BESCHWERDEKAMMERN DES EUROPÄISCHEN PATENTAMTS | BOARDS OF APPEAL OF THE EUROPEAN PATENT OFFICE | CHAMBRES DE RECOURS DE L'OFFICE EUROPEEN DES BREVETS

Internal distribution code:
(A) [ ] Publication in OJ
(B) [X] To Chairmen and Members
(C) [ ] To Chairmen

D E C I S I O N
of 10 December 1997

Case Number: T 0443/96 - 3.4.2

Application Number: 86105554.9

Publication Number: 207244

IPC: C25D 1/04

Language of the proceedings: EN

Title of invention:
Electrodeposited copper foil

Patentee:
Mitsui Mining & Smelting Co., Ltd.

Opponent:
Circuit Foil Luxembourg S.A.

Headword:
-

Relevant legal provisions:
EPC Art. 123(3), 123(2), 83, 84, 54, 56

Keyword:
"Main request: protection extended (no)"
"Subject-matter extended (no)"
"Sufficiency of disclosure (yes)"
"Clarity (yes)"
"Novelty (yes)"
"Inventive step (yes)"

Decisions cited:
G 0009/91, G 0010/91, T 0677/91

Europäisches Patentamt | European Patent Office | Office européen des brevets

Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 0443/96 - 3.4.2

D E C I S I O N
of the Technical Board of Appeal 3.4.2
of 10 December 1997

Appellant: (Proprietor of the patent)
Mitsui Mining & Smelting Co., Ltd.
1-1, 2 chome
Nihombashi-Muromachi
Chuo-ku
Tokyo (JP)

Representative:
Wilhelms, Kilian & Partner
Patentanwälte
Eduard-Schmid-Strasse 2
81541 München (DE)

Respondent: (Opponent)
Circuit Foil Luxembourg A.S.
Zone industrielle de Wiltz
9501 Wiltz (LU)

Representative:
Weyland, J. J. Pierre
Marks & Clerk
BP 1775
1017 Luxembourg (LU)

Decision under appeal: **Decision of the Opposition Division of the European Patent Office posted 4 March 1996 revoking European patent No. 0 207 244 pursuant to Article 102(1) EPC.**

Composition of the Board:

Chairman: M. Chomentowski
Members: A. Klein
M. Lewenton

Headnote:
with respect to a feature of an amended claim for maintaining a patent in amended form, said feature resulting from amendments of the application as filed made before grant of the patent and whereby no ground of opposition concerning the allowability of amendments was contained in the notice of opposition pursuant to Rule 55(c) EPC and no objection in this sense has been made during the opposition proceedings, the Board of Appeal may examine this point only with the approval of the patentee. However, the Board may not examine this point if patentee's arguments are convincing that, prima facie, these amendments of the application as filed are correctly based on the application as filed.

Summary of Facts and Submissions

I. The appellant is proprietor of European patent No. 0 207 244, which was granted with three claims on the basis of European patent application No. 86 105 554.9, claiming a priority of 1985. In the patent, the only independent claim and dependent claim 2 read as follows:

"1. A process for producing an electrodeposited copper foil which comprises:

electrolyzing a copper ion-containing electrolyte which consists of 50-100 g/l of copper ion and a member selected from the group consisting of 80-180 g/l of sulfuric acid, 5-50 g/l of hydrochloric acid, and a borofluoride in an amount corresponding to a pH value of 0,1-2,0, at least 60 vol.% of said electrolyte has been continuously treated with activated carbon by passing through an activated carbon column at a velocity of 5-100 cm/s, said electrolyte being continuously subjected to said electrolyzing step within 20 minutes after said treatment with activated carbon."

"2. A process according to claim 1, wherein the electrolyzing is carried out at an electrolyte temperature of 40-60°C, and at a current density of 30-120 A/dm^2."

II. The respondent filed an opposition against the patent on the grounds of lack of novelty having regard to D1 = "Electroforming Techniques", F. K. Savage et al., American Electroplater's Society, Proceedings of Educational Sessions of the 32d Annual Convention, June 1944, pages 173 to 192, and the general knowledge of the skilled person, and lack of an inventive step

having regard to the combination of D1, D2 = "The practical plating for on-the-spot technicians (1), compiled by Japan Plating Society, Publisher: Yoshida, 20 July 1983, and D3 = "Product Finishing", July 1983, pages 38 to 40. At a later stage, the opponent filed D4 = "Handbook of Metal Finishing Techniques", 7th edition, 1972, pages 278 to 283.

III. The patent was revoked.

The Opposition Division has reasoned as follows with respect to the claim as granted:

The method of claim 1 as granted was novel as compared to D1, because the concentration of sulfuric acid was somewhat lower than the range given in the claim, moreover, the production of foils and the velocity of the electrolyte passing through the activated carbon column were not mentioned explicitly in D1.

However, the production of a foil, according to the patent in suit, and electroforming according to D1 were considered as belonging to the same technical field, and the skilled person starting from D1 would find in his expertise the information needed to arrive at the method in dispute. In particular, purification of the electrolyte with activated carbon, mentioned in D1, was commonplace in electroplating industry, as see for instance D3. In a continuous process as shown in D1, the electrolyte was used immediately, thus within 20 minutes after treatment with activated carbon. The results of comparative measurements made by the opponent were considered as credible and were showing that the time limit of 20 minutes was technically meaningless. The Opposition Division stressed that particular effects mentioned by the proprietor for the treatment by the activated carbon, that is a reduction of ions of the electrolyte, was also obtained

automatically with prior method of this type. Therefore, the method of claim 1 in dispute did not involve an inventive step.

Incidentally, the decision also mentioned **insufficient disclosure**, objected by the opponent admittedly according to a late filed new ground of opposition; anyway, the Opposition Division considered that this requirement was satisfied, i.e. that for the skilled person there was enough information in the patent to carry out the invention.

IV. The patent proprietor lodged an appeal against this decision.

V. During the oral proceedings of 10 December 1997 which had been requested auxiliarily by the appellant, he filed in particular a new **main request** based on a text of claim 1 which, as compared with claim 1 as granted, additionally includes the word "continuous" inserted between "A" and "process for producing" and the features "the electrolyzing being carried out at an electrolyte temperature of 40-60°C and at a current density of 30-120 A/dm^2 whereby" inserted between "corresponding to a pH value of 0.1-2.0," and "at least 60 vol.% of said electrolyte". This request contains only one dependent claim based on granted claim 3.

VI. The appellant requested that the decision under appeal be set aside and that the patent be maintained in amended form on the basis of, in particular, claims 1 and 2 of its main request, the description to be amended and the drawings of the granted patent. He submitted the following arguments in support of his request:

Claim 1 of the main request has been restricted to continuous processes with continuous deposition of copper foils on a rotating cathode drum and to definite ranges of process temperature and current density which were specified in dependent claim 2 as granted.

Concerning the substitution of "consisting of" in the patent as granted and the main request for "comprising" which was in the original application, it is to be noted that the skilled reader received in the original application the teaching that, whereas the prior art processes used electrolytes with additives, no such additives were derivable from the whole content of this application and in particular from the examples for the process of the invention in spite of the unfortunate but isolated use of the word "comprising".

The closest prior art is represented by D1. However, this document of 1944 makes shortly reference for this technique to a teaching of 1933, the whole content of the document being however directed to electroplating for fabricating music instruments such as cornets and trumpet bells using electroforming. In particular, features mentioned in other parts of D1 are not directly and unambiguously derivable as being related to the technique of foil fabrication. Moreover, there are features of the claimed process which are not shown in D1. Therefore, the subject-matter of the main request is new.

Taking into account the date of this teaching of 1931 and the recognized excellent properties of the foils obtained by the process of the main request and the commercial success of said foils, the long time period between 1931 and the priority date of the patent in suit (1985) is an indication that it was not obvious to arrive at the process of the main request with its specific features although all of them in isolation

were known in the electroplating art, for instance also from D2 to D4. Therefore, the subject-matter of the main request involves an inventive step.

VII. The respondent requested that the appeal be dismissed and the patent be revoked and argued in substance as follows in support of his request:

Taking into account the specific teaching reported in D1 with respect to the continuous process of producing copper foils by electroforming and the numerous indications about parameters for electroplating techniques, either in general or for the fabrication of other specific objects, all taught in said same document, it can be concluded that the skilled person would have taken the known features and parameters for carrying out a process for fabricating foils or, if they were not directly indicated in D1, he would automatically have arrived at these features and parameters when carrying out said technique. Therefore, the subject-matter of the main request is not new.

Starting from the specific teaching reported in D1 with respect to the continuous process of producing copper foils by electroforming, the skilled person was able to find in D1 itself or in D2 to D4 all the indications which are necessary for arriving at the features or the parameters for carrying out a continuous process. For instance, D2 was also concerned with a continuous process of electroforming with a treatment by activated carbon of the copper-ion containing electrolyte comprising also sulfuric acid. Thus, at the priority date of the patent in suit, all features and parameters were part of the general knowledge of the skilled person and, to him, they were either obvious or at least automatically necessary. Although it was admitted that the products made by the process in dispute could be considered as good and were commercially successful,

this did not imply that the process for fabricating them was inventive. Thus, the subject-matter of claim 1 of appellant's main request was obvious having regard to the state of the art and did not involve an inventive step.

Reasons for the Decision

1. The appeal is admissible.

2. *Main request*

2.1 Allowability of the amendments

2.1.1 The following has been pointed out by the Board during the oral proceedings of 10 December 1997: In claim 1 of the main request the copper ion-containing electrolyte used in the process **consists of** 50-100 g/l of copper ion and a member selected from the group consisting of 80-180 g/l of sulfuric acid, 5-50 g/l of hydrochloric acid, and a borofluoride in an amount corresponding to a pH value of 0,1-2,0. However, the electrolyte in the originally filed application (see in particular claim 2) was mentioned as being a copper ion-containing electrolyte which **comprised** 50-100 g/l of copper ion and a member selected from the group consisting of 80-180 g/l of sulfuric acid, 5-50 g/l of hydrochloric acid, 200 to 500 g/l of a pyrophosphate, and a borofluoride in an amount corresponding to a pH value of 0,1-2,0. Thus, there was a question, whether there was a basis in the original application for an electrolyte "consisting of" the ingredients mentioned in the main request.

It is first to be noted in this respect that the wording of claim 1 of the main request does not differ in this respect from the wording in claim 1 as granted, which already stated that the copper ion-containing electrolyte used in the process **consisted of** said ingredients. Thus, the amendment having resulted in the expression "comprising" being replaced by "consisting of" had been done before granting the patent, and not in the course of opposition proceedings or appeal, after granting the patent.

It is also to be noted that this difference of wording between "consisting" and "comprising" had not been left unnoticed during the opposition proceedings. However, this was done only in the discussion of inventive step because of an argument of the patentee during the oral proceedings stressing that the claimed process was distinguished over prior art processes of the same type in that the latter were using electrolytes which did not consist only of the same ingredients but comprised moreover additives, and that this difference was to be considered as a support for an inventive step of the claimed process. However, if is not derivable from the file that the allowability of the amendments having led to the granted patent was objected in this respect. Incidentally, it is to be noted that such an objection, which according to Article 100(c) EPC is one of the grounds of opposition listed in Article 100 EPC, was not mentioned by the opponent in his notice of opposition, but that another ground of opposition not mentioned in said notice, i.e. insufficiency of disclosure, was indeed raised by the opponent at a late stage of the opposition proceedings.

2.1.2 According to the parallel decisions G 9/91, OJ EPO, 1993, 403 (see the Headnote) and G 10/91, OJ EPO, 1993, 420 (see the Headnote) of the Enlarged Board of Appeal, the power of a Board of Appeal to examine and decide on

the maintenance of a European patent under Articles 101 and 102 EPC depends upon the extent to which the patent is opposed in the notice of opposition pursuant to Rule 55(c) EPC.

Indeed, in the present case, it is first to be noted that, according to paragraph 19 of the reasons of said same decision G 9/91, in order to avoid any misunderstanding, it should finally be confirmed that in case of amendments of the claims or other parts of a patent in the course of opposition or appeal proceedings, such amendments are to be fully examined as to their compatibility with the requirements of the EPC (e.g. with regards to the provisions of Article 123(2) and (3) EPC). It is directly and unambiguously derivable from this statement that only amendments made after the grant of the patent are meant and, since the substitution of "consisting of" for "comprising" has been done before grant, no specific power to examine is given to the present Board.

2.1.3 Referring again to these decisions, it is to be noted that, in any case, fresh grounds for opposition may be considered in appeal proceedings only with the approval of the patentee.

In this respect, the Board has taken into consideration the following arguments of the appellant having regard to the content of the application as filed:

In the original application (see page 1, lines 14 to 21), the prior art process is mentioned as using an electrolyte comprising additives such as glue or the like. In another passage of the original application (see page 2, line 32 to page 4, line 14), the operational conditions to produce the electrodeposited copper foils are enumerated and do not indicate any other ingredients than those in claim 1 as granted, and

in particular no additives. All the examples in the original application (see for instance Example 1), although using electrolytes unfortunately mentioned with the term "comprising", however are not indicated with any other ingredients either. Thus, except for the reference to prior art processes, there is no indication whatsoever to any electrolyte with additives and the skilled person, reading the original application, would have concluded that, indeed, there was no additive in the electrolyte of the disclosed process.

2.1.4 Prima facie, the arguments of the appellant are convincing. Moreover, taking into account the course of the opposition and appeal proceedings as derivable from the present file, it is to be noted that it is only after the Board made reference to this question and its aspects relevant to additional subject-matter that the respondent made an objection in the same sense, and this is a confirmation that, for a skilled reader deriving information from the original application and the granted patent, respectively, the amendment resulting in the latter was correctly based on the former. Therefore, the Board concludes that, under these circumstances, there is no need to ask the patentee for his approval for examining this specific point of the substitution of "consisting of" for "comprising".

2.1.5 The amendments made in claim 1 as granted and having led to claim 1 of the main request consist in:

inserting, on the basis of page 3, lines 40 to 41 and 52 to 57 and Figure 1 as granted and the corresponding text locations in the application as filed, the word "continuous" at the beginning of the claim for

restricting to processes for producing an electrodeposited copper foil in a continuous process such as those of the mentioned prior art, and

inserting the content of dependent claim 2 as granted and the corresponding text of dependent claim 3 as originally filed for restricting the ranges of the electrolyte temperature and current density conditions in accordance with some of those specified in the granted patent and the application as filed.

Therefore, the amendments having led to the main request are such that they have neither extended the protection conferred nor resulted in subject-matter which extends beyond the content of the application as filed (Articles 123(3) and (2) EPC).

2.2 Sufficiency of disclosure

It is to be noted that the respondent had objected on the basis of measurements he had provided that the patent did not disclose the invention in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art. The respondent had admitted that this objection was a late filed new ground and the Opposition Division in its decision had found that this objection was not relevant. The Board in the annex to the summons has also expressed the opinion that this objection was not relevant. Since during the oral proceedings of 10 December 1997 the respondent has not provided new arguments and has admitted also that the products of the appellant were of good quality and were also a commercial success, this being however no indication for an inventive step of the process, there can be seen no reason to take into account this objection having regard to the process defined in claim 1 as amended in the main request.

2.3 Clarity of the claims

It is to be noted that, contrary to claim 1 of the main request but also to other parts of the description (see page 3, lines 23 to 24) where a current density in the range of 30-120 A/dm^2 is stressed, it is also indicated in the description (see page 3, lines 26 to 27; see also page 7, lines 12 to 14) that the use of current densities over 100 A/dm^2 will tend to cause unusual copper deposition or that values up to 150 A/dm^2 can be used. In any case, the description is still to be adapted to claim 1 of the main request, which in the opinion of the Board is otherwise clear in the sense of Article 84 EPC.

2.4 Novelty

A continuous process for producing an electrodeposited copper foil is known from D1 (see page 173, penultimate paragraph); the continuous electrodeposition of copper sheet is mentioned as using a rotating drum cathode; it is directly and unambiguously derivable from this passage of D1 that this process is done by electrolyzing a copper ion-containing electrolyte.

In another passage of D1 (see page 179, the part indicated as "Specific problems"), a copper ion-containing electrolyte is mentioned which comprises a copper ion concentration which falls within the range of 50-100 g/l of copper ion and sulfuric acid; the whole electrolyte, i.e. at least 60 vol.% thereof, is mentioned as being continuously filtered, i.e. continuously treated with e.g. activated carbon by passing said electrolyte through e.g. activated carbon. From still another passage of D1 (see Figure 3 and the corresponding text of page 181), there is shown a filter column through which the electrolyte is passed, said electrolyte being then directly passed into the

plating cell, i.e. the electrolytic cell; thus, it is derivable that the electrolyte is continuously subjected to said electrolyzing step within 20 minutes after said treatment with the filter. Moreover, there is information in another passage of D1 (see in particular page 185, second paragraph) about an electrolyzing process whereby current density values fall within the range of 30-120 A/dm^2.

The question, whether these above-mentioned different passages of D1 are directly and unambiguously related to each other can remain open because the following is to be added concerning the teaching of D1:

As credibly put forward in the decision under appeal, which with respect to the following features is still relevant because the same features are concerned,

- the concentration of sulfuric acid in D1 (74.8 g/l) is somewhat lower than the range given in the claim (80-180 g/l);

- D1 does not go into all the details of the production of foils; and

- the velocity of the electrolyte passing through the activated carbon column is not mentioned explicitly in D1.

The respondent has argued with respect to novelty that parameters of claim 1 are either not critical to the invention or can be directly and unambiguously derived from D1; for instance, the very broad range of velocities of the electrolyte through the filter in the claimed process covers the range of velocities currently used in the copper electrodeposition industry and as such is in the range which the skilled person would expect.

However, this argument is not convincing in that, as generally held by the Boards of Appeal, in particular in T 677/91 of 3 November 1992, unpublished (cf. point 1.2 of the reasons), for the assessment of novelty, the prior art should be read with the knowledge of the skilled person at the date said teaching was made available and, in the present case, no evidence has been provided that at said date said range of velocities was usual.

Moreover, no specific temperature of the electrolyte, and in particular no range of 40-60°C, is derivable from D1.

The other documents are less relevant.

Therefore, the subject-matter of claim 1 of the main request is novel in the sense of Article 54 EPC.

2.5 Inventive step

2.5.1 According to the patent in suit (see page 2, lines 2 to 41; see also page 8, lines 22 to 25), there are prior art electrodeposited copper foils, which have been obtained by an electrolytic method which comprises rotating a cathode drum in a glue - or the like - added electrolyte passing through an electrolytic cell to electrodeposit copper on the rotating cathode drum and then continuously peeling the thus electrodeposited copper therefrom while rotating the drum; these foils have poor mechanical properties; it is the object of the present invention to provide a process for producing an electrodeposited copper foil which exhibits a high elongation and a high tensile strength not only at room temperature but also at an elevated temperature of for example 180°C, and which process can

be used in the preparation of flexible circuit boards; this object is to be achieved by using a process with the features cited in the patent in suit.

As mentioned in paragraph 2.4 here above, a technique of the same type is described in D1 (see page 173, penultimate paragraph) with the following wording:

"In 1931, the copper producers commercialized electrolytic sheet copper. About this time Shakespeare developed the continuous electrodeposition of copper sheet using a rotating drum cathode of lead.[6]"

The superscript "[6]" refers to a note at the bottom of page 173 indicating a technical publication of 1933.

It is directly and unambiguously derivable from this passage of D1 that this process is done by electrolyzing a copper ion-containing electrolyte.

2.5.2 The appellant has convincingly argued as follows with respect to D1 as starting point for the process of claim 1 of the main request:

Except for this passage on page 173 which is contained in the part "Introduction", there is no more indication specifically directed to the continuous electrodeposition of a copper sheet using a rotating cathode drum. It is also necessary to take into account the nature of the document D1; it consists of a paper with title "Electroforming Techniques" presented at the Proceedings of a Convention of the American's Electroplaters' Society, in 1944; in this paper, in the introduction, historical developments of electroforming since 1838 are mentioned and, among them, in three lines, all that in said paper is directed to forming of electrolytic copper sheets is contained; for the rest, the paper is only concerned with generalities relating

to electroforming and, from the top of page 175, with the particular study and activity of a company which is involved in the fabrication of **music instruments** such as cornets and trumpet bells using electroforming. It is to be noted that some of the questions of the participants mentioned at the end of the paper were related with the tone obtained by music instruments fabricated by this technique.

The further information in D1 (see pages 179; page 181 with Figure 3; page 185) about electrolytes comprising copper sulfate and sulfuric acid, filtration of said electrolytes using i.a. activated carbon, continuous deposition arrangements including filtration means, current densities values, are directed to said fabrication of music instruments, and not to the succinct historical reference to electrodeposition of copper foils.

Indeed, D2 to D4 all provide useful information for most of the features of the process of claim 1 of the main request; however, even when for instance in D2 they are concerned with electroplating bath which are continuously filtered and treated, they are however related to electrodeposition technique in general and not specifically with a continuous process with continuous electrodeposition of copper foils of the type taught in the succinct passage of D1. In this respect, it is also to be noted that the appellant has admitted in the patent in suit (see in particular page 3, lines 34 to 37), that the features of the process of the main request, for instance treatment with activated carbon, were already known in isolation in the electroplating art; however, these features were not used for all types of processes and not in the claimed combination. Thus, taking into account case law of the Boards of Appeal for similar cases, it is to be concluded that the long time period since 1933,

together with the excellent results of the products fabricated with the process in dispute and the commercial success of said products as admitted by the respondent himself are an indication that to the skilled person presented at the priority date of the patent in suit, in 1985, with the different passages of D1 and with D2 to D4, the specific combination of features and values thereof of the continuous process with continuous electrodeposition of the main request was not obvious.

2.5.3 Incidentally, it is to be noted that the appellant has further convincingly argued as follows with respect to the process of claim 1 of the main request:

It is not directly derivable whether the results of comparative measurements made by the opponent concern measurements made exactly in accordance with the continuous process of the patent in suit. In any case, it is the right of the proprietor to restrict himself to those ranges of the parameters, for instance within 20 minutes after the treatment in activated carbon, which provided satisfactory results, even if, as shown by these comparative measurements, good results could also be obtained outside of this range.

2.5.4 Therefore, the subject-matter of claim 1 of the main request involves an inventive step in the sense of Article 56 EPC.

2.6 Thus, the claim is allowable and the patent can be maintained on this basis, so that it is not necessary to take into consideration the auxiliary requests of the appellant (Articles 52(1) and 102(3) EPC).

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the first instance with the order to maintain the patent in amended form on the basis of appellant's main request (claims 1 and 2) filed during the oral proceedings of 10 December 1997, with the description to be adapted and the drawings as granted.

The Registrar: The Chairman:

P. Martorana M. Chomentowski

A. K 0022.D