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D E C I S I O N
of 8 October 2002

Case Number: T 0536/00 - 3.4.2
Application Number: 93101305.6
Publication Number: 0554793
IPC: C25D 1/04, C25D 17/10
Language of the proceedings: EN

Title of invention:

Electroplating method and apparatus for the preparation of metal foil and split insoluble electrode used therein

Patentee:

TDK Corporation

Opponent:

Corus Staal BV

Headword:

-

Relevant legal provisions:

EPC Art. 56

Keyword:

"Inventive step (yes)"
"Admissibility of late-filed amendment (yes, replacement of a feature contested by the appellant under Art 123(2))"

Decisions cited:

-

Catchword:

-



Case Number: T 0536/00 - 3.4.2

D E C I S I O N
of the Technical Board of Appeal 3.4.2
of 8 October 2002

Appellant: TDK, Corporation
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Respondent: Corus Staal BV
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Decision under appeal: Decision of the Opposition Division of the
European Patent Office posted 17 March 2000
revoking European patent No. 0 554 793 pursuant
to Article 102(1) EPC.

Composition of the Board:

Chairman: E. Turrini
Members: A. G. Klein
B. J. Schachenmann

Summary of Facts and Submissions

I. European patent No. 0 554 793 (application number 93 101 305.6) was revoked following an opposition founded on the ground under Article 100(a) EPC that its subject-matter was not patentable in view of the contents of documents

D1: US-A-4 318 794; and

D2: US-A-4 119 515.

In its decision revoking the patent the opposition division held that it was not inventive to construct a segmented anode of the type of the patent in suit such that there is a minimum gap between the individual segments. The skilled person would be aware that an exceedingly large gap would firstly sacrifice active plating surface and secondly impair the flow of the electrolyte, whilst the minimum possible gap was dictated by mechanical requirements (see, point 2.2(b) of the Reasons).

II. The appellant (proprietor of the patent) filed an appeal against the opposition division's decision.

III. Oral proceedings were held on 8 October 2002 at which the appellant requested that the decision under appeal be set aside and that, according to its main request, the patent be maintained in amended form on the basis of independent claims 1, 5 and 7 filed as main request with letter of 2 October 2002, which reads as follows:

"1. An electroplating method comprising the steps of

- placing a rotating cathode drum and a stationary anode at a predetermined spacing therebetween,
- providing an electroplating solution containing a metal between the cathode drum and the anode,
- conducting electricity between the cathode drum and the anode for depositing the metal on the cathode drum, and
- separating the metal deposit from the cathode drum, obtaining a length of electrolytic metal foil,

wherein

said anode includes 3 to 100 of circumferentially arranged electrode segments formed of a valve metal substrate coated with a platinum group metal or an oxide thereof and a back plate,

said electrode segments are removably attached and electrically connected to said back plate,

said electrode segments are short, almost planar segments,

said electrode segments on their surface facing the cathode drum are separated by a gap of 0.1 to 5 mm,

said segments extend substantially parallel to the axis of the drums, and the electrode has an included angle of 45° to 120°, and

electricity is supplied to the anode from the back plate side.

5. A split insoluble anode which is placed around a rotating cathode drum to define a channel therebetween which is filled with an electroplating solution containing a metal whereby the metal is deposited on the cathode drum to form a metal foil which is separated from the drum,
 - said anode including a plurality of circumferentially arranged electrode segments formed of a valve metal substrate coated with a platinum group metal or an oxide thereof, a back plate, and conductive fixtures for removably attaching said electrode segments to said back plate,

wherein

said anode includes 3 to 100 electrode segments,

said electrode segments are short, almost planar segments,

said electrode segments on their arcuate surface are separated by a gap of 0.1 to 5 mm,

said segments extend substantially parallel to the axis of the drum, and the electrode has an included angle of 45° to 120°.

7. An electroplating apparatus comprising

- a cathode drum adapted to rotate about an axis,
- a stationary anode disposed around the cathode drum to define a channel therebetween, said anode includes 3 to 100 circumferentially arranged electrode segments of a valve metal material coated with a platinum group metal or an oxide thereof, a back plate, said electrode segments are removably attached and electrically connected to said back plate, said electrodes are short, almost planar segments, said electrode segments on their surface facing the cathode drum are separated by a gap of 0.1 to 5 mm, said segments extend substantially parallel to the axis of the drums, and the electrode has an included angle of 45° to 120°,
- means for supplying an electroplating solution containing a metal to the channel between the cathode drum and the anode,
- means for conducting electricity between the cathode drum and the anode for depositing the metal on the cathode drum from the back plate side, and
- means for separating the metal deposit from the cathode drum, obtaining a length of electrolytic metal foil."

As auxiliary requests I to III the appellant requested that the patent be maintained in amended form on the basis of three further sets of independent claims corresponding to the independent claims of the main request, with additional limitations.

The respondent (opponent) did not attend the oral proceedings, in conformity with the announcement made in its response of 6 September 2002 to the summons. It had requested in writing that the appeal be dismissed and that the appellant's late filed main and auxiliary requests as submitted with the letter of 2 October 2002 not be admitted into the procedure.

The Board announced its decision at the end of the oral proceedings.

IV. The appellant's arguments in support of its requests can be summarized as follows:

The invention relates to an electroplating method and apparatus of the type in which an electrodeposited foil is continuously produced by deposition of a metal on a cylindrical cathode which is rotated about a horizontal axis and partly submerged into an electrolyte, and it addresses the technical problem of reducing thickness variations in a transverse direction of the deposited foil.

This problem is solved by providing a predetermined gap of 0.1 to 5 mm between adjacent electrode segments. As evidenced by the experimental report filed on 21 January 2000 before the opposition division, such minimal gap results in a noticeable reduction of the thickness variation in a transverse direction as compared to the thickness variations observed with either a smaller or a larger gap. The positive influence of a gap can be explained by the resulting increase of the number of edges or of the overall edge length on the anode surface, which mitigates the concentration of current density at the outer edges of

the anode plates as is observed on one-piece anode. Such current concentration causes local wear of the catalytic coating of the latter and thus thickness variations in a transverse direction during continuous operation of the apparatus.

None of documents D1 or D2 addresses the problem of controlling thickness variations in electrodeposited foils and none of them suggests that gaps of a predetermined width between adjacent anode segments might have any influence whatsoever on such thickness variations

- V. The respondent for its part first submitted that the appellant's requests should not be admitted into the procedure because they had been filed later than one month before the oral proceedings, which is after expiry of the time limit for the filing of new submissions or requests set by the Board in the communication attached to the summons.

In respect of the feature of the claims relating to the presence of a gap of 0.1 to 5 mm separating the anode segments on the surface facing the cathode drum the respondent in its written submissions merely stated that it agreed with the remarks made by the opposition division concerning both the merits of the claimed gap dimensions and the experimental report filed by the appellant. For supplementary arguments it referred to its letter of 8 February 2000 as filed during the opposition procedure (see the respondent's response of 1 December 2000 to the appellant's statement of the grounds of appeal, the second paragraph of page 2). In the letter of 8 February 2000 the respondent had submitted that a tolerance of 0.1 to 0.15 mm was a

typical fine-grade tolerance for anode segments of the required width and that the skilled person would necessarily have allowed for a designed of gap at least as wide as such tolerance. The additional effect brought forward by the proprietor was thus inevitably achieved by the skilled person as a result of an obvious measure. Such inevitable "bonus" effect could not substantiate inventive step, even as a surprising effect.

Reason for the Decision

1. The appeal is admissible.
2. *Appellant's main request*
 - 2.1 Admissibility into the procedure of the amended claims

Independent claims 1, 5 and 7 of the appellant's main request were filed as main request with the letter dated 2 October 2002 of which a fax copy arrived at the EPO at the end of the same day, which is only three full working days before the oral proceedings of 8 October 2002.

However, the so amended independent claims only differ from the independent claims filed by the appellant with its letter of 12 September 2001 in that the indication of the number of electrode segments forming the anode was changed from "3 to 10" to "3 to 100". These amendments were clearly made in order to overcome the respondent's objection in its letter dated 6 September 2002 that the value of 10 electrode segments had been disclosed in the original patent application documents

only as an example in the disclosed range of from 3 to 100, not as a preferred upper limit for a range of 3 to 10 and that the claims therefore contravened the provisions of Article 123(2) EPC (see the respondent's letter of 6 September 2002, page 2, the third to fifth paragraphs).

The amended definition of the range for the number of electrode segments in the claim filed shortly before the oral proceedings thus overcomes the respondent's objections under Article 123(2) EPC. It does not however improve the status of the independent claims in respect of their patentability, because a number of electrode segments in the present range of 3 to 100 can be derived from the teaching of the closest prior art document D1 (see the numerical values given on column 6, lines 20 to 58), as was correctly pointed out in the respondent's letter dated 4 October 2002, a fax copy of which reached the EPO the date before the oral proceedings. This letter also shows that the appellant's late amendments could be both duly considered and properly evaluated by the respondent.

For these reasons, the amended version of the independent claims in accordance with the appellant's main request can be admitted into the procedure in spite of its late filing.

2.2 Compliance of the amended documents with the requirements of Articles 123(2) and (3) EPC

As compared to the independent claims as granted, independent claims 1, 5 and 7 were supplemented with an indication that the "plurality" of circumferentially arranged electrode segments encompasses "3 to 100" such

electrode segments, which is the preferable range disclosed originally on page 8, lines 26 to 30 of the application documents.

In addition, the amended independent claims 1 and 7 also specify that electricity is supplied to the anode from the back plate side, in accordance with the corresponding statement on page 10, lines 31 to 35 of the description as originally filed.

Since these amendments also clearly restrict the scope of the claims, they comply with the requirements of Article 123(2) and (3) EPC.

2.3 Novelty

Novelty of the subject-matter of independent claims 1, 5 and 7 was not disputed by the respondent.

Document D1 does not indeed reveal any detail of the precise mutual arrangement of the individual electrode segments of the rotative electroplating apparatus described there.

Document D2 does not relate to electroplating using a rotatable cathode drum. The electroplating apparatus described there comprises flat, vertically mounted electrodes which are not segmented in a direction transverse to the movement of the deposited foil (see Figures 1 and 2).

2.4 Inventive step

2.4.1 The electroplating method of independent claim 1, the split insoluble anode of independent claim 5 and the

electroplating apparatus of independent claim 7 all differ from the method and apparatus described in document D1, which undisputedly comes closer to the subject-matter of the patent than the apparatus described in document D2, *inter alia* in that the individual electrode segments are separated by a gap of 0.1 to 5 mm on the surface facing the cathode drum.

- 2.4.2 The appellant in this respect submitted that the presence of a minimal gap between adjacent anode elements increased the number of edges or the overall edge length on the anode surface, thereby blurring the edge effect and achieving a more uniform current flow distribution. This feature also reduced the increase with time of the edge effect during continuous operation and thus extended the life of the electrode segments (see also column 4, lines 14 to 23 of the specification of the patent in suit).

The Board has no reason to question this submission, which is supported by the experimental report filed during the opposition procedure with letter of 21 January 2000. The table of this experimental report indeed shows that the thickness variation is several times greater for a gap of 0.05 mm than for gaps of 0.4 mm and more.

The Board cannot in particular concur with the doubts raised by the opposition division against the conclusiveness of the experimental report in the decision under appeal, where it indicates that

"It is against all logic when it is reported that a very small gap, such as 0.05 mm, results in a thickness variation of 2-3%, compared with < 1 % for a broader

gap of 2 mm. One would expect any effect of gap size to decrease with the gap width and to become zero for zero gap width, corresponding to a single-piece electrode. The fact that the Experimental Report by Yukio Kawashima, filed with letter of 21.1.2000, shows otherwise is a clear indication that there must have been other factors which were apparently outside the control of the experimenter" (see page 5 of the decision, the first paragraph).

The fact that experimental results do not meet the skilled person's expectations, which would normally rather indicate the presence of an inventive step, cannot indeed *per se* justify that an experimental report be considered as not being conclusive.

- 2.4.3 Since neither of documents D1 and D2 actually provides any indication that the presence of a gap of a definite width between adjacent electrode segments reduces thickness variations of the electrodeposited foil in the transverse direction, the skilled person in the Board's view had no obvious reason to provide such gap in the expectation of an improvement of the product obtained by the method and apparatus of document D1.

The respondent submitted that the claimed range for the gap width between adjacent electrode segments automatically resulted from the necessity, on the one hand, to provide sufficient clearance between elements to allow for proper positioning and assembly, and on the other hand to avoid sacrificing too much active plating surface or impairing the flow of the electrolyte.

This reasoning in the Board's view is tainted with

hindsight. The construction of document D1 would not indeed appear to pose any assembly problem which would call for the provision of a predefined clearance between adjacent electrode elements. As shown in Figure 2 and stressed in column 7, lines 23 to 29, the anode elements shown there comprise a "foraminous expanded metal structure in which a sheet of metal is slit with parallel slits and is then subject to edgewise force to open the slits into diamond-shaped openings 60 separated by relatively narrow strips of metal 62". In addition, and contrary to the structure described in the patent in suit and tested in the appellant's experimental report in which solid electrode segments are applied directly upon the surface of a back plate, the grid-like electrode structure of document D1 is mounted at a distance from back plate 34 via any convenient means such as bolts or standoffs 38 (see column 5, lines 44 to 48 and Figure 1).

In view of the grid-like structure of the electrode segments and of their spacing from the rigid back plate 34, which would both appear to impart relative flexibility or deformability to the whole assembly, the Board cannot see why maintenance of a definite clearance between adjacent electrode segments should be an obvious necessity.

Quite on the contrary, document D1 in conjunction with Figure 6 describes an alternative embodiment using a single, one-piece anode in which contiguous strips are defined by merely forming bend lines so as to improve the rigidity of the anode and reduce the labour involved in installation and removal of the electrode, due to the smaller number of pieces which must be

handled as compared to the embodiment in which the electrode comprises individual segments (see column 8, line 61 to column 9, line 7). This teaching in effect leads away from the claimed provision of definite gaps between adjacent electrode segments.

Document D2 describes an electroplating apparatus having a generally flat rectangular anode including anode segments extending in closely spaced relation and electrically insulated from one another so as to allow for independent electrical energisation of the respective anode segments (see claim 1 and Figure 3). In this apparatus the gaps of a non specified width between adjacent anode segments are aimed only at an electrical insulation of these segments so that it becomes possible to electroplate strips of various widths (see column 1, lines 23 to 33 and the second sentence of the abstract).

The arrangement of the individual electrode segments in the closest prior art apparatus of document D1 would not however allow for the production of electroplated strips of different widths, even if the anode segments were energised independently of each other, because the active length of each anode segment in the direction transverse to the movement of the sheet is constant. Accordingly, there would be no obvious reason for the skilled person striving at improving the prior art method and apparatus disclosed in document D1 to take into consideration the technical teaching of document D2 concerning the provision of a separation between adjacent anode segments.

2.4.4 For these reasons, the contents of documents D1 and D2 as cited by the respondent do not call into question

the patentability of the subject-matter of independent claims 1, 5 and 7.

The same holds true for the subject-matter of the remaining claims 2 to 4, 6 and 8 to 13 by virtue of the appendance to the above independent claims.

3. Since taking into consideration the amendments made to the patent, the patent and the invention to which it relates meet the requirements of the Convention, the patent shall be maintained as amended in accordance with the appellant's main request.

Accordingly the appellant's auxiliary requests need not be considered further.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the department of first instance with the order to maintain the patent as amended in the following version:
 - claims 1, 5 and 7 filed as main request with letter of 2 October 2002;
 - claims 2 to 4, 6 and 8 to 13 as granted;
 - description and drawings as in the granted patent.

The Registrar:

The Chairman:

P. Martorana

E. Turrini