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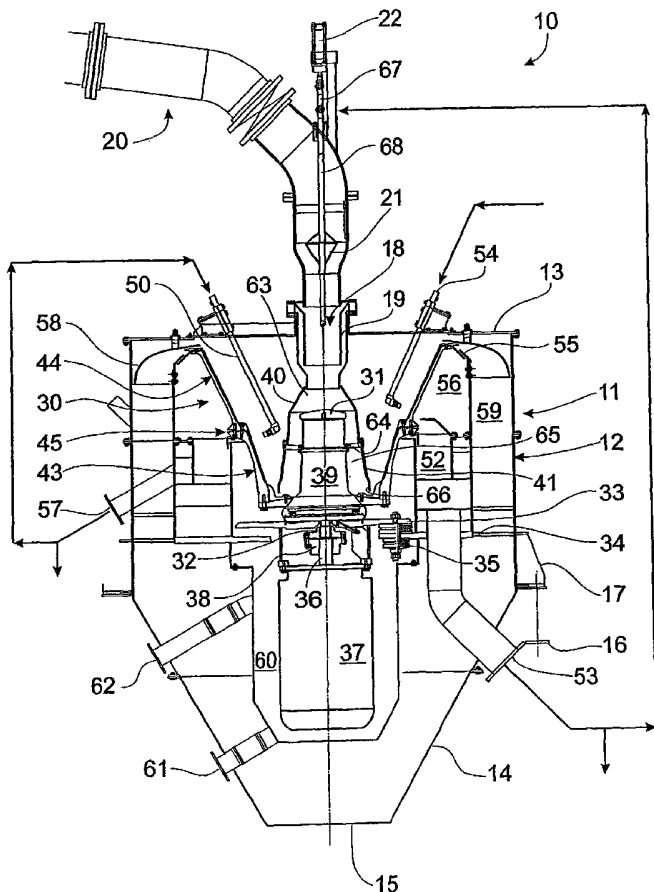
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(54) Title: CONTINUOUS CENTRIFUGE



(57) Abstract: A continuous centrifuge (10) has a basket (30) with upper and lower basket portions (43, 44) separated by an intermediate slip portion (45). The lower basket portion (43) has an included angle of 40-50°, to separate "green" molasses from the sugar crystals, while the upper basket portion (44) has an included angle of 50-60°, to separate washed molasses from the sugar crystals. The inner faces of the walls of the basket portions (43, 44) have radial drainage grooves (46), closed at their lower ends and open at their upper ends, to discharge the molasses.

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TITLE: CONTINUOUS CENTRIFUGE

BACKGROUND OF THE INVENTION

1. Field of the Invention

THIS INVENTION relates to a continuous centrifuge.

5 The invention also relates to a basket for the centrifuge.

The invention particularly relates, but is not limited to, a continuous centrifuge (and centrifuge basket therefore) for separating sugar crystals from viscous masses such as molasses or massecuites, while being processed in centrifuges in the production of the sugar crystals.

10 Throughout the specification, the term "centrifuge" shall also include "centrifugal machine" and "fugal".

2. Prior Art

In recent years, continuous centrifuges have started to replace batch centrifuges. One reason for this is that the power demands for the continuous centrifuges are more evenly distributed than the "peak" power demands of the batch centrifuges. This enables the capital and operating costs for power supply and transmission equipment to be reduced significantly.

20 The purging of massecuites in centrifuges has two distinctly separate steps. The first step is the initial removal of all excess molasses and "free" surface molasses from the sugar crystals. The second step is the final washing and partial drying of the crystals before discharge of the crystals from the centrifuge basket. These two steps are presently done with centrifugal single section baskets.

25 Conventional continuous centrifuges have been proposed with two separate centrifuge baskets. The massecuite feed is directed to a first (upper) basket (for the removal of the "green" molasses) and the resultant sugar crystal/molasses mixture is directed (via deflection means) to a second (lower) basket for the washing of the remaining molasses from the sugar crystals.

When separating the sugar crystals from the massecuites, it is a major objective to minimise the damage to the sugar crystals. The damaged or broken crystals are re-mixed with the molasses/water liquor and must be recrystallised, which is inefficient.

5                   The feeding of the massecuites to the first basket; and the transfer to the second basket, with resultant impacts of the sugar crystals with the baskets and deflection means within the centrifuge, increases the likelihood of damage to the sugar crystals.

10                   The likelihood of damage due to the impacts is increased due to the high gravitational forces within the centrifuge, eg., in the order of 300-1000G. Such high forces are required to cause the molasses to pass through the stainless steel screens in the basket(s) and to be expelled via the drainage holes in the basket(s).

15                   The power demands of the known continuous centrifuges are still relatively high as the baskets must be driven at, eg., 700-2000 rpm to generate the high gravitational forces discussed above. The high power demands at high speed are due to the fact that continuous centrifuge power is proportional to (speed)<sup>1.8 to 2.0</sup>.

#### SUMMARY OF THE PRESENT INVENTION

20                   It is an object of the present invention to provide a continuous centrifuge which can provide effective separation of the sugar crystals from the massecuites at lower gravitational levels.

                  It is a preferred object of the present invention to provide such a continuous centrifuge which can be operated at lower basket rotational speeds; and thereby with lower power demand.

25                   It is a further preferred object of the present invention to provide a two-stage centrifuge basket as an integral unit.

It is a still further preferred object of the present invention to provide a centrifuge basket which enables separation of the molasses from the sugar crystals at lower gravitational force ranges.

5 It is a still further preferred object to provide a continuous centrifuge where the impact damage to the discharged sugar crystal(s) is reduced by the aforesaid lower rotational speed.

It is a still further preferred object to provide a continuous centrifuge where the incoming massecuite can be "conditioned" by mixing with recycled "green" molasses.

10 It is a still further preferred object to provide a continuous centrifuge where the volume of wash water added to the molasses is reduced.

Other preferred objects of the present invention will become apparent from the following description.

15 In one aspect, the present invention resides in a continuous centrifuge, including:

a centrifuge housing;

a centrifuge basket rotatably mounted in the housing and driven by drive means;

a massecuite inlet to feed massecuites to the centrifuge basket;

20 at least one molasses outlet; and

a sugar outlet; wherein:

25 the centrifuge basket has a first portion operable to separate "green" molasses from the sugar crystals and a second portion operable for separation of the washed sugar crystals from the remaining molasses and waste water.

The massecuite fed to the centrifuge basket may be conditioned by mixing with recycled "green" molasses.

Preferably, the centrifuge basket is mounted on a shaft rotatably journalled within the housing and is operably connected to the output shaft of a drive motor (forming the drive means) by a suitable coupling which preferably dampens any vibrations between the basket and the drive motor.

5                    Preferably, the first, lower portion of the basket receives the massecuite from the massecuite inlet via an accelerator, the lower portion having an inclined side wall inclined at an angle, eg., in the range of 15-20° to the vertical (ie. included angle 40-50°). Preferably, the second, upper portion has an inclined side wall inclined at an angle of 20-30° to the vertical (ie. an included angle 50-60°),  
10                    where the lower and upper portions are connected by an intermediate "step" portion.

Preferably, the conditioning of the massecuite by the mixing with "green" molasses is effected in an initial accelerating cone of the accelerator.

Preferably, the basket has screen means overlying substantially radially extending drainage grooves in the wall of the basket to enable the molasses  
15                    to be expelled from the sugar crystals via gravitational force. Preferably the side walls of the upper and lower portion of the basket have respective screens overlying respective drainage grooves, the drainage grooves being open to the respective upper ends of the side walls. The arrangement of the stainless steel screens and drainage grooves will be described hereinafter in more detail.

20                    Preferably, the recirculating molasses is sprayed onto the screen of the lower portion; and wash water is sprayed onto the screen of the upper portion.

Preferably, the "green" molasses, separated from the sugar crystals in the lower portion of the basket, is collected in the housing and discharged through a green molasses outlet. At least a portion of the green molasses can be directed to  
25                    the accelerator to condition the incoming massecuite.

Preferably, the washed molasses, separated from the sugar crystals in the upper portion of the basket, is collected in the housing and discharged through a washed molasses output.

5 Preferably, the washed sugar crystals are also collected in the housing and discharged out the sugar outlet.

Preferably, the drive motor rotates the basket at a rotational speed of, eg., 300-350 rpm, to generate gravitational forces in the range of 75-140 G. (The upper and lower limits may be varied to suit the particular masseccites being processed.)

10 In a second aspect, the present invention resides in a centrifuge basket for a continuous centrifuge including:

at least one wall portion having a plurality of substantially radially extending drainage grooves on an inner face of the wall and extending upwardly to a discharge portion at or adjacent the top of the wall (or wall portion);

15 a screen overlying the drainage grooves, having holes or slots therethrough to enable the molasses to be separated from the sugar crystals in the masseccite;

and means spacing and supporting the screen above the drainage grooves to enable the molasses to pass through the holes or slots in the screen and  
20 enter the drainage grooves.

For the centrifugal basket of the continuous centrifuge hereinbefore described, both the lower and upper portions of the basket will be provided with respective drainage grooves, screens and spacing means.

#### BRIEF DESCRIPTION OF THE DRAWINGS

25 To enable the invention to be fully understood, a preferred embodiment will now be described with reference to the accompanying drawings, wherein:

FIG. 1 is a schematic sectional side view of a continuous centrifuge in accordance with the present invention;

FIG. 2 is a sectional plan view of a basket section of a conventional continuous centrifuge basket; and

5 FIG. 3 is a similar sectional view of a basket section in accordance with the present invention.

#### DETAILED DESCRIPTION OF THE PRIOR ART

Referring to FIG. 1, the continuous centrifuge 10 has a housing 11 with a substantially cylindrical side wall 12, a removable top wall 13, and a frusto-  
10 conical lower wall 14 with a sugar crystal discharge outlet 15. The housing 11 is mounted on a suitable structure 16 via mounting brackets 17.

A massecuite inlet 18 is provided centrally in the top wall 13 and is heated by a steam jacket 19, to control the temperature, and thereby the viscosity, of the massecuite fed to the centrifuge 10.

15 A massecuite feed pipe 20 has a flow control valve 21, controlled by a pneumatic ram 22, to control the flow of massecuite to the centrifuge 10. A current sensor, not shown, measures the power demand of the drive motor (to be hereinafter described), and is connected to the pneumatic ram 22 to increase the massecuite flow as the current level drops.

20 The centrifuge basket 30, to be hereinafter described in more detail, is rotationally mounted substantially centrally in the housing 11, about a rotary support member 31, in turn provided at the upper end of a basket drive shaft 32 journalled in suitable bearings (not shown) in a centre support 33, mounted on an internal housing wall 34 on damped mountings 35.

25 The basket drive shaft 32 is coupled to the motor output shaft 36 of an electric drive motor 37 via a damped coupling 38.

The basket 30 has an inner wall 39, which depends from the rotary support member 31, to form an annular space with upper and lower accelerating cones 40, 41 to direct the massecuite to the bottom of the basket 30. *NB:* The accelerating cones 40, 41 are mounted on, and rotate with, the inner wall 39 of the basket 30; and the small distance between the lower end of the lower accelerating cone 41 and the adjacent side wall of the basket 30 minimises the impact of the crystals on the side wall of the basket 30.

The bottom wall 42 of the basket 30 is profiled to generate a smooth flow of massecuite into the basket 30 for separation of the sugar crystals from the molasses.

The basket 30 has a lower basket portion 43 for the separation of the "green" molasses, and upper portion 44 for the separation of the washed molasses from the sugar crystals; the portions being connected by an intermediate "step" portion 45.

As shown in FIG. 2, a conventional continuous centrifuge basket section A has a stainless steel screen B and woven wire backing C overlying radial drainage holes D to allow the molasses to be separated from the sugar crystals.

Unlike the conventional continuous centrifuge basket section shown in FIG. 2, the lower and upper basket portions 43, 44 have the sectional profile shown in FIG. 3. Radial drainage grooves 46, closed at their lower ends, are provided in the inner face of the wall (or sheet) of the basket portions 43, 44 and are open at their upper ends to discharge the molasses received therein.

The stainless steel screen 47, eg., with preferably 120 micron slots, is spaced from the grooves 46 by a woven wire backing 48 laid over a perforated sheet support plate 49. (*NB:* The purpose of the radial drainage grooves 46 is to cause the formation of a low pressure zone generally free of molasses immediately behind the stainless steel screen 47 and its supports 48 and 49.)

In tests carried out on the basket construction shown in FIG. 3, the molasses can be separated from the sugar crystals under gravitational loads as low as 75-140 G; whereas the standard construction of FIG. 2 requires gravitational loads of 300-700 G.

5                   With the basket construction of FIG. 3, the molasses can more easily flow through the stainless steel screen 47 to the drainage grooves 46 and thereby to a collection chamber(s) to be hereinafter described.

                  At least one spray nozzle 50 sprays recirculated molasses onto the stainless steel screen 47 of the lower basket portion 43 and the "green" molasses is discharged from the upper ends of the radial grooves through a passage(s) or port(s) 10 51 to a "green" molasses collection chamber 52, from which the "green" molasses flows through a green molasses discharge pipe 53.

                  The sugar crystals/molasses then flows over the stainless steel screen 47 of the upper basket portion 44 and the crystals are washed by water from 15 water nozzle(s) 54 directed onto the screen 47.

                  NB: It will be noted that the upper basket screen 47 is inclined at a greater angle, eg., 25° to the vertical, than the lower basket screen 47 which is inclined at, eg., 18°. The increase in angle, and increase in major diameter of the upper basket results in higher gravitational and radial flow forces on the sugar 20 crystals/molasses to overcome the high viscosity and frictional co-efficient of the mixture in the upper basket 44.

                  The "washed" molasses (and water) is discharged through passage(s)/port(s) 55 at the top of the upper basket portion 44 into a molasses collection chamber 56 for discharge via a wash molasses outlet pipe 57.

25                   A deflection plate 58 directs the washed sugar crystals to a crystal collection chamber 59 for discharge through the sugar crystal discharge outlet 15.

Due to the relatively low velocity of the sugar crystals, the impact damage on contact with the deflection plate 58 is minimised.

To keep the drive motor 37 within its operating temperature range, cooling air is pumped into the motor housing 60 via an inlet pipe 61 and outlet pipe  
5 62.

The construction of the basket portions 43, 44 with the drainage grooves 46, enables the molasses to be separated at low gravitational loads, and thereby low power demands for the centrifuge; while further permitting the two separating stages to be effected in the basket portions 43, 44 provided in an  
10 integrated basket 30.

In conventional continuous centrifuges, conditioning of the massecuite, by blending with molasses and/or water, is effected external to the centrifuges. With the present invention, such conditioning, where the massecuite is mixed with recycled "green" molasses can be effected internally. The accelerating  
15 cones 40, 41 can be used to effect the process function of conditioning the massecuite by blending the mixture of incoming massecuite and recycled green molasses within the centrifuge to provide a more easily purged massecuite.

The conditioning effect on the massecuite by the accelerating cones 40 and 41 improves the even distribution of the massecuite on the centrifugal screen and is a major factor in the better purging of the massecuite on the centrifugal  
20 screen.

The operation of the massecuite conditioning is as follows.

The incoming streams of massecuite and molasses or water enter a chamber 63 formed by the upper accelerating cone 40. On contact with the  
25 accelerating cap 31, the streams of massecuite and molasses or water are deflected by inertia to the inner surface of the upper accelerating cone 41 and the massecuite

and molasses or water are accelerated to approximately the rotational speed of the centrifuge.

5 The upper accelerating cone 40 increases in diameter towards its lower end and facilitates the flow of the mixture of massecuite, molasses or water in a downwards direction.

The lower surface of the chamber 63 is formed by the upper portion of the lower accelerating cone 41. This portion of the lower accelerating cone 41 includes shaped angled openings 64 which act to divide the flow of massecuite, molasses and water into several separate streams. These streams are re-combined  
10 in entry to the chamber 65 formed by the lower accelerating cone 41.

The lower accelerating cone 41 is shaped to cause the mixture of massecuite, molasses or water to further mix by means of profile changes as at 66 before discharging the massecuite in a conditioned form to the lower centrifuge basket 43.

15 The split-cycle operation of the present invention enables the amount of wash water added to the centrifuge to be reduced.

A major problem in regard to the operation of other continuous centrifuges has been that in other cases, continuous centrifuges add considerably more wash water to the molasses discharge than do batch centrifuges. The ability to  
20 separate the two molasses stream ("green" and "wash") in the centrifuge design of the present invention enables a reduced quantity of wash water to be added, in that both the initial conditioning of the massecuite and the initial washing of in the basket are done using re-cycled molasses. The reduction in water addition to the molasses from centrifugals reduces the evaporation workload of the crystallisation section of  
25 the sugar factory.

In addition, the "counter-flow" of washings to the massecuite flow reduces the dissolution (and loss of sucrose to the molasses stream) of the crystal within the massecuite.

The operation within the centrifuge is carried out as follows.

5 A portion of the "green" molasses discharged from the outlet 53 is recycled to the probe molasses feed 67 and passes via a hollow pipe 68 to the incoming massecuite below the valve 21. This, together with any water which can also be added at 67 is mixed with the massecuite within the centrifuge before entry to the lower basket 43.

10 Wash water is added to the upper basket through the spray 54. A portion of the molasses and wash water mixture discharged through the wash molasses outlet 57 (via spray nozzle 50) is sprayed to the upper section of the lower basket 43 to commence the washing process and facilitate flow of sugar crystal to the upper basket 44.

15 Various changes and modifications may be made to the embodiments described and illustrated without departing from the present invention as claimed.

CLAIMS

1. A continuous centrifuge, including:
  - a centrifuge housing;
  - a centrifuge basket rotatably mounted in the housing and driven by drive
- 5 means;
  - a massecuite inlet to feed massecuites to the centrifuge basket;
  - at least one molasses outlet; and
  - a sugar outlet; wherein:
    - 10 the centrifuge basket has a first portion operable to separate "green" molasses from the sugar crystals and a second portion operable for separation of the washed sugar crystals from the remaining molasses and waste water.
2. A centrifuge as claimed in claim 1, wherein the massecuite fed to the centrifuge basket is conditioned by mixing with recycled "green" molasses.
3. A centrifuge as claimed in claim 1, wherein the centrifuge basket is mounted
- 15 on a shaft rotatably journalled within the housing and is operably connected to the output shaft of a drive motor, forming the drive means, by a suitable coupling which dampens any vibrations between the basket and the drive motor.
4. A centrifuge as claimed in any one of claims 1 to 3, wherein the first, lower portion of the basket receives the massecuite from the massecuite inlet via an
- 20 accelerator, the lower portion having an inclined side wall inclined at an angle in the range of 15-20° to the vertical; the second, upper portion has an inclined side wall inclined at an angle of 20-30° to the vertical; and where the lower and upper portions are connected by an intermediate "step" portion.
5. A centrifuge as claimed in claim 4, wherein the conditioning of the
- 25 massecuite by the mixing with "green" molasses is effected in an initial accelerating cone of the accelerator.

6. A centrifuge as claimed in any one of claims 1 to 5, wherein the basket has screen means overlying substantially radially extending drainage grooves in the wall of the basket to enable the molasses to be expelled from the sugar crystals via gravitational force.
- 5 7. A centrifuge as claimed in claim 6, wherein the side walls of the upper and lower portions of the basket have respective screens overlying respective drainage grooves, the drainage grooves being open to the respective upper ends of the side walls.
8. A centrifuge as claimed in claim 2 or claim 5, wherein the recirculating  
10 molasses is sprayed onto the screen of the upper portion.
9. A centrifuge as claimed in any one of claims 1 to 8, wherein the "green" molasses, separated from the sugar crystals in the lower portion of the basket, is collected in the housing and discharged through a green molasses outlet, and at least a portion of the green molasses is directed to the accelerator to condition the  
15 incoming massecuite.
10. A centrifuge as claimed in claim 9, wherein the washed molasses, separated from the sugar crystals in the upper portion of the basket, is collected in the housing and discharged through a washed molasses output.
11. A centrifuge as claimed in claim 10, wherein the washed sugar crystals are  
20 collected in the housing and discharged out the sugar outlet.
12. A centrifuge as claimed in claim 3, wherein the drive motor rotates the basket at a rotational speed of 300-350 rpm, to generate gravitational forces in the range of 75-140 G.
13. A centrifuge basket for a continuous centrifuge including at least one wall  
25 portion having a plurality of substantially radially extending drainage grooves on an inner face of the wall and extending upwardly to a discharge portion at or adjacent to the top of the wall (or wall portion); a screen overlying the drainage grooves, having

holes or slots therethrough to enable the molasses to be separated from the sugar crystals in the massecuite; and means spacing and supporting the screen above the drainage grooves to enable the molasses to pass through the holes or slots in the screen and enter the drainage grooves.

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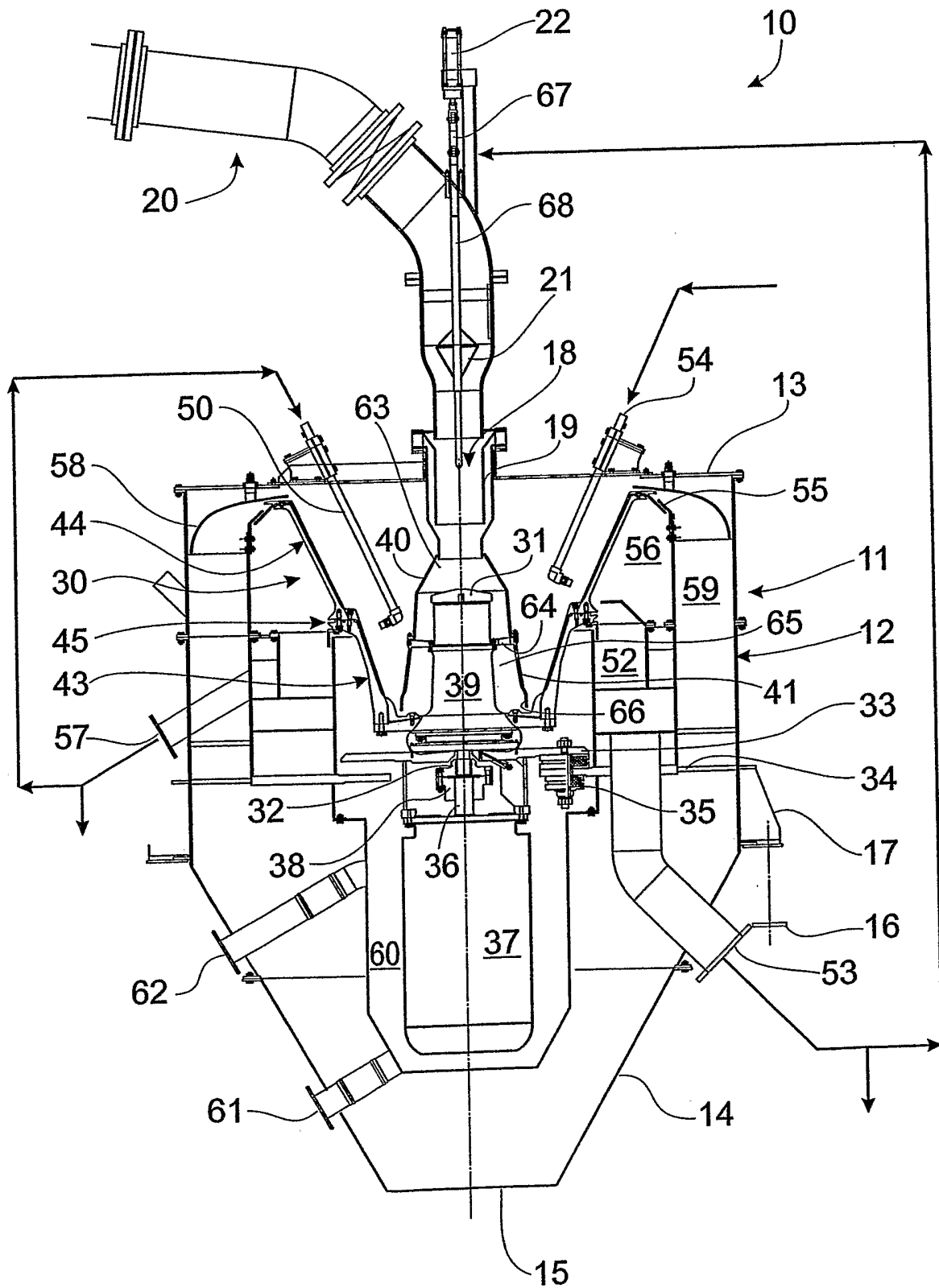
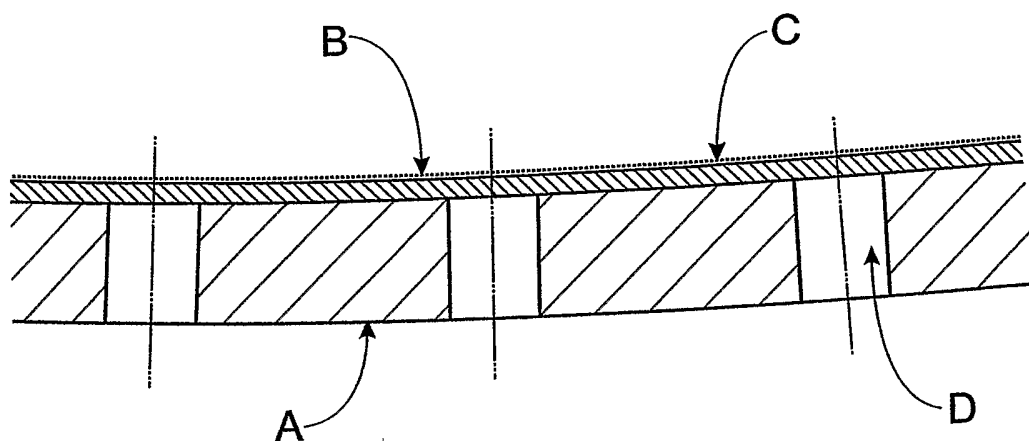


FIG. 1

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PRIOR ART

FIG. 2

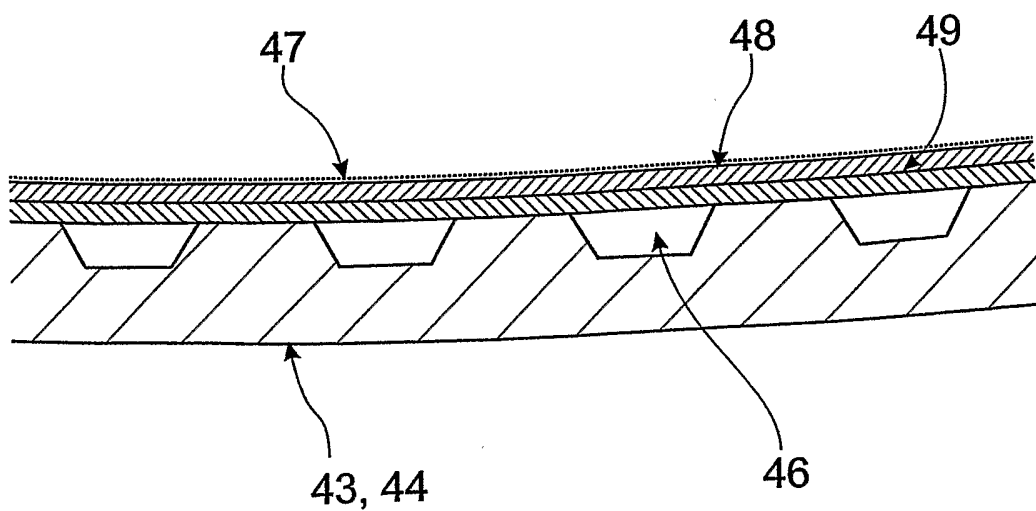


FIG. 3

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/AU02/01399

<b>A. CLASSIFICATION OF SUBJECT MATTER</b>												
Int. Cl. <sup>7</sup> : B04B 7/08, 7/18, C13F 1/06, 1/10												
According to International Patent Classification (IPC) or to both national classification and IPC												
<b>B. FIELDS SEARCHED</b>												
Minimum documentation searched (classification system followed by classification symbols)												
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched AU: IPC B04B 7/- AND C13F 1/06 FOR 1920-1975												
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) DWPI: B04B 7/08, 7/18, C13F 1/06, 1/10 and keywords CAPRI: C13F 1/06												
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>												
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.										
X	US 4762570 A (SCHAPER) 9 August 1988 Column 5 lines 23-56	1-5, 8-11										
X	US 4131482 A (DIETZEL) 26 December 1978 Column 3 line 66 – column 4 line 17	1-5, 8-11										
X	GB 918386 A (BRAUNSCHWEIGISCHE MASCHINENBAU) 13 February 1963 Figure 4, page 3 line 116 – page 4 line 28	1-5, 8-11										
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C <input checked="" type="checkbox"/> See patent family annex												
<p>* Special categories of cited documents:</p> <table border="0"> <tr> <td>"A" document defining the general state of the art which is not considered to be of particular relevance</td> <td>"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</td> </tr> <tr> <td>"E" earlier application or patent but published on or after the international filing date</td> <td>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</td> </tr> <tr> <td>"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)</td> <td>"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</td> </tr> <tr> <td>"O" document referring to an oral disclosure, use, exhibition or other means</td> <td>"&amp;" document member of the same patent family</td> </tr> <tr> <td>"P" document published prior to the international filing date but later than the priority date claimed</td> <td></td> </tr> </table>			"A" document defining the general state of the art which is not considered to be of particular relevance	"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	"E" earlier application or patent but published on or after the international filing date	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone	"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)	"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	"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family	"P" document published prior to the international filing date but later than the priority date claimed	
"A" document defining the general state of the art which is not considered to be of particular relevance	"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											
"E" earlier application or patent but published on or after the international filing date	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone											
"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)	"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											
"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family											
"P" document published prior to the international filing date but later than the priority date claimed												
Date of the actual completion of the international search 11 December 2002		Date of mailing of the international search report 18 DEC 2002										
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustalia.gov.au Facsimile No. (02) 6285 3929		Authorized officer  <b>M. BREMERS</b> Telephone No : (02) 6283 2052										

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/AU02/01399

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 1084754 A (THOMAS BROADBENT & SONS LIMITED) 21 March 2001 Column 5 line 36 – column 6 line 16	1-5, 8-11
X	DE 100787 A (BRONISLAW) 28 March 1897 Figure 1	1-5, 8-11
X	DE 2364260 A (KRAUSS-MAFFEI AG) 26 June 1975 Figure 1	1-5, 8-11
A	US 3108067 A (DIETZEL et al.) 22 October 1963 Figure 2	1-5, 8-11
X	Derwent Abstract Accession No. 97-037122/04 class P41 JP 08294645 A (ISI IIGAKI KIKO) 12 November 1996 Abstract (&JP 08294645 A Figure 3)	13
X	EP 625374 A (ROTOQUIM) 23 November 1994 Figure 2, column 3 lines 29-36	13

## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/AU02/01399**Box I Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)**

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

1.  Claims Nos :  
because they relate to subject matter not required to be searched by this Authority, namely:
  
2.  Claims Nos :  
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.  Claims Nos :  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a)

**Box II Observations where unity of invention is lacking (Continuation of item 3 of first sheet)**

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

See Extra Sheet

1.  As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims
2.  As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3.  As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
  
4.  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 claims Nos.:

**Remark on Protest**  The additional search fees were accompanied by the applicant's protest.  
 No protest accompanied the payment of additional search fees.

**Supplemental Box**

(To be used when the space in any of Boxes I to VIII is not sufficient)

**Continuation of Box No: II**

The international application does not comply with the requirements of unity of invention because it does not relate to one invention or to a group of inventions so linked as to form a single general inventive concept. In coming to this conclusion the International Searching Authority has found that there are different inventions as follows:

1. Claims 1-12 are directed to a continuous centrifuge wherein the basket has two separate portions for separating and washing the sugar crystals. It is considered that the two separate portions of the basket comprises a first "special technical feature".
2. Claim 13 is directed to a centrifuge basket having radially extending drainage grooves on an inner face wall and extending upwards to a discharge portion. It is considered that the drainage grooves comprises a second "special technical feature".

These groups are not so linked as to form a single general inventive concept, that is, they do not have any common inventive features, which define a contribution over the prior art. The common concept linking together these groups of claims is a centrifuge basket for a continuous centrifuge. However this concept is not novel in the light of your own description of the prior art at page 1 of the present application. Therefore these claims lack unity a posteriori.

**INTERNATIONAL SEARCH REPORT**

Information on patent family members

International application No.

**PCT/AU02/01399**

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member					
US	4762570	DE	3628588	EP	257270	IN	171105
		JP	63054961				
US	4131482	BR	7701523				
EP	1084754	NONE					
DE	2364260	NONE					
JP	8294645	NONE					
EP	625374	NONE					
END OF ANNEX							