Strömungsrichtung am meisten ungefähr 100 Grad ändert, wenn die Strömung die Vorrichtung passiert.
22. Vorrichtung nach Anspruch 11, **dadurch gekennzeichnet, dass** der Auslass (16, 116, 216) tangential zur Drehrichtung des Läufers ist.

Revendications

1. Procédé de mélange d'un second milieu, c'est-à-dire des produits chimiques fluides ou gazeux ou de la vapeur, avec de la pâte, c'est-à-dire des suspensions de matières solides et du liquide, dans lequel procédé la pâte est délivrée dans le logement du dispositif de mélange où elle est mélangée avec le second milieu et évacuée de celui-ci, dans lequel le rotor (20) du mélangeur, disposé dans le logement, est fait tourner au moyen de la pâte s'écoulant par l'intermédiaire du logement (10) et mélange efficacement la pâte avec le second milieu.
2. Procédé selon la revendication 1, **caractérisé en**

ce que ledit second milieu à mélanger est délivré dans le logement (10) du mélangeur en amont du rotor (20) ou dans la conduite d'admission (38) précèdent le mélangeur.

3. Procédé selon la revendication 1, **caractérisé en ce que** le centre de gravité du courant du milieu pénétrant dans le logement (10) du mélangeur est dévié du courant central, pour guider convenablement le courant afin de faire tourner le rotor (20) du mélangeur. 5
4. Procédé selon la revendication 1, **caractérisé en ce que** le courant pénétrant dans le logement du mélangeur (10) est étranglé, pour commander la vitesse d'écoulement de manière à la rendre appropriée à faire tourner le rotor du mélangeur. 10
5. Procédé selon la revendication 1, **caractérisé en ce que** le courant pénétrant dans le logement (10) du mélangeur est étranglé de manière à obtenir une différence de pression voulue. 15
6. Procédé selon la revendication 5, **caractérisé en ce que** la différence de pression est réglée à une plage allant de 0,5 à 2,5 bar. 20
7. Procédé selon la revendication 4, **caractérisé en ce que** la vitesse du courant du milieu pénétrant dans le logement du mélangeur après l'étranglement est comprise entre 10 et 20 m/s. 25
8. Procédé selon la revendication 1, **caractérisé en ce qu'une** pression dynamique est récupérée du courant évacué du mélangeur. 30
9. Procédé selon la revendication 1, **caractérisé en ce que** ledit second milieu à mélanger est de la vapeur, de l'eau, de l'oxygène, du dioxyde de chlore ou toute autre matière équivalente. 35
10. Procédé selon la revendication 1, **caractérisé en ce que** l'on crée une turbulence au moyen dudit rotor avec des nervures (25, 28) pourvues sur le logement (10) pour mélanger ledit second milieu avec la pâte. 40
11. Dispositif pour mélanger un second milieu, c'est-à-dire des produits chimiques fluides ou gazeux ou de la vapeur avec de la pâte, c'est-à-dire des suspensions de matières solides et du liquide, comprenant un logement du mélangeur (10) avec un orifice d'entrée (12) fixé de son flasque (14) à une conduite d'admission et un orifice de sortie (16) présentant un flasque (18), et un rotor (20), ledit logement (10) ou ladite conduite d'admission du mélangeur étant pourvu d'un conduit (38, 38' ; 138, 138' ; 238, 238') pour délivrer un second milieu dans ladite pâte, 45

dans lequel

le rotor (20) est librement rotatif, efficace pour mélanger la pâte avec le second milieu, et disposé du point de vue de la structure de manière à ce que l'on puisse le faire tourner au moyen de la pâte s'écoulant par l'intermédiaire du logement (10).

12. Dispositif selon la revendication 11, **caractérisé en ce que** l'orifice d'entrée (12) du logement (10) est muni d'éléments (26, 126, 226 ; 30, 130, 230) pour étrangler l'écoulement. 50
13. Dispositif selon la revendication 12, **caractérisé en ce que** l'élément d'étranglement est une nervure (26, 126, 226) disposée au voisinage de l'admission dans le logement, pour dévier le centre de gravité du courant pénétrant dans le logement (10) de l'écoulement central.
14. Dispositif selon la revendication 12, **caractérisé en ce que** l'élément d'étranglement est une vanne (30, 130, 230) disposée au voisinage de l'admission (12), pour dévier le centre de gravité du courant pénétrant dans le logement (10) de l'écoulement central.
15. Dispositif selon la revendication 14, **caractérisé en ce que** la vanne (30, 130, 230) est disposée, soit en tant que partie du logement du mélangeur (10), soit pour être fixée au flasque (14) du logement (10) ou bien pour servir autrement en tant que partie de la conduite d'admission du mélangeur.
16. Dispositif selon la revendication 11, **caractérisé en ce que** le logement est prévu d'au moins un élément de mélange (26, 28 ; 126, 128 ; 226, 228).
17. Dispositif selon la revendication 16, **caractérisé en ce qu'au** moins un des éléments de mélange (26, 28 ; 126, 128 ; 226, 228) est disposé contre le sens de rotation du rotor à une distance angulaire d'au moins 90° de l'orifice de sortie (16) du logement (10).
18. Dispositif selon la revendication 15 ou 16, **caractérisé en ce que** l'élément de mélange est une nervure (26, 28 ; 126, 128 ; 226, 228) fixée à la paroi du logement (10).
19. Dispositif selon la revendication 11, **caractérisé en ce que** l'orifice de sortie (116, 216) du logement (10) est pourvu d'un tuyau d'évacuation du type diffuseur, qui récupère de la pression dynamique.
20. Dispositif selon la revendication 11, **caractérisé en ce que** le rotor est formé d'un arbre monté sur des paliers dans le logement et d'ailettes qui laissent le centre du rotor ouvert. 55

21. Dispositif selon la revendication 11, **caractérisé en ce que** l'orifice d'entrée et de sortie (12, 16) sont disposés l'un par rapport à l'autre de sorte que le sens du courant change d'environ 100° au maximum lorsque le courant passe à travers le dispositif. 5

22. Dispositif selon la revendication 11, **caractérisé en ce que** l'orifice de sortie (16, 116, 216) est tangentiel dans le sens de rotation du rotor. 10

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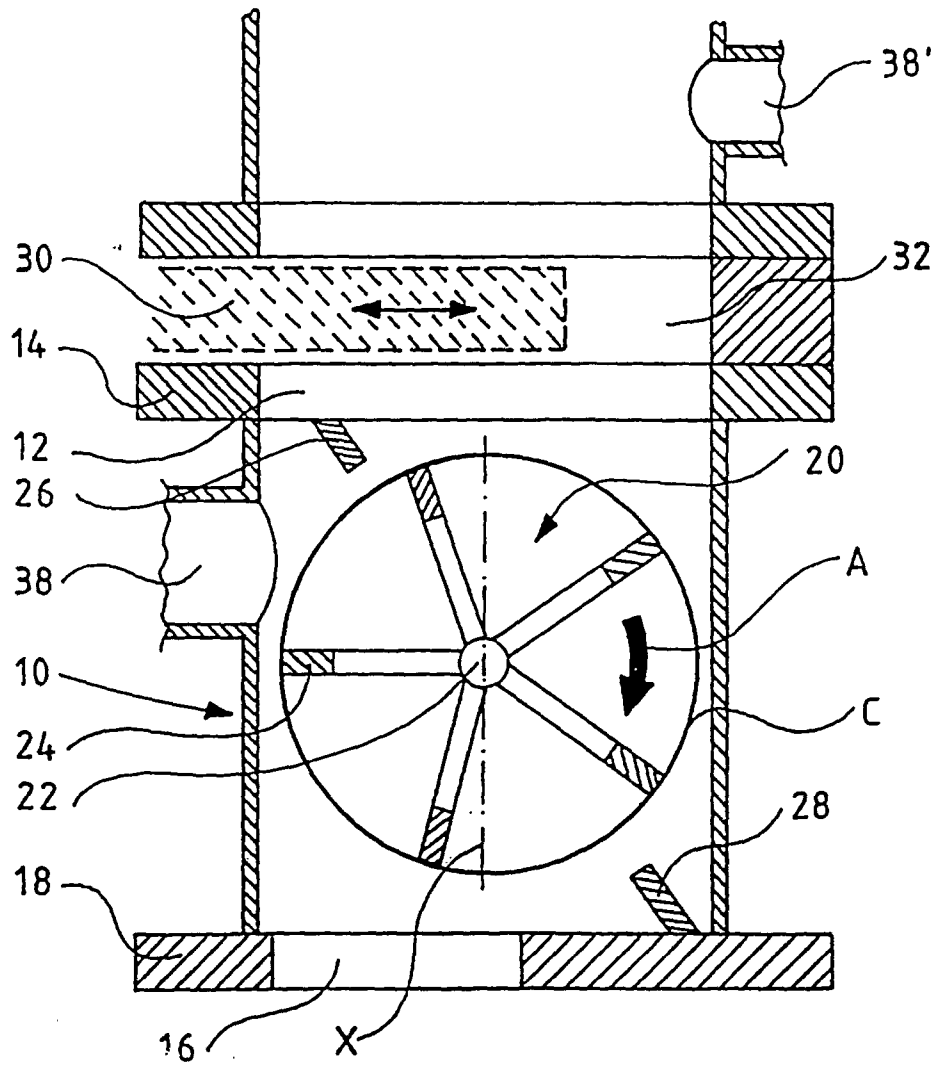


FIG. 1

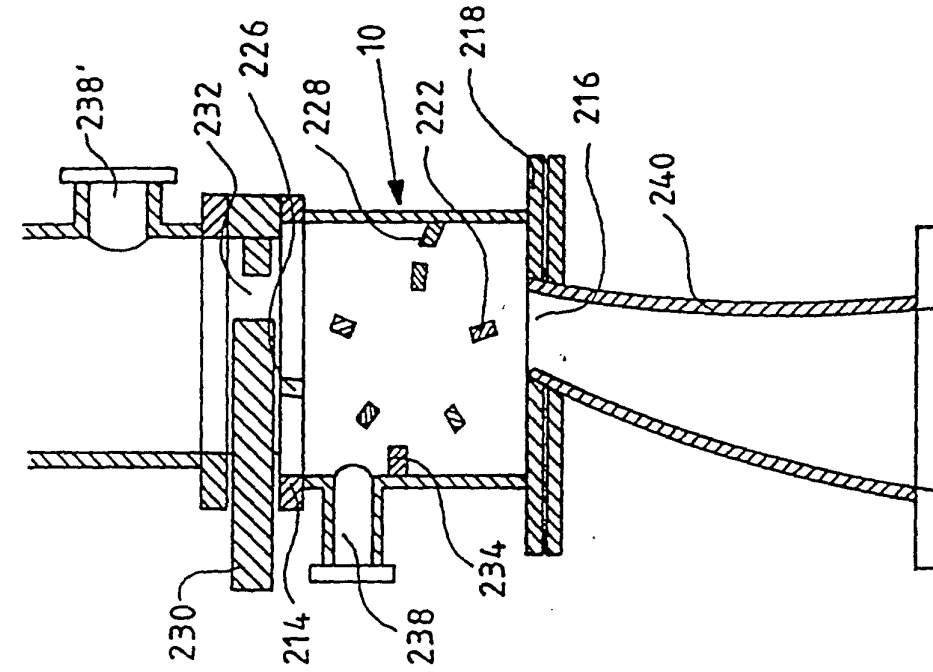


FIG. 3

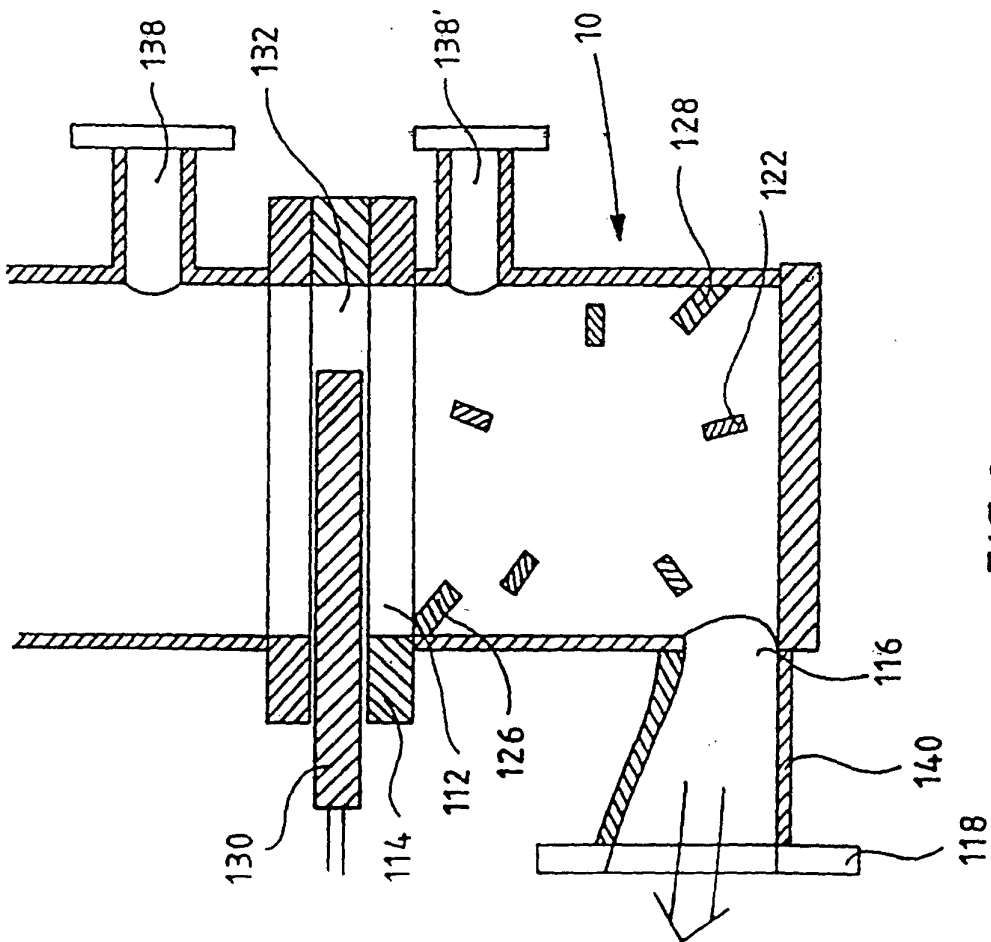


FIG. 2