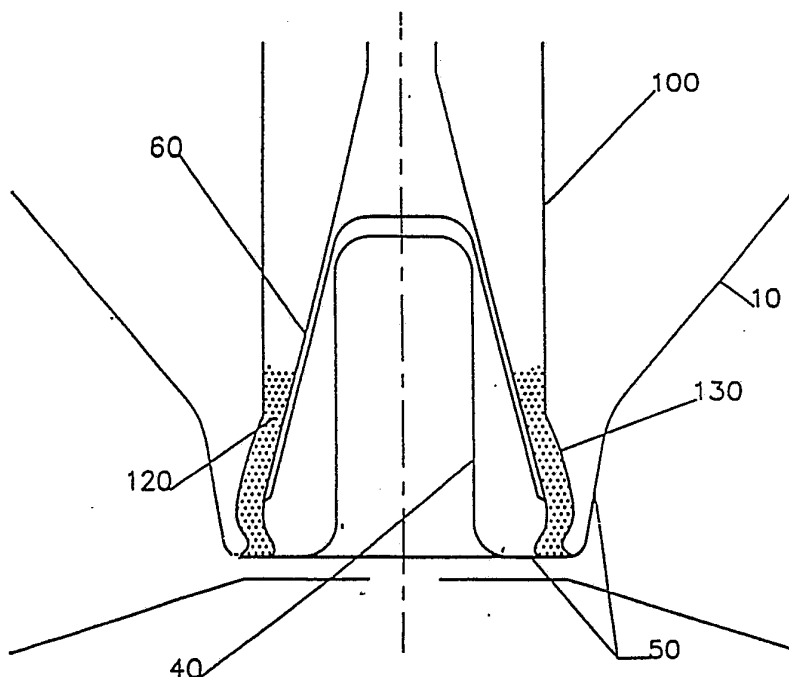




INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁵ : B04B 11/02, 15/02	A1	(11) International Publication Number: WO 92/07659 (43) International Publication Date: 14 May 1992 (14.05.92)
(21) International Application Number: PCT/AU90/00525 (22) International Filing Date: 31 October 1990 (31.10.90) (71) Applicant (for all designated States except US): NQEA AUSTRALIA PTY. LIMITED [AU/AU]; 60-92 Cook Street, Cairns, QLD 4870 (AU). (72) Inventor; and (75) Inventor/Applicant (for US only) : MURRY, Charles, Rodney [AU/AU]; 14 Glenlea Street, Cairns, QLD 4870 (AU). (74) Agent: HALFORD, Graham, William; 49-51 York Street, Sydney, NSW 2000 (AU). (81) Designated States: AT, AT (European patent), BB, BE (European patent), BF (OAPI patent), BG, BJ (OAPI patent), BR, CA, CF (OAPI patent), CG (OAPI patent), CH, CH (European patent), CM (OAPI patent), DE, DE (European patent), DK, DK (European patent), ES, ES (European patent), FI, FR (European patent), GA (OAPI patent), GB, GB (European patent), GR (European patent), HU, IT (European patent), JP, KP, KR, LK, LU, LU (European patent), MC, MG, ML (OAPI patent), MR (OAPI patent), MW, NL, NL (European patent), NO, RO, SD, SE, SE (European patent), SN (OAPI patent), SU⁺, TD (OAPI patent), TG (OAPI patent), US.		Published <i>With international search report.</i>

(54) Title: FEED DISTRIBUTION AND CONTROL ARRANGEMENT FOR CENTRIFUGE**(57) Abstract**

A tube (100) feeds a solid/liquid mixture (130) to the centre of a rotating perforated centrifuge basket (10) having a central cylindrical portion (40). Control of the feed is provided by moving the tube (100) vertically so that an annular gap (120) is formed in the region (50) between the conical end (60) and tube (100). The central member including end (60) to which is attached a cylindrical extension (not numbered) is stationary. Tube (100) is of such a diameter that when completely lowered it closes the gap (120). Member and end (60) may be hollow to allow introduction of steam, water, or other fluids into the region (50) for the purpose of heating or lubrication. The invention relates particularly to centrifuging masseccuite.

+ DESIGNATIONS OF "SU"

Any designation of "SU" has effect in the Russian Federation. It is not yet known whether any such designation has effect in other States of the former Soviet Union.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	ES	Spain	MG	Madagascar
AU	Australia	FI	Finland	ML	Mali
BB	Barbados	FR	France	MN	Mongolia
BE	Belgium	GA	Gabon	MR	Mauritania
BF	Burkina Faso	GB	United Kingdom	MW	Malawi
BG	Bulgaria	GN	Guinea	NL	Netherlands
BJ	Benin	GR	Greece	NO	Norway
BR	Brazil	HU	Hungary	PL	Poland
CA	Canada	IT	Italy	RO	Romania
CF	Central African Republic	JP	Japan	SD	Sudan
CG	Congo	KP	Democratic People's Republic of Korea	SE	Sweden
CH	Switzerland	KR	Republic of Korea	SN	Senegal
CI	Côte d'Ivoire	LI	Liechtenstein	SU ⁺	Soviet Union
CM	Cameroon	LK	Sri Lanka	TD	Chad
CS	Czechoslovakia	LU	Luxembourg	TG	Togo
DE	Germany	MC	Monaco	US	United States of America
DK	Denmark				

-1-

FEED DISTRIBUTION AND CONTROL ARRANGEMENT FOR CENTRIFUGE

TECHNICAL FIELD

5

10

The present invention relates to a feed distribution and control arrangement for centrifugal separating machines. In particular the invention relates to centrifuges for the separation of solid and liquid mixtures one example of which is massecuite. Massecuite is a mixture of solid sugar crystals and molasses.

BACKGROUND ART

15

20

25

In the prior art two types of feed distribution and control are known. In one arrangement (known as side feeding) the mixture of solid and liquid is fed eccentrically on to the bottom of a rotating conical basket down the outside of a fixed metal probe. In another arrangement (known as centre feeding), a rotating distribution device attached to the basket is used and includes a tortuous path to help distribute the solid/liquid mixture. The latter arrangement is described in Australian patent 487,750.

30

35

Central feed systems of similar principles but having different configurations are described in Australian patent 487,425 and Australian patent application No. 23,234/77. The first arrangement provides a basically single stream to the centrifugal separator and for good operation requires the use of a complex and expensive iris control valve. With massecuites of high crystal content it is difficult or impossible to obtain a steady stream of feed mixture. The second arrangement when used in the processing of massecuite results in damage to the sugar crystals and still

-2-

requires the use of a control valve ahead of the feeding unit.

5 Particularly in sugar centrifuges for high grade
massecuites the avoidance of damage to the sugar
crystals is important. The distribution of the
solid/liquid mixture to the conically shaped rotating
basket is important to the proper separation of the
10 solid particles from the liquid carrier.

The present invention seeks at least to overcome these
disadvantages in the prior art.

15 DISCLOSURE OF INVENTION

The present invention improves on prior art
arrangements by providing for centrifugal separating
machines a stationary feed distribution and control
device to deliver the solid/liquid mixture to the
20 centrifuge.

In accordance with the invention there is provided a
feed distribution and control arrangement for a
centrifugal separating machine having a centrifuge
25 basket including a vertical central stationary member
having a cylindrical extension joined to a co-axial
frusto-conical member, and a co-axial outer sleeve
member enclosing said central member to define
therebetween a variable annular space for receiving a
30 liquid/solid mixture, said outer sleeve being movable
vertically to thereby vary the opening or closing of
said annular space to control the flow rate of said
mixture and the distribution thereof into a lower part
of the centrifuge basket of said centrifugal
35 separating machine.

-3-

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 shows a broad schematic cross section of the apparatus according to the invention, and

5

Figure 2 shows an enlarged schematic of the area corresponding to the feed zone of the centrifuge.

MODES FOR CARRYING OUT THE INVENTION

10

As shown schematically in Figure 1 a rotating basket or drum 10 which is driven from below comprises a frusto-conical member 12 joined to a central cylindrical section 40 which houses drive shaft and bearings (not shown). The basket 10 is perforated to allow escape of the liquid component of the mixture into chamber 20 while solids, for example, sugar crystals in a massecuite, move up the basket 10 and thence into chamber 30.

15

A cylindrical sleeve member 100 is arranged coaxially about cylindrical section 40 of the drum 10. Sleeve member 100 surrounds a central stationary conical member 60 fixed to a cylindrical extension 70 supported against the wall of bent tube 90 by radial webs 80. The mixture of liquid and solid is fed along tube 90 leading to sleeve 100 as indicated generally at arrow 85.

20

25

30

35

Instead of the bend in tube 90 other arrangements are possible such as a rectangular or cylindrical head box. The feed material may then be introduced into the head box by a branch pipe of about the same diameter as tube 90 in any convenient location and at any convenient angle. The cylindrical extension 70 may continue through the top of the head box in a manner similar to Figure 1 or may be terminated inside

-4-

tube 90 or the head box by a suitable closure, for example near the top of radial webs 80.

5 Sleeve member 100 is movable vertically along the axis of the sleeve to define a loading or distribution region 50 for the centrifuge. Sleeve member 100 is of a diameter such that when it is completely lowered it closes the annular gap 120 between its lower edge and conical member 60.

10 Suitable mechanical means 110 are provided to control movement of the sleeve member 100. Means 110 may be either operated manually or automatically. By adjusting the height of sleeve member 100 the annular gap 120 can be adjusted to control the rate of flow of solid/liquid feed mixture while also enabling it to be distributed in a uniform curtain 130 on to the rotating distribution region 50 of basket 10.

20 Extension 70 may comprise a hollow column connected to cone 60 to be used for the introduction of steam, water, molasses, syrup or other fluids into the lower distribution area 50 for the purpose of heating or lubrication. Equally the inner surface of the feed material within sleeve member 100 can be heated or lubricated through the extension 70 and cone 60.

30 When extension 70 does not continue through the bend in pipe 90 or through the alternate head box, convenient connections may be made to extension 70 or cone 60 by pipes attached to or incorporated in the webs 80 and penetrating the wall of pipe 90 at convenient locations above sleeve 100.

35 Also by using flexible connexions spray nozzles for steam, water, molasses, syrup or other fluids can be mounted on the outside of the sleeve member 100 to

-5-

treat the material on the basket of the centrifuge.

5 The present invention provides a simple and effective
arrangement for the distribution and also the control
of the feed mixture in a centrifugal separating
machine. Though the invention has been described
above with respect to a driving arrangement in which
the conical basket is driven from below with the
discharge of the separated components occurring
10 vertically other arrangements are possible within the
knowledge of a person skilled in the art. Equally it
is to be understood that the arrangement can be used
with other solid/liquid mixtures than massecuite and
with other basket or drum shapes.

CLAIMS

1. A feed distribution and control arrangement for a centrifugal separating machine having a centrifuge basket including a vertical central stationary member having a cylindrical extension joined to a co-axial frusto-conical member, and a co-axial outer sleeve member enclosing said central member to define therebetween a variable annular space for receiving a liquid/solid mixture, said outer sleeve being movable vertically to thereby vary the opening or closing of said annular space to control the flow rate of said mixture and the distribution thereof into a lower part of the centrifuge basket of said centrifugal separating machine.

2. A feed distribution and control arrangement as claimed in claim 1 further including means to move said outer sleeve in a vertical direction.

3. A feed distribution and control arrangement as claimed in claim 2 further including feeding means to introduce a liquid/solid mixture to said variable annular space.

4. A feed distribution and control arrangement for a centrifugal separating machine as claimed in claim 3 further including means for heating and/or lubricating said variable annular space.

5. A feed distribution and control arrangement as claimed in claim 4 further including means for heating and/or lubricating said mixture in said feeding means.

6. A feed distribution and control arrangement as claimed in any one of the previous claims wherein said cylindrical extension and said coaxial frusto-conical

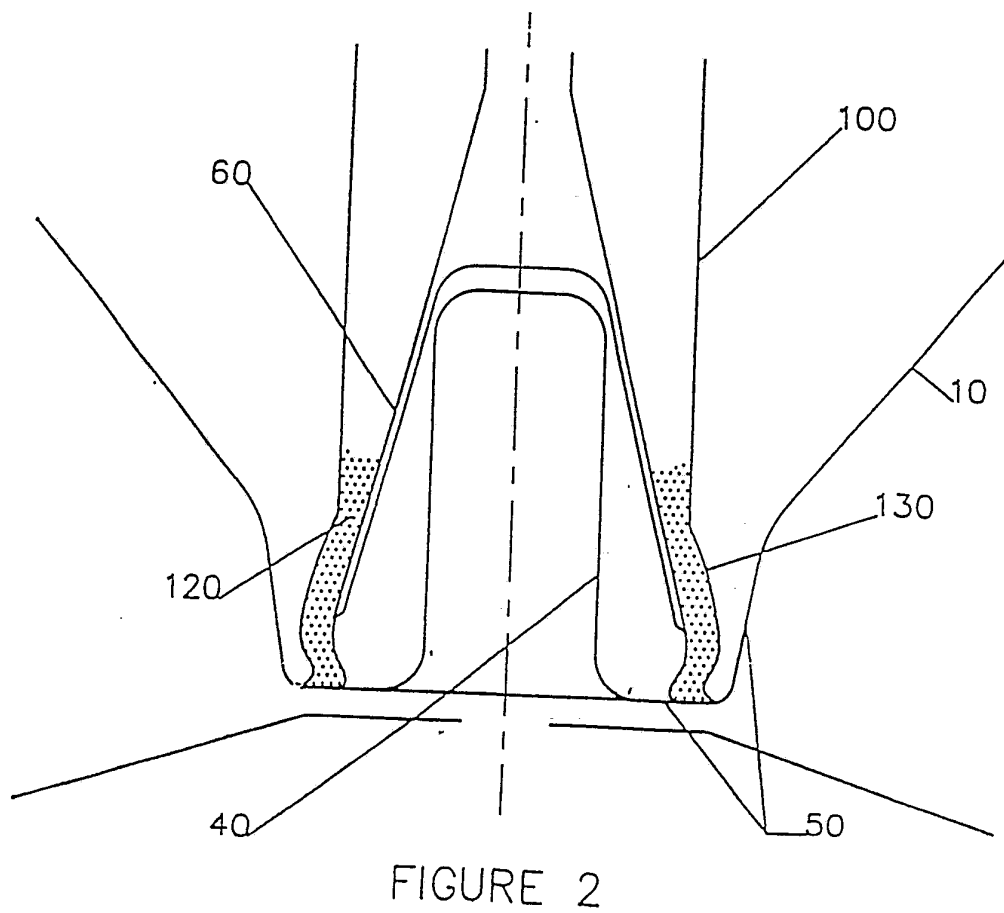
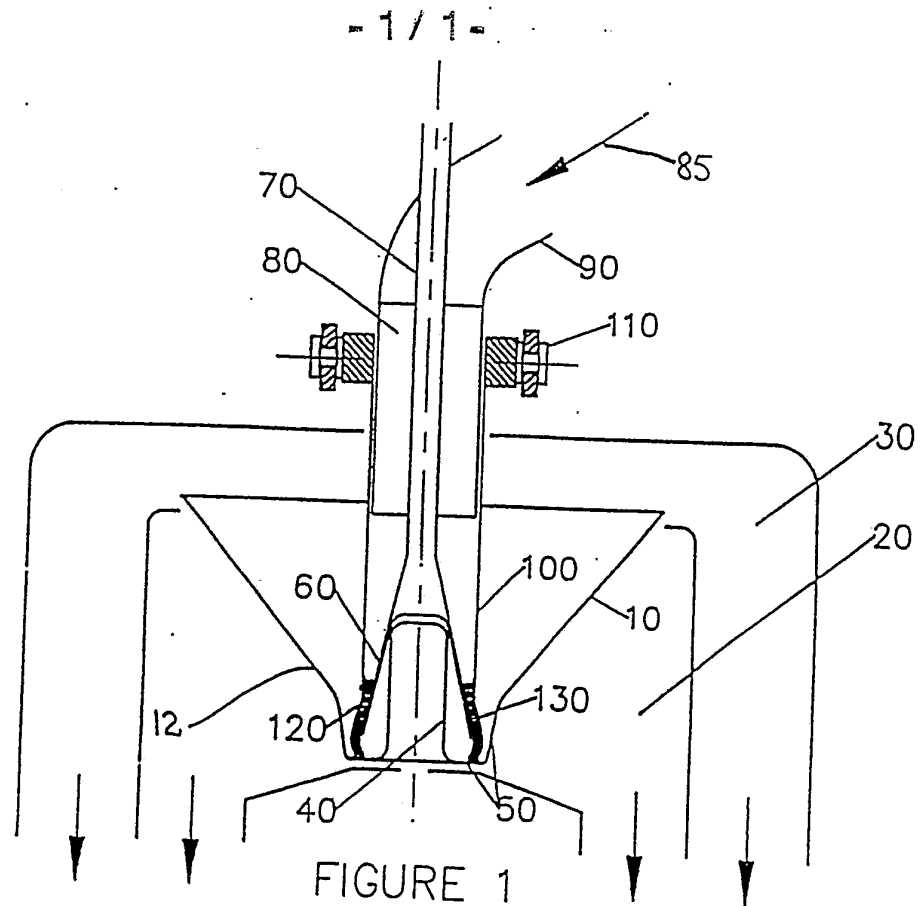
-7-

member are hollow.

7. A feed distribution and control arrangement as claimed in claim 6 wherein said basket comprises a perforated rotating frusto-conical drum joined to a central cylindrical section, with said section housing drive means to rotate said basket.

8. A feed distribution and control arrangement as claimed in claim 7 further including means to space said cylindrical extension from said coaxial outer sleeve member.

9. A centrifugal separating machine including a feed distribution and control arrangement as claimed in any previous claim.



INTERNATIONAL SEARCH REPORT

International Application No. **PCT/AU 90/00525**

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) 6				
According to International Patent Classification (IPC) or to both National Classification and IPC				
Int. Cl. ⁵ B04B 11/02, 15/02				
II. FIELDS SEARCHED				
Minimum Documentation Searched 7				
Classification System	Classification Symbols			
IPC	B04B 11/02, 15/02			
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched 8				
AU : IPC as above				
III. DOCUMENTS CONSIDERED TO BE RELEVANT 9				
Category*	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages 12	Relevant to Claim No 13		
A	US,A, 4409031 (SCHAPER) 11 October 1983 (11.10.83)			
A	US,A, 3682373 (MERCIER) 8 August 1972 (08.08.72)			
A	GB,A, 1062880 (HEIN LEHMANN & CO., AG.) 22 March 1967 (22.03.67)			
A	DE,A, 3828204 (BRAUNSCHWEIGISCHE MASCHINENBAUANSTALT AG,) 22 February 1990 (22.02.90)			
A	AU,B, 82160/75 (487425) (FIVES-CAIL BABCOCK) 23 December 1976 (23.12.76)			
(continued)				
* Special categories of cited documents: 10 <table style="width: 100%;"> <tr> <td style="width: 50%;"> "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "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) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed </td> <td style="width: 50%;"> "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 "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step "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. "&" document member of the same patent family </td> </tr> </table>			"A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "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) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed	"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 "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step "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. "&" document member of the same patent family
"A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "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) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed	"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 "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step "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. "&" document member of the same patent family			
IV. CERTIFICATION				
Date of the Actual Completion of the International Search 11 March 1991 (11.03.91)	Date of Mailing of this International Search Report 25 March 1991			
International Searching Authority Australian Patent Office	Signature of Authorized Officer 3. B. (B. BOURKE)			

FURTHER INFORMATION CONTINUED FROM THE SECOND SHEET

A	AU,A,23234/77 (BRAUNSCHWEIGISCHE MASCHINENBAUANSTALT AG) 21 September 1978 (21.09.78)
A	Derwent Abstract Accession no. 46039 K/19, Class P41, SU,A, 939097 (KRASD POLY) 30 June 1982 (30.06.82)

V. ☐ OBSERVATIONS WHERE CERTAIN CLAIMS WERE FOUND UNSEARCHABLE 1

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 2

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.

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON
INTERNATIONAL APPLICATION NO. PCT/AU 90/00525

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 Members		
US	4409031	BR 8200825 IN 157691 MX 154598	FR 2500328 IT 1149675 NL 8200100	GB 2093364 JP 57156000 SE 8201092	
US	3682373	BE 742328 ES 374139 YU 3064/69	DE 1961734 FR 1595971	DE 1966575 GB 1257535	
AU	82160/75	BE 830296 ES 438454 IN 143482 US 3989185	BR 7503773 FR 2274360 IT 1038772 ZA 7503839	DE 2526866 GB 1484744 JP 51013475	
AU	23234/77	BR 7701523 FR 2350401	US 4131482 IT 1081388	BE 850441 ZA 7702195	