

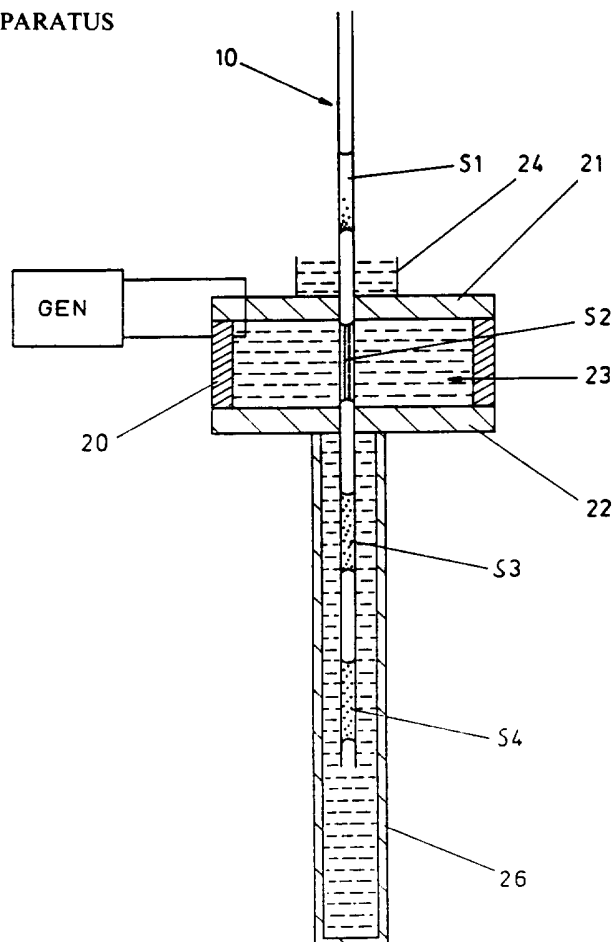


## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>(51) International Patent Classification <sup>5</sup> :</b><br><b>G01N 33/541, 33/53, 29/02</b><br><b>B01J 19/10</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>A3</b> | <b>(11) International Publication Number:</b> <b>WO 93/19367</b><br><b>(43) International Publication Date:</b> 30 September 1993 (30.09.93)                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>(21) International Application Number:</b> PCT/GB93/00504<br><b>(22) International Filing Date:</b> 10 March 1993 (10.03.93)<br><br><b>(30) Priority data:</b><br>9205128.3                      10 March 1992 (10.03.92)                      GB<br><br><b>(71) Applicant (for all designated States except US):</b> UNIVERSITY COLLEGE CARDIFF CONSULTANTS LIMITED [GB/GB]; Park Place, Cardiff CF1 1XL (GB).<br><br><b>(72) Inventors; and</b><br><b>(75) Inventors/Applicants (for US only) :</b> COAKLEY, William, Terence [GB/GB]; 30 Windmere Avenue, Cardiff CF2 5PR (GB). GRUNDY, Martin, Alan [GB/GB]; 15 Stranraer Road, Pennar, Pembroke Dock, Dyfed SA72 6RY (GB). BOLEK, Werner [AT/AT]; Wiedner Hauptstrasse 8-10/134, A-1040 Wien (AT). |           | <b>(74) Agent:</b> GIBSON, Stewart, Harry; Urquhart-Dykes & Lord, Business Technology Centre, Senghennydd Road, Cardiff CF2 4AY (GB).<br><br><b>(81) Designated States:</b> AU, CA, FI, HU, JP, US, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).<br><br><b>Published</b><br><i>With international search report.</i><br><i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i><br><br><b>(88) Date of publication of the international search report:</b><br>28 October 1993 (28.10.93) |

**(54) Title:** PARTICLE AGGREGATION METHOD AND APPARATUS**(57) Abstract**

A sample (e.g. 52) of liquid with suspended particles is contained in a tube (10) and subjected to a standing wave ultrasound field transverse to the tube (10), the standing wave exhibiting a progressive change in pressure amplitude transverse to the tube, so that particles in suspension are displaced transversely of the tube to one or more predetermined regions: exposure of the sample to the standing wave is then terminated and the particles are allowed to settle, and inspected to determine whether they remain aggregated or whether they dissociate. The ultrasound field is produced by a transducer (20) of tubular form encircling the tube (10). The invention may be used for the agglutination of particles or cells via cross-bridging molecules in immuno-agglutination assays.



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# INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 93/00504

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                        |                          |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|--------------------------|
| <b>I. CLASSIFICATION OF SUBJECT MATTER</b> (If several classification symbols apply, indicate all) *<br>According to International Patent Classification (IPC) or to both National Classification and IPC<br>IPC <sup>5</sup> : G 01 N 33/541, G 01 N 33/53, G 01 N 29/02, B 01 J 19/10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                        |                          |
| <b>II. FIELDS SEARCHED</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                        |                          |
| Minimum Documentation Searched †                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                        |                          |
| Classification System                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Classification Symbols                                                                                 |                          |
| IPC <sup>5</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | G 01 N, B 01 J                                                                                         |                          |
| Documentation Searched other than Minimum Documentation<br>to the Extent that such Documents are Included in the Fields Searched ‡                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                        |                          |
| <b>III. DOCUMENTS CONSIDERED TO BE RELEVANT</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                        |                          |
| Category *                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Citation of Document, †† with indication, where appropriate, of the relevant passages †‡               | Relevant to Claim No. †‡ |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | GB, A1, 2 233 089<br>(PUBLIC HEALTH LAB.)<br>22 July 1992 (22.07.1992),<br>claims; figs..<br>---       | 1-10                     |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | WO, A1, 88/04 051<br>(UNIVERSITE RABELAIS)<br>02 June 1988 (02.06.1988),<br>claims; figs..<br>-----    | 1-10                     |
| <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>* Special categories of cited documents: ††</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </div> <div style="width: 45%;"> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"Z" document member of the same patent family</p> </div> </div> |                                                                                                        |                          |
| <b>IV. CERTIFICATION</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                        |                          |
| Date of the Actual Completion of the International Search<br><div style="text-align: center;">18 August 1993</div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Date of Mailing of this International Search Report<br><div style="text-align: center;">09.09.93</div> |                          |
| International Searching Authority<br><div style="text-align: center;">EUROPEAN PATENT OFFICE</div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Signature of Authorized Officer<br><div style="text-align: center;">TENGLER e.h.</div>                 |                          |

**ANHANG**

zum internationalen Recherchen-  
bericht über die internationale  
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**ANNEX**

to the International Search  
Report to the International Patent  
Application No.

**ANNEXE**

au rapport de recherche inter-  
national relatif à la demande de brevet  
international n°

PCT/GB 93/00504 SAE 73926

In diesem Anhang sind die Mitglieder  
der Patentfamilien der im obenge-  
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Diese Angaben dienen nur zur Unter-  
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This Annex lists the patent family  
members relating to the patent documents  
cited in the above-mentioned inter-  
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La présente annexe indique les  
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|------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|
| GB A1 2233089                                                                                                                                              | 02-01-91                                                                       | GB A0 8905807<br>GB A0 9005731<br>GB B2 2233089                                                          | 26-04-89<br>09-05-90<br>22-07-92                                               |
| WD A1 8804051                                                                                                                                              | 02-06-88                                                                       | EP A1 292525<br>FR A1 2607257<br>FR B1 2607257<br>JP T2 1502928                                          | 30-11-88<br>27-05-88<br>06-04-90<br>05-10-89                                   |