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㉝ **Zinc-containing metal-plated composite steel article and method of producing the same.**

㉞ A zinc-containing metal-plated composite steel article having an enhanced paint-coating property has 0.3 to 3.0 g/m<sup>2</sup> of a zinc phosphate composite coating layer formed on a zinc-containing metal-plated steel substrate by a cathodic electrolysis treatment or a first chemical conversion treatment and including zinc and phosphorus in a weight ratio Zn/P of 2.504 :1 to 3.166 :1 and 0.06 to 9.0% by weight of Fe, Co, Ni, Ca, Mg and/or Mn, and a phosphate chemical conversion layer formed on the composite coating layer by a second chemical conversion treatment and including fine phosphate crystals.

**EP 0 653 502 A3**



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# EUROPEAN SEARCH REPORT

Application Number  
EP 94 30 8277

| 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.6)                               |
| X                                                                                                                                                                                                                                                      | EP-A-0 454 361 (NIPPON PAINT)<br>* page 12, line 15 - page 13, line 14;<br>claim 1; table 1 *<br>---                                                                                                | 10-12, 14                                                                                                                                                                                                                                                                             | C23C22/73<br>C23C22/36<br>C25D11/36<br>C23C22/18<br>C23C22/22<br>C23C22/13 |
| X                                                                                                                                                                                                                                                      | GB-A-2 138 844 (PYRENE CHEMICAL SERVICES)<br>* page 2, column 42 - page 3, column 22;<br>claims 1-6 *<br>---                                                                                        | 10-12, 14                                                                                                                                                                                                                                                                             |                                                                            |
| X                                                                                                                                                                                                                                                      | WO-A-92 17628 (HENKEL KOMMANDITGESELLSCHAFT AA)<br>* claims 1-9; tables 1, 2 *<br>---                                                                                                               | 8, 9                                                                                                                                                                                                                                                                                  |                                                                            |
| P, X                                                                                                                                                                                                                                                   | DE-A-42 41 134 (HENKEL KGAA)<br><br>* page 4, line 65 - page 5, line 11; claim 1; table 2 *<br>---                                                                                                  | 1-5, 7,<br>10, 11,<br>15, 16                                                                                                                                                                                                                                                          |                                                                            |
| A                                                                                                                                                                                                                                                      | PATENT ABSTRACTS OF JAPAN<br>vol. 10, no. 71 (C-334) (2128) 20 March 1986<br>& JP-A-60 211 080 (NIPPON PAINT) 23 October 1985<br>* abstract *<br>---                                                | 8, 9                                                                                                                                                                                                                                                                                  | TECHNICAL FIELDS SEARCHED (Int.Cl.6)<br><br>C23C<br>C25D                   |
| A                                                                                                                                                                                                                                                      | FR-A-2 026 749 (HOOKER CHEMICAL CORP.)<br>* page 8, line 1 - page 9, line 27; claims 1-6 *<br>---                                                                                                   | 10-14                                                                                                                                                                                                                                                                                 |                                                                            |
| A                                                                                                                                                                                                                                                      | METALLOBERFLACHE,<br>vol. 44, no. 10, 1 October 1990, MUNCHEN DE<br>pages 485 - 489, XP205144<br>GEHMECKER H. 'Triktion-Phosphatierung von Aluminium, Stahl und Zink'<br>* table 1 *<br>---<br>-/-- | 1                                                                                                                                                                                                                                                                                     |                                                                            |
| The present search report has been drawn up for all claims                                                                                                                                                                                             |                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                       |                                                                            |
| Place of search<br>THE HAGUE                                                                                                                                                                                                                           |                                                                                                                                                                                                     | Date of completion of the search<br>8 June 1995                                                                                                                                                                                                                                       | Examiner<br>Torfs, F                                                       |
| CATEGORY OF CITED DOCUMENTS<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 |                                                                                                                                                                                                     | T : theory or principle underlying the invention<br>E : earlier patent document, but published on, or after the filing date<br>D : document cited in the application<br>I : document cited for other reasons<br>.....<br>& : member of the same patent family, corresponding document |                                                                            |

EPO FORM 1503 01.82 (P04C01)



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# EUROPEAN SEARCH REPORT

Application Number  
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| DOCUMENTS CONSIDERED TO BE RELEVANT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                          |                                                 |                                              |
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| Category                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Citation of document with indication, where appropriate, of relevant passages                                                                                                            | Relevant to claim                               | CLASSIFICATION OF THE APPLICATION (Int.Cl.6) |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | PATENT ABSTRACTS OF JAPAN<br>vol. 5, no. 195 (C-83) (867) 11 December 1981<br>& JP-A-56 119 780 (NITSUSHIN SEIKOU) 19 September 1981<br>* abstract *                                     |                                                 |                                              |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | ---<br>PATENT ABSTRACTS OF JAPAN<br>vol. 9, no. 153 (C-288) (1876) 27 June 1985<br>& JP-A-60 029 476 (NIPPON PAINT) 14 February 1985<br>* abstract *                                     |                                                 |                                              |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | ---<br>CHEMICAL ABSTRACTS, vol. 111, no. 26, 25 December 1989, Columbus, Ohio, US; abstract no. 242606e,<br>OTA T. 'SURFACE TREATMENT OF METAL FOR CORROSION RESISTANCE'<br>* abstract * |                                                 |                                              |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | & JP-A-1 127 697 (OTA T.) 19 May 1989                                                                                                                                                    |                                                 | TECHNICAL FIELDS SEARCHED (Int.Cl.6)         |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | ---<br>CHEMICAL ABSTRACTS, vol. 113, no. 18, 29 October 1990, Columbus, Ohio, US; abstract no. 161218,<br>OTA T. 'Phosphating by cathodic treatment'<br>* abstract *                     |                                                 |                                              |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | & JP-A-2 153 098 (OTA T.) 12 June 1990<br>-----                                                                                                                                          |                                                 |                                              |
| The present search report has been drawn up for all claims                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                          |                                                 |                                              |
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