BESCHWERDEKAMMERN DES EUROPÄISCHEN PATENTAMTS

BOARDS OF APPEAL OF THE EUROPEAN PATENT OFFICE

CHAMBRES DE RECOURS DE L'OFFICE EUROPEEN DES BREVETS

Publication in the Official Journal ~~Yes~~ / No

File Number: T 230/89 - 3.3.3

Application No.: 80 104 479.3

Publication No.: 0 023 362

Title of invention: A method for manufacturing an electrically conductive copper alloy material

Classification: C22C 9/00

D E C I S I O N
of 26 March 1991

Applicant: KABUSHIKI KAISHA TOSHIBA

Opponent: 02) Kabel- und Metallwerke Gutehoffnungshütte AG

Headword:

EPC Art. 56, 100(a)

Keyword: "Inventive step (after amendments, yes)"

Headnote

Case Number : T 230/89 - 3.3.3

D E C I S I O N
of the Technical Board of Appeal 3.3.3
of 26 March 1991

Appellant : (Proprietor of the patent)	KABUSHIKI KAISHA TOSHIBA 72, Horikawa-cho Saiwai-ku Kawasaki-shi Kanagawa-ken 210 (JP)
Representative :	Henkel, Feiler, Hänzel & Partner Möhlstraße 37 W - 8000 München 80 (DE)
Respondent : (Opponent 02)	Kabel- und Metallwerke Gutehoffnungshütte AG Klosterstraße 29 W - 4500 Osnabrück (DE)
Decision under appeal :	**Decision of Opposition Division of the European Patent Office of 23 November 1988, issued on 1 February 1989, revoking European patent No. 0 023 362 pursuant to Article 102(1) EPC.**

Composition of the Board :

Chairman : F. Antony
Members : R.A. Lunzer
J.A. Stephens-Ofner

Summary of Facts and Submissions

I. European patent No. 0 023 362 was granted on 19 June 1985 on the basis of application No. 80 104 479.3, dated 29 July 1980, having priority dates of 30 July and 7 August 1979, derived from Japanese Application Nos. 96067/79, and 99884/79.

II. On 20 March 1986 an opposition was lodged by the Respondent on the ground of Article 100(a) EPC, alleging lack of novelty (Article 54 EPC), and lack of any inventive step (Article 56 EPC). A second opposition filed by another party was later withdrawn. The Opponents relied in particular on the following documents:

(1) GB-A-1 194 888
(2) DE-A-2 743 471
(7) US-A-3 039 867.

III. By its decision given orally on 23 November 1988, and issued in writing on 1 February 1989, the Opposition Division revoked the patent. It held that the patent in suit could not be maintained on the basis of the then Main Request for formal reasons (Art. 123(2) and 84, and Rule 29(1) EPC), whereas the subject matter claimed in accordance with the then Auxiliary Request was lacking in inventive step. Without an analysis of the case applying the problem and solution approach, it was held that document (1) was the most relevant prior art, and that as it disclosed at page 2 lines 36 - 42 and lines 56 - 79 the option of not carrying out any solution treatment after hot working, there could be no invention in the exclusion of this process step.

IV. An appeal against this decision was lodged on 31 March 1989, the appeal fee was paid on the same day, and the Grounds of Appeal were filed on 7 June 1989. In its Statement of Grounds of Appeal, and during oral proceedings held on 26 March 1991, the Appellant argued that the decision under appeal did not sufficiently take account of the fact that the invention was based on a fundamental departure from the teachings contained in the prior art, in that it excluded the use of a solution treatment at any stage of the manufacturing process. Such a step had been essential in the past, whereas its avoidance affords a significant economic advantage. Together with its Statement of Grounds of Appeal, the Appellant filed as its sole Request a single Claim which, after further amendment during oral proceedings, ultimately was in the following form:

"A method for manufacturing an electrically conductive precipitation hardenable copper alloy wire material consisting of at least one alloying metal selected from chrome and zirconium, the balance copper, and optionally minor amounts of silicon, germanium, boron and magnesium which comprises the steps of making an ingot, hot-working so as to form the material into a suitable shape, and thereafter repeatedly cold-working and annealing, wherein the steps are performed without subjecting the material to solution treatment so as to obtain said copper alloy material having a grain size numer of not less than 7 as defined by JISG 0551, a minimum electrical conductivity of about 88 (IACS %), and a minimum offset yield stress (0.2%) of about 22 kg/mm^2."

V. The Respondent argued in its counterstatement, filed on 21 October 1989, and during the oral proceedings, that the distinction between the alleged invention and the prior art was without any significance, because, as reflected in

document (2) page 7 lines 21 - 26, and document (7) col. 3 lines 20 - 24, a significant degree of solution of alloying elements into the copper phase inherently occurs during the heating of the alloy in preparation for hot working. The Respondent also contested the admissibility of the proposed amended Claim, insofar as it was intended to be construed as meaning that solution treatment was to be avoided altogether, contending that the application as originally filed specified the exclusion of solution treatment only during the later process steps, but not during the whole of the treatment of the alloy, from casting in the form of an ingot, to the final forming of the wire.

VI. The Appellant (patentee) requested that the decision under appeal be set aside, and that the patent be maintained on the basis of the Claim submitted during the oral proceedings. The Respondent (opponent) requested that the appeal be dismissed.

Reasons for the Decision

1. The appeal complies with Articles 106 to 108 and Rule 64 EPC, and is admissible.

2. Admissibility of amendments

2.1 In the course of the Opposition, the Appellant introduced certain amendments to the Claim, and further modifications were made on appeal. As compared with the Claim in the patent as granted, the following limitations have been introduced by the proposed amendments:

(i) The composition of the copper alloy is now specified as:

consisting of at least one alloying metal selected from chromium and zirconium, the balance copper, and optionally minor amounts of silicon, germanium, boron and magnesium.

(ii) The word "shaped" has been deleted from the phrase "without subjecting the shaped material to solution treatment".

(iii) The two limitations at the end of the claim relating to minimum electrical and mechanical properties have been introduced.

2.2 As to these limitations:

(i) The composition is clearly disclosed in the application as originally filed, as appears from the description and in particular Claims 7 and 9. While these Claims do not appear in the granted version, their substance can be gathered from, e.g., page 3 lines 34 to 47.

(ii) By deleting the word "shaped", it becomes clear that there is no solution treatment throughout all the processing steps. In contrast, when the word is present, the claim is open to the interpretation that there could be solution treatment in the earlier stages of the process, such as prior to hot working, but not thereafter. The claim as so amended is consistent with the statement at page 2 lines 26 - 30 of the application as filed, (page 2 lines 39 - 44 of the granted specification), which is to the effect that the process is to be conducted, without the solution treatment which had heretofore required a precipitation treatment.

(iii) The minimum electrical and mechanical properties are disclosed in the application as filed at page 9, lines 23 - 27, read in conjunction with Table III on page 11 (granted specification page 5, lines 48 to 50 and page 6).

As these limitations to the scope of the Claim introduce features which were disclosed in the application as originally filed, they are admissible for the purposes of Article 123(2) and 123(3) EPC.

3. Interpretation of the claim

In the course of the oral proceedings, the Board drew attention to the fact that the term "solution treatment" in this art is normally used to indicate the combination of two distinct steps, viz. solution annealing at a sufficiently elevated temperature for the alloying components to be brought into solid solution in the copper matrix, followed by cooling sufficiently rapidly to keep the alloying elements in solid solution. These two steps are essential features in documents (1) and (2), which relate to copper/chromium alloys. Accordingly, the Board interprets the present claim as meaning that that deliberate combination of steps is not used, although it must be assumed that during hot working, there will normally be some degree of solution of alloying elements into the copper matrix.

4. Closest prior art

4.1 Document (1) is regarded by the Board as being the closest prior art. It relates to a high conductivity copper base alloy consisting of 0.1 to 2.5% chromium, 0.01 to 0.5% phosphorus, 0.001 to 0.25% boron, and the balance copper, apart from conventional impurities. This alloy composition

is thus very similar to that of the alloy of the patent in issue, save that it must contain a minimum of 0.01% phosphorus, which is absent from the composition claimed.

4.2 The treatment specified in (1) involves heating for at least 30 minutes at 700 to 975°C, rolling in the aforesaid temperature range, cooling to below 300°C at a rate greater than 550°C per hour, and heating at a temperature of 350 to 550°C for at least one hour. It is to be observed that this document discloses all three of the usual process steps involved in precipitation hardening, i.e. holding for a prolonged period at elevated temperature so as to bring the alloying elements into solid solution, rapid cooling to retain them in solid solution, and finally holding for a significant period at a lower elevated temperature to effect precipitation hardening.

5. Problem

Given document (1) as a starting point, the problem with which the alleged invention is concerned can be seen as being the desire to find a method of making copper conducting alloys which simplifies the above stated processing steps, while nevertheless achieving a desirable combination of conductivity and mechanical properties.

6. Solution and its effectiveness

6.1 The solution proposed by the patent in issue is the use of a composition which, when compared with document (1), does not include phosphorus, and a series of process steps which does not involve any solution treatment. Instead, the conditions of hot working, cold working, and annealing are so controlled that three parameters must be exceeded, viz. the grain size in the finished product must be not

less than 7 as defined by JISG 0551, the conductivity not less than 88 (IACS %), and the minimum offset yield stress (0.2%) not less than about 22 kg/mm^2.

6.2 In Table II on page 4 of the specification as granted, the properties of two Examples in accordance with the alleged invention, (one in the annealing finish and the other in the cold working finish) are compared with both pure copper and a precipitation hardened alloy. As is to be anticipated, the pure copper shows very good conductivity, but poor mechanical strength. Although the precipitation hardened comparative sample shows considerable mechanical strength, it has bad pliability, and an electrical conductivity of 80 (IACS %), as compared with figures of 88% and 92% for the two Examples in accordance with the alleged invention.

6.3 These results are consistent with the opening discussion of the prior practice in the patent specification at page 1 lines 13 to 15, which states that in the past improved mechanical properties have been achieved through the use of precipitation hardened alloys, but not without a significant loss of conductivity when compared with unalloyed copper.

6.4 In contrast, the Examples in accordance with the alleged invention show good conductivity, with mechanical strength well above that of pure copper. In the Board's view, the results given in Table II show credibly that the solution proposed in the patent in issue has the dual advantages of saving in processing steps, with consequent economic and environmental benefits, while achieving a product having good conductivity and desirable mechanical properties. The identified problem is therefore solved.

7. Novelty

The process disclosed in document (1) differs from that in accordance with the alleged invention, both with respect to the composition of the alloys treated, and with respect to their treatment. In document (1) the composition contains the above stated essential minimum proportion of phosphorus, and the process involves solution treatment, followed by a precipitation hardening step. Accordingly, the Board is satisfied that the alleged invention is novel in relation to this citation. None of the other documents comes any closer to the alleged invention. Therefore the subject matter of the Claim is novel within the meaning of Article 54 EPC.

8. Inventiveness

8.1 The issue of inventiveness turns on whether a skilled person, having as his starting point the disclosure of document (1), and confronted with the problem of obtaining a conductor with the two advantages of better conductivity than precipitation hardened alloys, in combination with acceptable mechanical properties, while at the same time capable of being manufactured more economically, would have appreciated that these objectives were attainable by subjecting alloys of suitable composition to controlled conditions of hot and cold working, without solution treatment.

8.2 As document (1) teaches that it is essential to make use of the well known combination of the three process steps, in the Board's view it affords no pointer in the direction of avoiding any solution treatment in the course of the manufacturing process.

8.3 Turning to the other citations which were mentioned in the course of the oral proceedings, document (2) relates to a

copper alloy whose composition is not distinguishable from that which is claimed in the patent in issue. In common with document (1) it requires as essential elements of its process the three steps of holding at elevated temperature, followed by rapid cooling and precipitation hardening, although at page 7 lines 21 - 26 it is explained that the effect of the solution anneal can be obtained during the hot working at the relatively high temperatures of 975 to 1,000°C. The teaching of this document differs from the alleged invention in that it requires in steps d) to g) inclusive specific cold working and annealing steps. As both a rapid cooling step and a precipitation step are essential elements of the process here described, it is not regarded by the Board as being a pointer away from the use of any solution treatment.

8.4 In document (7) the alloy is significantly different from that which is here under consideration, being an alloy consisting essentially of copper and iron. At column 3 lines 20 - 23 it is indicated that the hot working alone had been found to be sufficient to obtain a solution of the iron in the copper, although it is preferred to solution anneal after hot working. Furthermore, there is no explicit teaching of rapid cooling, although it could be implicit from the fact that the examples refer to hot rolling to a thickness of 0.05 inches or less, at which thickness the rate of cooling might be sufficiently rapid to hold the iron in solid solution.

8.5 Despite the aforesaid reservation, the Board is prepared to accept that this document could be regarded as the disclosure of a process in which a precipitation hardenable copper base alloy is neither subjected to a deliberate solution annealing step, nor to rapid cooling. However, as the alloy composition is quite different, and there is no suggestion of any deliberate control of grain

size, the Board does not consider that there is any reason why a skilled reader might seek to apply the process disclosed in this document to alloys of substantially different compositions.

8.6 Accordingly, the Board is satisfied that the subject matter of the Claim (as amended) of the patent in issue involves an inventive step as required by Article 56 EPC, and the Claim is therefore patentable.

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 the Claim submitted in the course of the oral proceedings, with further amendments to the description.

The Registrar: The Chairman:

E. Görgmaier R. Antony