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**Datasheet for the decision  
of 25 January 2018**

**Case Number:** T 0738/14 - 3.2.03

**Application Number:** 02258241.5

**Publication Number:** 1318214

**IPC:** C23C22/46, C23C22/47

**Language of the proceedings:** EN

**Title of invention:**

Processing solution for forming hexavalent chromium free and corrosion resistant conversion film on zinc or zinc alloy plating layers, hexavalent chromium free and corrosion resistant conversion film, method for forming the same

**Patent Proprietor:**

DIPSOL CHEMICALS CO., LTD.

**Opponent:**

Jenkins, Peter David

**Headword:**

**Relevant legal provisions:**

EPC Art. 56

RPBA Art. 13(3)

**Keyword:**

Inventive step - (yes)

Late-filed request - admitted (yes)

**Decisions cited:**

**Catchword:**



**Beschwerdekammern**  
**Boards of Appeal**  
**Chambres de recours**

Boards of Appeal of the  
European Patent Office  
Richard-Reitzner-Allee 8  
85540 Haar  
GERMANY  
Tel. +49 (0)89 2399-0  
Fax +49 (0)89 2399-4465

Case Number: T 0738/14 - 3.2.03

**D E C I S I O N**  
**of Technical Board of Appeal 3.2.03**  
**of 25 January 2018**

**Appellant:**  
(Patent Proprietor)

DIPSOL CHEMICALS CO., LTD.  
3-2-17, Kyobashi,  
Chuo-ku  
Tokyo (JP)

**Representative:**

Bawden, Peter Charles  
Bawden & Associates  
4 The Gatehouse  
2 High Street  
Harpenden, Hertfordshire AL5 2TH (GB)

**Appellant:**  
(Opponent)

Jenkins, Peter David  
Page White & Farrer  
Bedford House  
John Street  
London WC1N 2BF (GB)

**Representative:**

Jenkins, Peter David  
Page White & Farrer  
Bedford House  
John Street  
London WC1N 2BF (GB)

**Decision under appeal:**

**Interlocutory decision of the Opposition  
Division of the European Patent Office posted on  
11 March 2014 concerning maintenance of the  
European Patent No. 1318214 in amended form.**

**Composition of the Board:**

**Chairman**            G. Ashley  
**Members:**            B. Miller  
                             E. Kossonakou

## Summary of Facts and Submissions

I. European patent No. 1 318 214 relates to a processing solution for forming a hexavalent chromium free and corrosion resistant conversion film on zinc or zinc alloy plating layers.

II. An opposition was filed against the patent, based on the grounds of

- a) Article 100(b) EPC and
- b) Article 100(a) EPC both on account of Article 54 and of Article 56 EPC.

In its interlocutory decision the opposition division found that the contested patent met the requirements of the EPC on the basis of the claims of auxiliary request 2 submitted during the oral proceedings on 11 February 2014.

III. This decision was appealed by both parties. As the proprietor and the opponent are both appellants and respondents in the present proceedings, for simplicity, the Board will continue to refer to the parties as the proprietor and the opponent.

IV. State of the art

The following documents cited during the opposition proceedings are of particular importance for the present decision:

- D1: US-B-6 287 704;
- D6: US-A-5 368 655;

Annex 2: Declaration of Mr. Manabu Inoue submitted on 14 July 2014.

V. With the summons to oral proceedings, the Board sent a communication pursuant to Articles 15(1) and 17(2) of the Rules of Procedure of the Boards of Appeal (RPBA) indicating to the parties its preliminary opinion of the case.

VI. In the course of the oral proceedings, which took place on 25 January 2018, the proprietor filed a third auxiliary request and withdrew all previous requests.

Therefore, at the end of the oral proceedings, the proprietor requested that the patent be maintained on the basis of claims 1 to 3 filed as the third auxiliary request.

The opponent requested that the decision under appeal be set aside and the patent be revoked in its entirety.

VII. Claim 1 filed as the third auxiliary request is based on claim 8 as granted and reads as follows:

"Zinc or zinc alloy plating layers comprising a hexavalent chromium free, corrosion resistant, trivalent chromate conversion film containing zinc, trivalent chromium, cobalt and oxalic acid ion and formed on the zinc or zinc alloy plating layers, wherein the mass ratio of trivalent chromium to (trivalent chromium + zinc)  $[Cr/(Cr + Zn)]$  is not less than 15/100, the mass ratio of cobalt to (trivalent chromium + cobalt)  $[Co/(Cr + Co)]$  ranges from 5/100 to 40/100 and the mass ratio of the oxalic acid ion to (trivalent chromium + oxalic acid ion)  $[oxalic\ acid\ ion/(Cr + oxalic\ acid\ ion)]$  ranges from 5/100 to 50/100."

Claims 2 to 3 relate to preferred embodiments of the zinc or zinc alloy plating layers according to claim 1.

VIII. The arguments of the proprietor can be summarised as follows.

The third auxiliary request filed during oral proceedings could be easily dealt with by the opponent and the Board, since claims 1 to 3 of the request in principle corresponded to claims 8 to 10 as granted. Therefore the request should not be held inadmissible by the Board.

Starting from D6 as the closest prior art it was not obvious that the corrosion resistance of zinc platings could be improved by providing a conversion film as defined in claim 1. D6 disclosed processing solutions for providing a passivation film on zinc but did not disclose the specific composition of the film. Moreover, D6 did not teach the skilled person that by incorporating cobalt ions into the conversion film, the anti-corrosion properties could be improved. This missing teaching was also not derivable from D1.

IX. The respective arguments of the opponent can be summarised as follows.

The third auxiliary request was filed very late in the appeal proceedings. The request could have been filed earlier, in particular with the response to the opponent's statement of appeal since it corresponded to auxiliary request 5 which had been filed during opposition proceedings. The late-filed request changed the focus of discussion from a processing solution to a plated zinc product and therefore unexpectedly changed

the case. It should thus be held inadmissible by the Board.

D6 disclosed, in example 2, processing solutions comprising Cr(III) ions and oxalate in amounts similar to those used in the examples of the contested patent. Adding cobalt ions as taught by D1 (example 3) into the processing solutions proposed by D6 was obvious for the skilled person. Adjusting the amounts of oxalic acid in the compositions exemplified in D6 was within the usual experimental routine of the skilled person when following the teaching derived from claims 3, 11 and 12 of D6.

Using the treatment conditions as suggested by D6, comprising the addition of a cobalt salt, inevitably provided a conversion film as defined in claim 1, as shown by the experimental evidence provided by the proprietor in table 7 of the contested patent and in Annex 2.

Therefore the plated zinc product according to claim 1 was obvious, since it was inherently obtained by using a processing solution which was obvious in view of D6 and D1.



## **Reasons for the Decision**

### 1. Admissibility of the third auxiliary request

The proprietor filed the third auxiliary request during the oral proceedings on 25 January 2018.

The opponent argues that the third auxiliary request corresponds to auxiliary request 5, which had been filed in opposition proceedings but not during the written appeal procedure. In his view, this request could and should have been filed at the latest with the reply to the appeal by the opponent.

The Board observes that claims 1 to 3 correspond to claims 8 to 10 as granted which were present in this wording in all previous requests discussed during the appeal proceedings. The remaining claims as granted have been deleted and are not present in the set of claims according to the third auxiliary request.

The deletion of claims which had been objected to by the opponent cannot come as a surprise. The Board also sees no reason as to why the filing of the restricted set of claims should be regarded as an abuse of procedure.

The Board further takes the view that the filing of a set of claims having a restricted number of independent claims cannot increase the complexity of the case.

Furthermore, claims 8 to 10 of the patent as granted had been discussed in the written appeal proceedings by both parties. Therefore the case to be discussed with

respect to these claims is not changed by filing a request limited to them, and the parties could be expected to be prepared to discuss further these claims during oral proceedings.

The Board therefore admits into the proceedings the third auxiliary request exercising its discretion under Article 13(3) RPBA.

2. Article 56 EPC

2.1 Both parties identify D6 as a suitable starting point for the discussion on inventive step.

D6 describes solutions for passivating zinc plating alloys containing Cr(III) oxalate (see col. 2, lines 44 to 68), and hence deals in general with the same technical problem as the contested patent.

The Board therefore sees no reason to deviate from the assessment of the parties.

2.2 Example 1 of D6 discloses various concentrates comprising Cr(III) and oxalic acid. According to example 2, 40 ml of the concentrate are diluted to form the processing solution. Based on the amounts presented in table 1 with respect to the concentrate, the amount of oxalic acid present in the processing solution can be calculated to be from about 0.5 to 6 g/L (12.9 g/L to 155 g/L in the concentrate).

Example 2 further describes that zinc plated panels are dipped for 30 to 60 seconds into one of the processing solutions having a pH from 1.4 to 2.5, rinsed and dried with compressed air.

Thereby zinc plating layers comprising a hexavalent chromium free, corrosion resistant, trivalent chromate conversion film are formed.

2.3 The specific mass ratios of the compounds present in the conversion film are not disclosed in D6. Moreover, the processing solutions used according to example 2 of D6 do not contain cobalt ions.

2.4 Therefore the subject-matter of claim 1 differs from the zinc plating layers disclosed in D6 in that

- the conversion film contains in addition to zinc, trivalent chromium, oxalic acid and cobalt, wherein
- the mass ratio of trivalent chromium to (trivalent chromium + zinc)  $[Cr/(Cr + Zn)]$  is not less than 15/100,
- the mass ratio of cobalt to (trivalent chromium + cobalt)  $[Co/(Cr + Co)]$  ranges from 5/100 to 40/100 and
- the mass ratio of the oxalic acid ion to (trivalent chromium + oxalic acid ion)  $[oxalic\ acid\ ion/(Cr + oxalic\ acid\ ion)]$  ranges from 5/100 to 50/100.

2.5 Comparative example 2 of the contested patent demonstrates that the addition of cobalt ions into the conversion film enhances the corrosion resistance of zinc.

Annex 2 further demonstrates in the tables on page 4 that a higher amount of cobalt in the conversion layer, resulting in a higher ratio of cobalt to (trivalent

chromium + cobalt)  $[Co/(Cr + Co)]$ , provides an enhanced anti-corrosion effect.

2.6 The objective technical problem to be solved by claim 1 can therefore be regarded as the provision of zinc or zinc alloy plating layers having enhanced anti-corrosion protection.

2.7 D1 is also a document relating to chromate-free conversion layers on zinc plating layers (see claim 1), and therefore would be consulted by the skilled person being confronted with the underlying technical problem.

D1 teaches in example 3 (column 11, lines 22 to 31):

"Cobalt is an element which is capable, in accordance with the model concept of catalysing ligand replacement and moreover reducing reverse reaction II owing to insertion of kinetically stable oxides into the chromate layer , .... Corrosion protection could once more clearly be enhanced in comparison with Example 3 by nothing but the addition of cobalt into the chromate coating solution".

The enhancement of the anti-corrosion property by addition of cobalt is described in example 3 of D1 in the context of a conversion layer comprising  $Cr^{3+}$  and malonic acid as a complexing ligand.

D1 further states in column 6, lines 7 to 11 that oxalic acid and malonic acid are alternative chelating ligands. Consequently it can be expected by the skilled person that the effect described in example 3 with respect to a processing solution comprising malonic acid would also be achieved by an alternative solution comprising oxalic acid instead of malonic acid.

Therefore the Board accepts that the skilled person starting from D6 would expect that the addition of cobalt increases the corrosion resistance of a conversion layer comprising a complex ligand on zinc when considering in addition the teaching of example 3 of D1.

2.8 However, neither D1 nor D6 describe the content of the compounds being present in the conversion layer.

In the absence of any teaching concerning the composition of the conversion layer achieved by the processing solutions disclosed in D6 or D1, the skilled person has no motivation to combine the teaching of D6 and D1 in a manner that would result in a zinc plating layer comprising a conversion film comprising the various compounds in the mass ratios as defined in claim 1.

The subject-matter of claim 1 is therefore not obvious when starting from D6.

2.9 The opponent argues that the zinc plating defined in claim 1 is inherently obtained when treating a zinc plating with a processing solution as proposed by D6, which comprises in addition cobalt ions in the amounts as proposed by example 3 of D1. As evidence for this allegation, reference was made to table 7 of the contested patent.

2.10 Table 7 confirms that processing solutions according to examples 6 to 10 result in a conversion film as defined in claim 1 of the third auxiliary request when a zinc plating layer is immersed into the solution having a pH of 2.2 for 40 seconds at 30°C.

The conditions for the immersing step used according to the examples of the contested patent are thus similar to the conditions used in example 2 of D6.

However, the processing solution obtained by combining the teaching of example 2 of D6 and example 3 of D1 differs from the solutions of examples 6 to 10 of the contested patent at least in that oxalic acid and Cr(III) are present in substantially lower concentrations and in a different mass ratio.

In more detail, the concentration of the oxalic acid used according to examples 6 to 10 is 12 g/L and thus is higher than the concentration of oxalic acid according to example 2 of D6, which is from about 0.5 to 6 g/L.

Cr(III) is present in the processing solution of examples 6 to 10 of the contested patent in an amount of 4 g/L. The corresponding amount in the processing solution disclosed in D6 can be determined to be 0.86 g/L by, for example, using the following calculation based on four of the solutions disclosed in example 2:

Table 1 of D6 discloses concentrates comprising oxalic acid and Cr(III) in a molar ratio of 0.75, 1, 1.5 and 2. 40 ml of the respective concentrates are added to one liter of water (example 2). From the concentration of oxalic acid present in the concentrates (see Table 1: 0.31, 0.41, 0.62, 0.82 mol/L), the molar concentrations of oxalic acid in the processing solutions of D6 can be deduced to be 0.0124 mol/L, 0.0164 mol/L, 0.0248 mol/L and 0.0328 mol/L respectively. Further, taking into account the oxalic acid/Cr(III) molar ratio (0.75, 1, 1.5 and 2) of each

processing solution, the concentration of Cr(III) in each processing solution can be calculated (molar mass of Cr is 52 g/mol):

$$\begin{aligned} 0.0124 \text{ mol/L} / 0.75 &= 0.0165 \text{ mol/L} \triangleq 0.86 \text{ g/L} \\ 0.0164 \text{ mol/L} / 1 &= 0.0164 \text{ mol/L} \triangleq 0.86 \text{ g/L} \\ 0.0248 \text{ mol/L} / 1.5 &= 0.0165 \text{ mol/L} \triangleq 0.86 \text{ g/L} \\ 0.0328 \text{ mol/L} / 2 &= 0.0164 \text{ mol/L} \triangleq 0.86 \text{ g/L} \end{aligned}$$

- 2.11 Since the concentration of oxalic acid and Cr(III) inevitably has an impact on the composition of the conversion film, in particular on the amount of oxalic acid and Cr(III) therein, it cannot be concluded that a zinc plating layer as defined in claim 1 is inherently achieved by following the teaching of example 2 of D6, even when adding Co as proposed by example 3 of D1.

Therefore the Board does not agree with the argument of the opponent that a conversion layer according to claim 1 is inherently formed when following the combined teachings of D6 and D1.

In the absence of any disclosure concerning the composition of the conversion layer achieved by the processing solutions disclosed in D6 or D1, the skilled person has no motivation to modify further the processing solutions described in the examples of D6, for example by increasing the concentration of oxalic acid, in order to achieve a zinc plating layer comprising a conversion film comprising the various compounds in the mass ratios as defined in claim 1.

- 2.12 In summary, the Board reaches the conclusion that the subject-matter of claim 1 fulfils the requirements of Article 56 EPC.

3. Adaptation of the description

Both parties requested remittal of the case for adaptation of the description. The Board sees no reason not to comply with this request.



## Order

### For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the opposition division with the order to maintain the patent on the basis of claims 1 to 3 filed as the third auxiliary request in the oral proceedings before the Board and a description and drawings to be adapted thereto.

The Registrar:

The Chairman:



C. Spira

G. Ashley

Decision electronically authenticated