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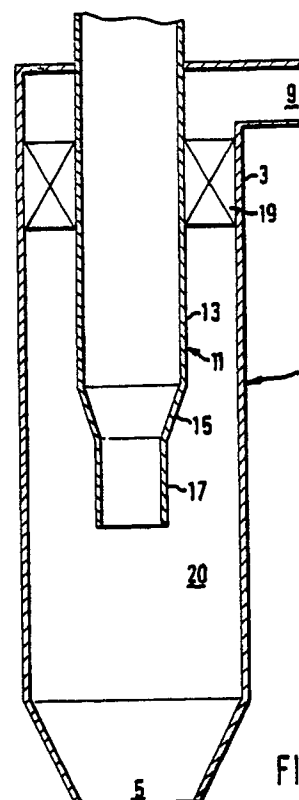
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**28.03.90 Bulletin 90/13**(72) Inventor: **van den Akker, Hendrikus Egidius  
Antonia  
Badhuisweg 3**(34) Designated Contracting States:  
**BE DE ES FR GB IT NL****NL-1031 CM Amsterdam(NL)**(68) Date of deferred publication of the search report:  
**30.01.91 Bulletin 91/05**Inventor: **de Kort, Cornelius Josephus Maria  
Badhuisweg 3  
NL-1031 CM Amsterdam(NL)**(71) Applicant: **SHELL INTERNATIONALE  
RESEARCH MAATSCHAPPIJ B.V.  
Carel van Bylandtlaan 30**(74) Representative: **Aalbers, Onno et al  
P.O. Box 302  
NL-2501 CH The Hague(NL)**(54) **Swirl tube separator.**

(57) Swirl tube separator comprising a cylindrical housing (1) having an inlet part (3) at its upper end and a solids outlet opening (5) at its lower end part. The inlet part (3) is provided with swirl imparting means (19). A swirl zone (20) extends in the housing (1) between the swirl imparting means (19) and the solids outlet opening (5). An open-ended fluid outlet conduit (11) is arranged concentrically in the housing (1) and comprises a primary section (13) extending into the inlet part (3) of the housing (1), a downwardly tapering frustoconical section (15) joined to the lower end of the primary section (13), and a secondary section (17) having a diameter equal to the smallest diameter of the frustoconical section (15) and joined to the lower end of the frustoconical section (15). The ratio of the distance between the lower ends of the fluid outlet conduit (11) and the swirl zone (20) to the inner diameter of the housing (1) is between 1.0 and 3.0.

**FIG.1****EP 0 360 360 A3**



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## EUROPEAN SEARCH REPORT

Application Number

EP 89 20 2391

| DOCUMENTS CONSIDERED TO BE RELEVANT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                   |                                                |                                               |                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                   |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|-----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Category                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Citation of document with indication, where appropriate, of relevant passages                                                                                                                                                     | Relevant to claim                              | CLASSIFICATION OF THE APPLICATION (Int. Cl.5) |                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                   |
| X                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | US-A-3 273 320 (L.J. DELAUME et al.)<br>* Column 4, line 59 - column 5, line 18; figure 1 *<br>- - - -                                                                                                                            | 1,3-8,<br>10-12                                | B 04 C 5/081                                  |                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                   |
| Y                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | GB-A-2 132 511 (SHELL)<br>* Page 3, lines 53-56; figure 2 *<br>- - - -                                                                                                                                                            | 1,2,4,11,<br>12                                |                                               |                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                   |
| Y                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | WO-A-8 303 986 (BAUER BROS)<br>* Page 7, line 24 - page 10, line 23; figure 1 *<br>- - - -                                                                                                                                        | 1,2,4,11,<br>12                                |                                               |                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                   |
| Y                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | US-A-3 636 682 (J.B. RUSH)<br>* Column 3, line 1 - column 4, line 14; figures 1,2 *<br>- - - -                                                                                                                                    | 1,3-9,11,<br>12                                |                                               |                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                   |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | US-A-2 667 944 (J. CRITES)<br>* Column 1, line 40 - column 4, line 8; figures 1-3 *<br>- - - -                                                                                                                                    | 1,3,4,<br>10-12                                |                                               |                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                   |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | AUFBEREITUNGS-TECHNIK, vol. 29, no. 7, July 1988,<br>pages 395-402, Wiesbaden, DE; M. GEBICA: "A contribution<br>to pressure loss and dedusting efficiency of cyclones"<br>* Page 396, figure 1; page 399, table 4 *<br>- - - -   | 1,3,4,<br>10-12                                |                                               |                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                   |
| A,D                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | US-A-2 890 764 (G.D. ARNOLD)<br>- - - - -                                                                                                                                                                                         |                                                | TECHNICAL FIELDS<br>SEARCHED (Int. Cl.5)      |                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                   |                                                | B 04 C                                        |                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                   |
| The present search report has been drawn up for all claims                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                   |                                                |                                               |                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                   |
| Place of search<br>The Hague                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                   | Date of completion of search<br>27 November 90 | Examiner<br>LAVAL J.C.A                       |                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                   |
| <table><tr><td><b>CATEGORY OF CITED DOCUMENTS</b><br/>X : particularly relevant if taken alone<br/>Y : particularly relevant if combined with another document of the same category<br/>A : technological background<br/>O : non-written disclosure<br/>P : intermediate document<br/>T : theory or principle underlying the invention</td><td>E : earlier patent document, but published on, or after the filing date<br/>D : document cited in the application<br/>L : document cited for other reasons<br/>-----<br/>&amp; : member of the same patent family, corresponding document</td></tr></table> |                                                                                                                                                                                                                                   |                                                |                                               | <b>CATEGORY OF CITED DOCUMENTS</b><br>X : particularly relevant if taken alone<br>Y : particularly relevant if combined with another document of the same category<br>A : technological background<br>O : non-written disclosure<br>P : intermediate document<br>T : theory or principle underlying the invention | E : earlier patent document, but published on, or after the filing date<br>D : document cited in the application<br>L : document cited for other reasons<br>-----<br>& : member of the same patent family, corresponding document |
| <b>CATEGORY OF CITED DOCUMENTS</b><br>X : particularly relevant if taken alone<br>Y : particularly relevant if combined with another document of the same category<br>A : technological background<br>O : non-written disclosure<br>P : intermediate document<br>T : theory or principle underlying the invention                                                                                                                                                                                                                                                                                          | E : earlier patent document, but published on, or after the filing date<br>D : document cited in the application<br>L : document cited for other reasons<br>-----<br>& : member of the same patent family, corresponding document |                                                |                                               |                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                   |