

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
9 August 2001 (09.08.2001)

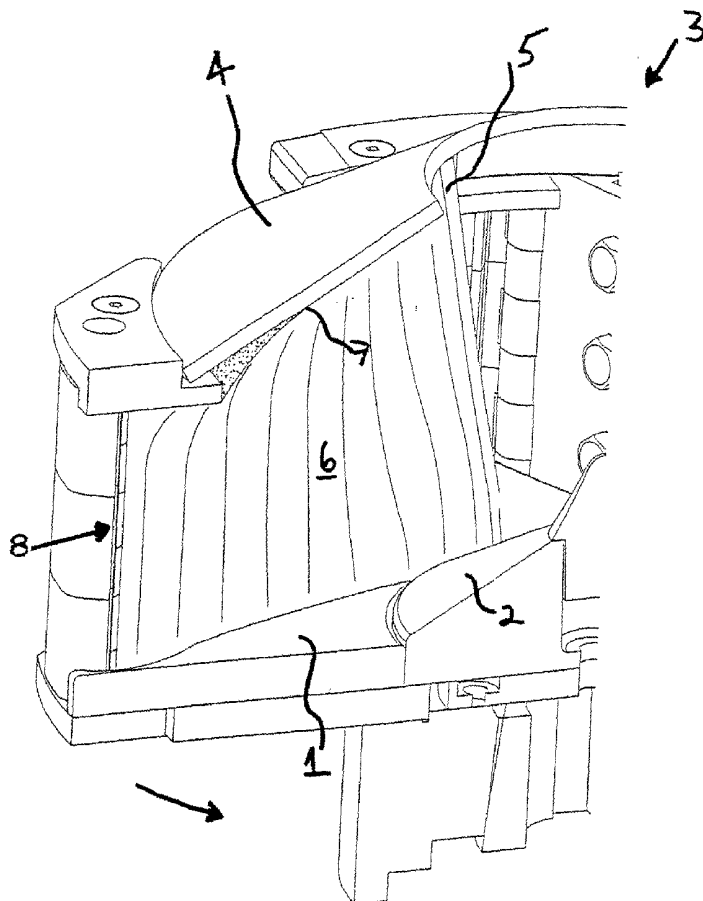
PCT

(10) International Publication Number
WO 01/56698 A1

- (51) International Patent Classification⁷: **B02C 7/11**, 7/08, 13/282
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- (21) International Application Number: PCT/NZ01/00008
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- (22) International Filing Date: 26 January 2001 (26.01.2001)
- (25) Filing Language: English
- (81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.
- (26) Publication Language: English
- (30) Priority Data: 502725 7 February 2000 (07.02.2000) NZ
- (84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European
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[Continued on next page]

(54) Title: ROTARY MINERAL BREAKERS



(57) Abstract: The invention relates to a rotary mineral breaker, a rotor and a method of using a rotary mineral breaker. The rotary mineral breaker includes a rotor having an inlet for mineral pieces at and/or substantially parallel to the rotary axis thereof from above and at least one peripheral exit port for such materials to exit in the same and/or a modified form radially of the rotor into a surrounding mineral piece interaction zone, the rotor being characterised in that in use for each exit port there will be a retained bed of mineral pieces having (a) a greater vertical extend inwardly of the exit port than at the exit port itself and/or (b) starting higher inwardly than at the exit port itself and being further characterised in that at the trailing boundary of each exit port there is at least a sacrificial member which acts or will act directly or indirectly as a weir for the retained bed of mineral pieces and over which other mineral pieces may be flung, said retained mineral pieces extending inwardly to a backup form which limits the inward intrusion of the retained bed.



patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

Published:

— *with international search report*

ROTARY MINERAL BREAKERS

The present invention relates to rotary mineral breakers.

5 BACKGROUND

In our PCT International Application Nos. PCT/NZ98/00075 (published as WO 98/56507) and PCT/NZ98/00076 (published as WO 98/56508) we disclosed in respect of rotary mineral breakers the matching of the rotor flow to the surrounding mineral breaking chamber and the contouring of the rotor bed of retained mineral pieces respectively.

The present invention is directed to alternative and/or improved constructions of rotor or rotor assembly (hereafter "rotor") in rotary mineral breakers of the type typified in the aforementioned patent specification (or any of the acknowledged prior art contained therein) with a view to providing rotor bed contouring of retained mineral pieces which better channels whilst accelerating mineral pieces from the substantially vertical in-feed direction to an outward substantially horizontal direction as high speed.

It is an object of the invention to at least duplicate but preferably improve upon the *loci* of movement disclosed in WO 98/56508 as disclosed in respect of Figures 2, 4B to 4F and 7 of that patent specification, or alternatively to provide a useful alternative.

STATEMENT OF INVENTION

The present invention in one aspect can broadly be said to consist in a **rotary mineral breaker** of a kind having a rotor to rotate about a substantially vertical rotary axis, the rotor having an inlet for mineral pieces at and/or substantially parallel to the rotary axis thereof from above and at least one peripheral exit port for such materials to exit in the same and/or a modified form radially of the rotor into a surrounding mineral piece interaction zone,

the rotor being **characterised in that** in use for each exit port there will be a retained bed of mineral pieces having (a) a greater vertical extent inwardly of the exit port than at the exit port itself and/or (b) starting higher inwardly than at the exit port itself

and being further characterised in that at the trailing boundary of each exit port there is at least a sacrificial member which acts or will act directly or indirectly as a weir for the retained bed of mineral pieces and over which other mineral pieces may

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be flung, said retained mineral pieces extending inwardly to a backup form which limits the inward intrusion of the retained bed.

Preferably a distributor structure at or about the rotation axis of the rotor is provided on or as part of a base member, such distributor structure (whether by virtue of a conical or other form) having the effect of deflecting centrally dropping mineral pieces towards each trailing bed of retained mineral pieces and/or to allow the bed to build towards and/or to it.

Preferably the rotor includes an upper surface at least inwardly of the exit ports which rises centrally to an axial intake port.

Preferably the rotor includes a frustoconical or inverted bowl like shape upper surface to ensure and/or allow a greater vertical height of retained bed of mineral pieces than at and adjacent each exit port.

Preferably the structure of the rotor includes one or more of the components and/or sub-assemblies or components or sub-assemblies substantially as hereinafter described with reference to any one or more of the accompanying drawings.

In still a further aspect the present invention is a **rotor** suitable for a rotary mineral breaker having a main structure from which depends exit port defining assemblies which includes at least one sacrificial component to act (at least in part) directly or indirectly as a weir, the arrangement being such that (preferably in conjunction with an inward geometry, an inwardly rising roof, and an inwardly rising base) a locus of curvature over a retained bed of mineral pieces is achieved for each exit port, such locus commencing in a region of the retained bed that is higher than the upper reaches of said part.

In still a further aspect the present invention consists in a **method of operating a rotary mineral breaker** which comprises feeding mineral pieces to be broken into the rotor of such a mineral breaker and by appropriate assembly of the bed retaining geometries at (i) the exit port, (ii) the inner region of the retained bed, and (iii) above, (iv) below and (v) behind the retained bed, a retained bed of a form characterised by Figure 2 hereof is obtained.

DESCRIPTION OF THE DRAWINGS

The invention consists in the foregoing and also envisages constructions of which the following gives examples.

The preferred form of the present invention will now be described with reference to the accompanying drawings in which:

Figure 1 shows (with a substantially flat roof type member removed) our prior art rotor having a flat base with a distributor member centrally therein and which by virtue of oppositely configured exit port weir to the inward bed confinement members is able to configure a channel conducive to providing a *loci* of mineral pieces over the retained bed over the sacrificial weir at the exit port in the manner depicted by the arrows;

Figure 2 shows an alternative arising from the use of the present invention (the rotor being adapted to rotate in the same direction as the prior art rotor of Figure 1, ie; in the arrowed direction) but having a retained bed that has a greater height centrally than at and adjacent the exit port arising from the use of a back up member which defines the inner bounds of the retained bed but which by virtue of its extending up towards a raised roof structure can provide a greater height as is desirable to better provide a curved *locus* from the central region out to the exit port; and

Figure 3 shows a preferred form of componentry of structure for providing a rotor in accordance with the present invention.

In the preferred form of the present invention the sacrificial components are of a kind exemplified in our aforementioned specifications.

In the present invention however the rotor preferably comprises a base member 1 having a distributor cone or other structure 2 at or adjacent the rotational axis below the intake port 3 through the preferably frustoconical or the like roof or cover or top 4.

Extending between the roofing member or substantially between the roofing member 4 and the base member 1 is a backing member 5 which protrudes closer to the distributor member 2 at its bottom end than at the top so as to configure a retained bed 6 in the manner depicted in conjunction with the effect of the interface 7 provided by the member 4 and the weir arrangement 8 which it is to be noted preferably does not require the localising configurations of the prior art form of Figure 1 as disclosed in some detail in WO 98/56508.

The present invention therefore envisages structures whereby a rotor might be provided with a centrally rising base and an inwardly rising roof or cover member and which has in conjunction therewith an array of bed form determining members at least

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one of which acts as a weir and one of which is a bed backing member typified by, for example, member 5.

5 Persons skilled in the art will appreciate how without any substantial increase in the vertical height of the rotor at and/or adjacent its spinning periphery (but with preferably some raising of the upper regions of the rotor inwardly thereof) all of the desirable *loci* features disclosed in WO 98/56508 can be obtained and enhanced.

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WHAT WE CLAIM IS:

1. **A rotary mineral breaker** of a kind having a rotor to rotate about a substantially vertical rotary axis, the rotor having an inlet for mineral pieces at and/or substantially parallel to the rotary axis thereof from above and at least one peripheral exit port for such materials to exit in the same and/or a modified form radially of the rotor into a surrounding mineral piece interaction zone,
the rotor being **characterised in that** in use for each exit port there will be a retained bed of mineral pieces having

(a) a greater vertical extent inwardly of the exit port than at the exit port itself,
and/or

(b) starting higher inwardly than at the exit port itself,

and being further characterised in that at the trailing boundary of each exit port there is at least a sacrificial member which acts or will act directly or indirectly as a weir for the retained bed of mineral pieces and over which other mineral pieces may be flung, said retained mineral pieces extending inwardly to a backup form which limits the inward intrusion of the retained bed.

2. **A rotary mineral breaker** as claimed in claim 1 wherein a distributor structure at or about the rotation axis of the rotor is provided on or as part of a base member, such distributor structure (whether by virtue of a conical or other form) having the effect of deflecting centrally dropping mineral pieces towards each trailing bed of retained mineral pieces and/or to allow the bed to build towards and/or to it.

3 **A rotary mineral breaker** as claimed in claims 1 and 2 wherein the rotor includes an upper surface at least inwardly of the exit ports which rises centrally to an axial intake port.

4. **A rotary mineral breaker** as claimed in any one of the preceding claims wherein the rotor includes a frustoconical or inverted bowl like shape upper surface to ensure and/or allow a greater vertical height of retained bed of mineral pieces than at and adjacent each exit port.

5. **A rotary mineral breaker** as claimed in any one of the preceding claims wherein the structure of the rotor includes one or more of the components and/or sub-assemblies or components or sub-assemblies.

6. **A rotary mineral breaker** substantially as herein described with reference to any one or more of the accompanying drawings.

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7. **A rotor** suitable for a rotary mineral breaker having a main structure from which depends exit port defining assemblies which includes at least one sacrificial component to act (at least in part) directly or indirectly as a weir, the arrangement being such that (preferably in conjunction with an inward geometry, an inwardly rising roof, and an
5 inwardly rising base) a locus of curvature over a retained bed of mineral pieces is achieved for each exit port, such locus commencing in a region of the retained bed that is higher than the upper reaches of said part.

8. **A rotor** substantially as herein described with reference to any one or more of the accompanying drawings.

10 9. **A method of operating a rotary mineral breaker** which comprises feeding mineral pieces to be broken into the rotor of such a mineral breaker and by appropriate assembly of the bed retaining geometries at (I) the exit port, (ii) the inner region of the retained bed, and (iii) above, (iv) below and (v) behind the retained bed, a retained bed
of a form characterised by Figure 2 hereof is obtained.

15 10. **A method of operating a rotary mineral breaker** substantially as herein described with reference to any one or more of the drawings.

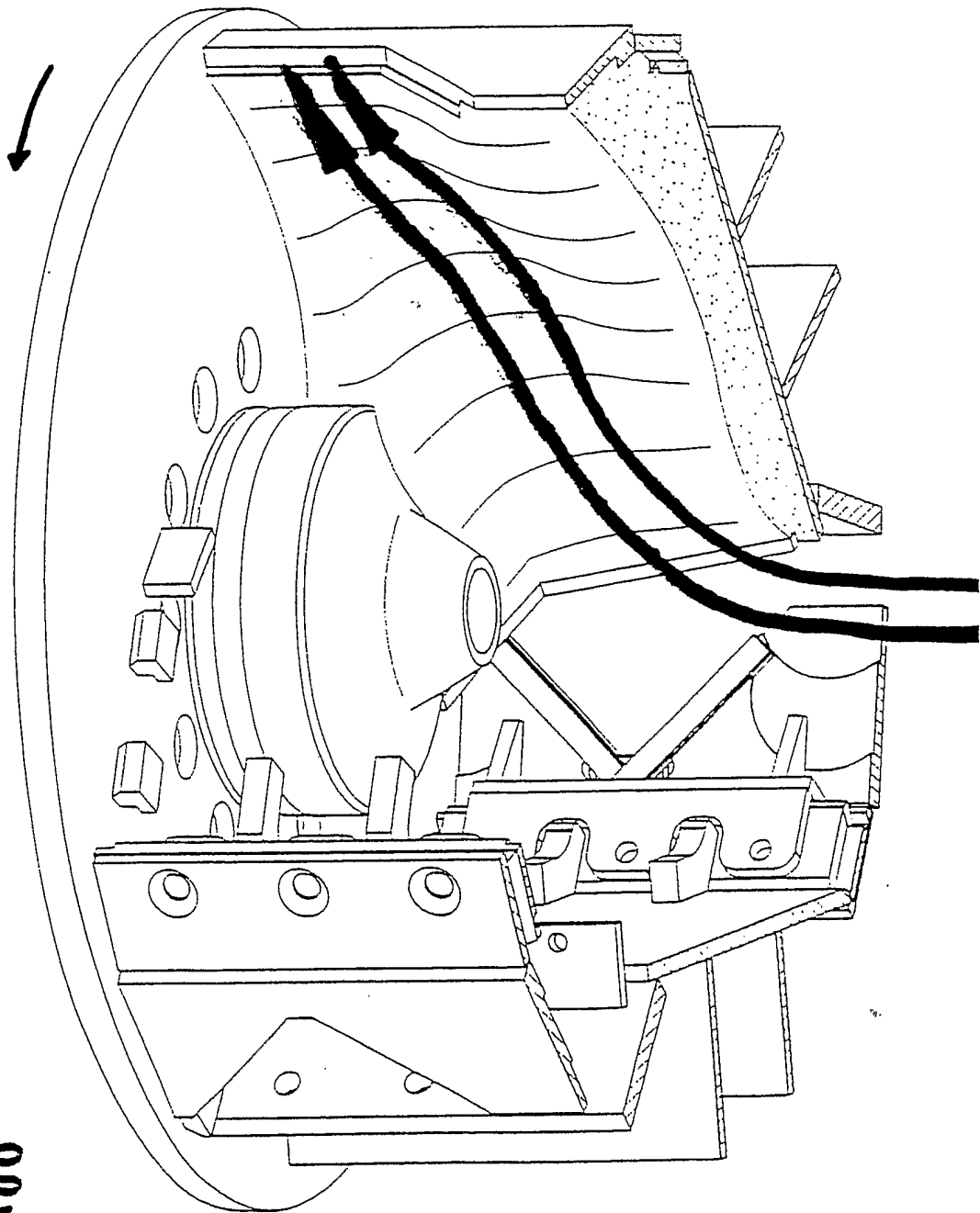


Figure 1

PRIOR ART

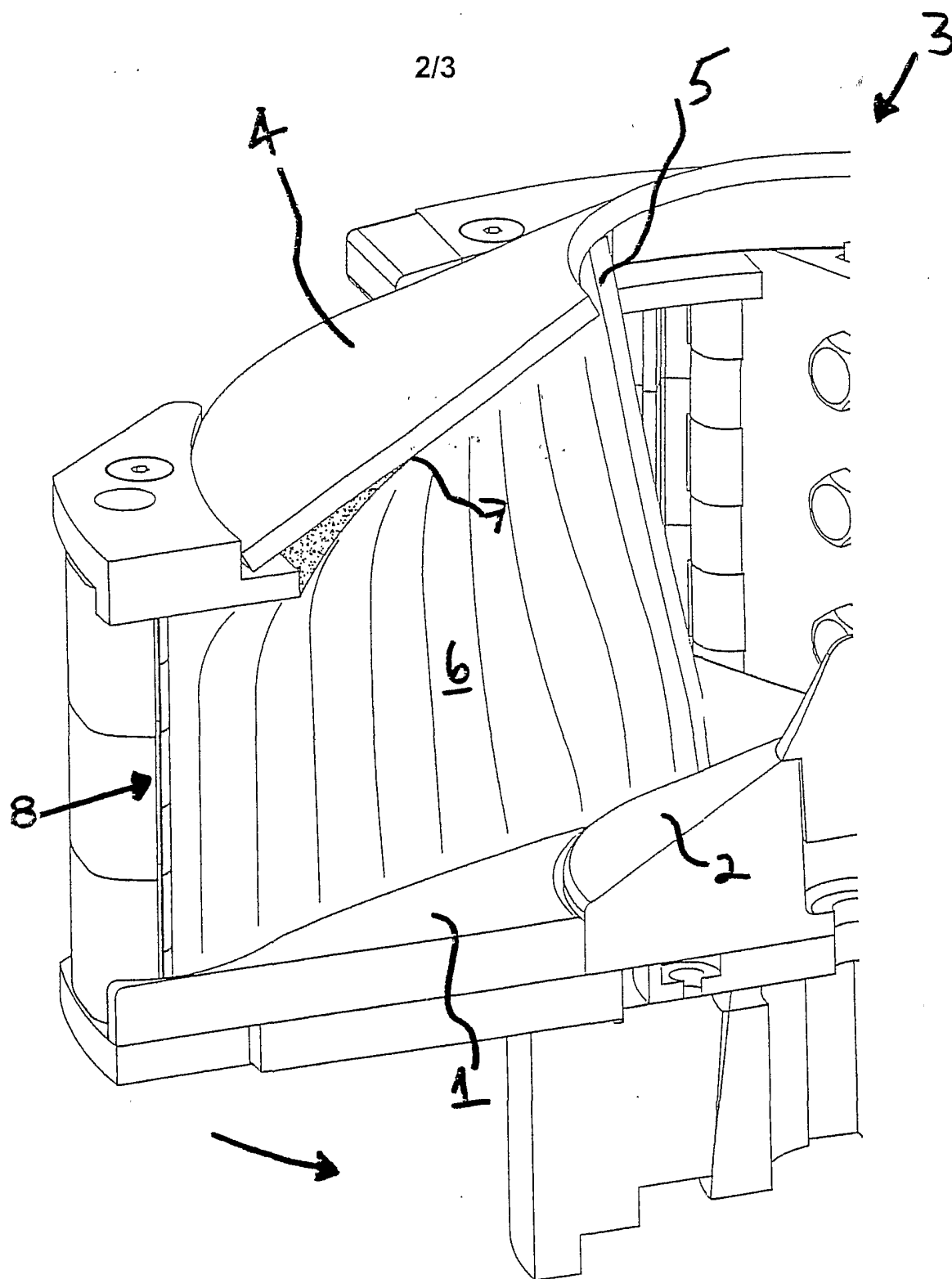


Figure 2

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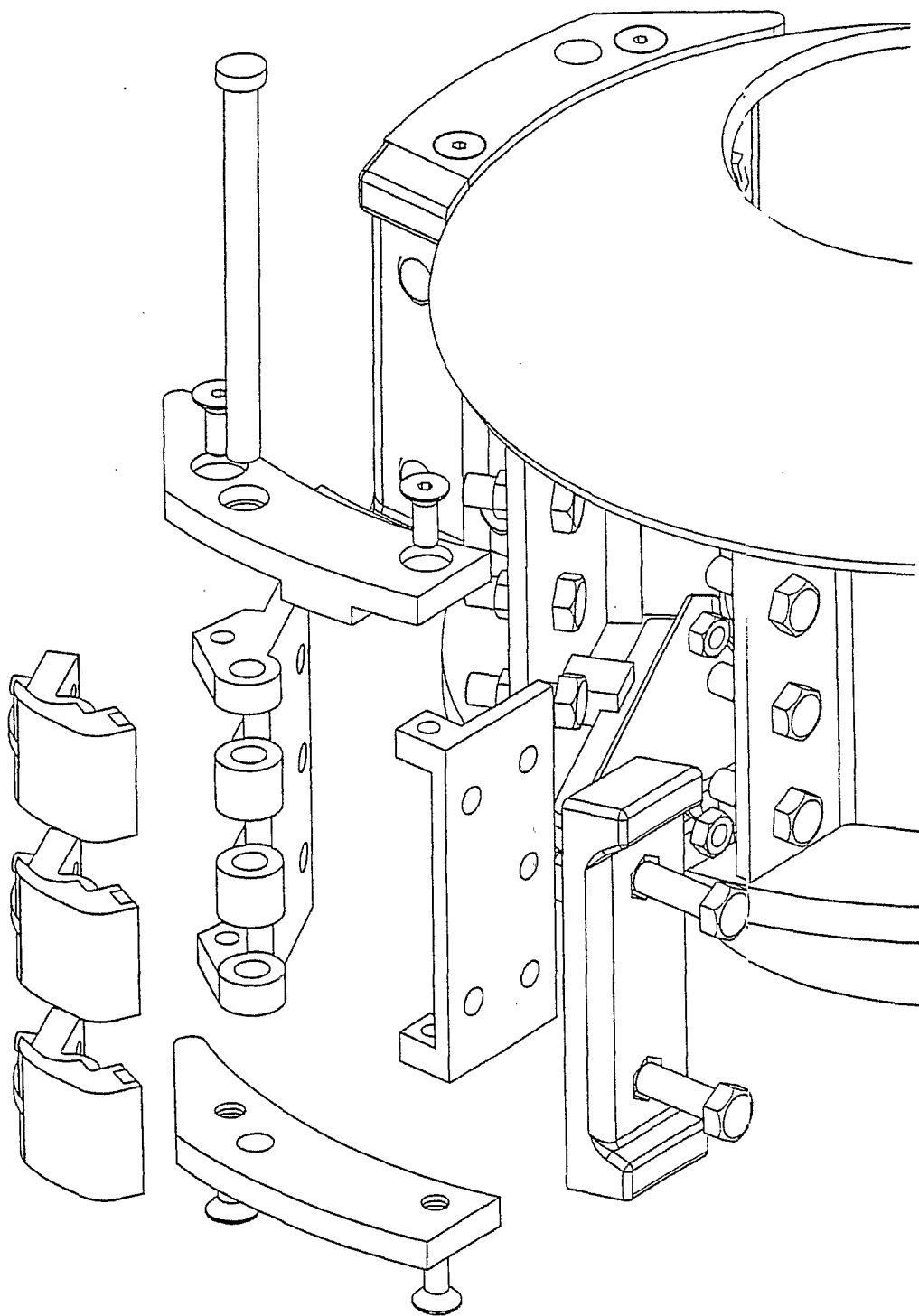


Figure 3

INTERNATIONAL SEARCH REPORT

International application No.

PCT/NZ01/00008

A. CLASSIFICATION OF SUBJECT MATTER																						
Int. Cl. ⁷ : B02C 7/11, 7/08, 13/282																						
According to International Patent Classification (IPC) or to both national classification and IPC																						
B. FIELDS SEARCHED																						
Minimum documentation searched (classification system followed by classification symbols) IPC ⁷ AS ABOVE																						
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched																						
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) Derwent WPAT: IPC ⁷ as above																						
C. DOCUMENTS CONSIDERED TO BE RELEVANT																						
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.																				
A	WO 9856508 A1 (Svedala Barmac Ltd) 17 December 1998 Whole Document																					
A	WO 9856507 A1 (Svedala Barmac Ltd) 17 December 1998 Whole Document																					
A	AU 36804/97 A (Svedala Barmac Ltd) 12 March 1998 Whole Document																					
☒ Further documents are listed in the continuation of Box C ☒ See patent family annex																						
* Special categories of cited documents: <table border="0"> <tr> <td>"A"</td> <td>document defining the general state of the art which is not considered to be of particular relevance</td> <td>"T"</td> <td>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"</td> <td>earlier application or patent but published on or after the international filing date</td> <td>"X"</td> <td>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"</td> <td>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"</td> <td>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"</td> <td>document referring to an oral disclosure, use, exhibition or other means</td> <td>"&"</td> <td>document member of the same patent family</td> </tr> <tr> <td>"P"</td> <td>document published prior to the international filing date but later than the priority date claimed</td> <td></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 2 March 2001		Date of mailing of the international search report <i>6 March 2001</i>																				
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 DAVID K. BELL Telephone No : (02) 6283 2309																				

INTERNATIONAL SEARCH REPORT

International application No.

PCT/NZ01/00008

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 9511086 A1 (Barnac Assoc) 18 October 1994 Whole Document	
A	US 4940188 A (Rodriguez et al) 10 July 1990 Whole Document	

INTERNATIONAL SEARCH REPORT

Information on patent family members -

International application No.
PCT/NZ01/00008

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			
AU	36804/97	AU	40368/97	GB	2331716	US	5911370
		WO	9809729	NZ	299299		
WO	9511086	AU	80061/94	BR	9407849	CA	2174644
		CZ	9601150	EP	724484	NZ	250027
US	4940188	AU	26816/88	CA	1301135	FR	2625114
		GB	2214107	GB	2248410	JP	1203052
		NZ	227492	NZ	238349	ZA	8809485
		CA	2006528				
WO	9856507	AU	79425/98	BR	9812425	EP	1009526
		NZ	328061	ZA	9805042		
WO	9856508	AU	79426/98	EP	1009527	NZ	328062
		ZA	9805037				
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