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**Datasheet for the decision  
of 6 December 2006**

**Case Number:** T 1021/04 - 3.4.03

**Application Number:** 94116649.8

**Publication Number:** 0650206

**IPC:** H01L 39/24

**Language of the proceedings:** EN

**Title of invention:**  
Superconducting conductor

**Patentee:**  
SUMITOMO ELECTRIC INDUSTRIES, LIMITED

**Opponent:**  
Siemens AG

**Headword:**  
Superconductor/SUMITOMO

**Relevant legal provisions:**  
EPC Art. 123(2), (3), 56

**Keyword:**  
"Added subject-matter - (no)"  
"Inventive step - (yes, after amendment)"

**Decisions cited:**  
-

**Catchword:**  
-



Case Number: T 1021/04 - 3.4.03

**D E C I S I O N**  
of the Technical Board of Appeal 3.4.03  
of 6 December 2006

**Appellant:** SUMITOMO ELECTRIC INDUSTRIES, LIMITED  
(Patent Proprietor) 5-33, Kitahama 4-chome  
Chuo-ku  
Osaka 541 (JP)

**Representative:** Winter, Brandl, Fürniss, Hübner, Röss, Kaiser  
Polte Partnerschaft Patent- und  
Rechtsanwaltskanzlei  
Alois-Steinecker-Strasse 22  
D-85354 Freising (DE)

**Respondents:** Siemens AG  
(Opponent) Postfach 22 16 34  
D-80506 München (DE)

**Decision under appeal:** Decision of the Opposition Division of the  
European Patent Office posted 8 June 2004  
revoking European patent No. 0650206 pursuant  
to Article 102(1) EPC.

**Composition of the Board:**

**Chairman:** R. G. O'Connell  
**Members:** E. Wolff  
P. Mühlens

## Summary of Facts and Submissions

I. This is an appeal against the revocation of European patent 650 206 on the grounds of added subject matter (Article 123(2) EPC - main request and first auxiliary request) and lack of inventive step (Article 56 EPC - second auxiliary request).

II. The appellant proprietor requested that the patent be maintained in amended form on the basis of claims 1 to 6 filed during oral proceedings held before the board on 6 December 2006. Claim 1 reads as follows:

"1. Process for manufacturing an oxide superconductor conductor, comprising:

assembling a plurality of metal-covered multifilamentary superconducting strands on a former, and

applying bending to the superconductor formed by the superconducting strands on the other former after winding an insulating material having a coefficient of heat contraction of at least two times the coefficient of heat contraction of said superconducting strands on a surface of said superconducting conductor, wherein the value of said bending as applied is at least 0,75 m and not less than 3,0 m in radius of curvature."

Claims 2 to 6 are dependent on claim 1.

III. The appellant submitted that the amendments were permissible pursuant to Article 123(2) and (3) EPC, claim 1 being a combination of granted claims 1 and 6. The invention now claimed was furthermore new and inventive because none of the prior art disclosed

improving the critical current density of a superconductor by choosing an insulation material that had a coefficient of heat contraction at least twice that of the superconducting wire and which, on account of being wound over the superconductor, radially compressed the superconductor on cooling.

IV. The respondent, who - as foreshadowed - did not attend the oral proceedings, filed two new documents as part of his written submissions

A1: JP 05-144 333 A

A2: DE 3 928 085 A

With reference to these documents, the respondent argued that the claimed invention was obvious over the disclosure in document A1, which showed a spiral shaped cylindrical former around the outside of which a ceramic oxide superconductor was wound in spiral form. Similarly document A2 showed a superconductor having a former with spiral shaped hollows spaces and bands of ceramic oxide superconductor wound in a spiral around the former.

### **Reasons for the decision**

1. The appeal is admissible.
2. *Amendments (Article 123(2), (3) EPC)*
  - 2.1 Claim 1 is a combination of claims 1 and 6 of the patent as granted, with one alteration to the text

incorporated from claim 6 in that "not more than" is replaced by "less than".

- 2.2 The description refers to the bending radius of curvature being preferably at least 0.5 m, more preferably at least 1.0 m, and not more than 3 m (column 2, lines 54 to 58). In the description of example 1 it is specifically stated that a bending radius of 1.25 m resulted in an improvement of about 8% and a bending radius of 2.5 m in an improvement of about 3%, with a bending radius of 3.0 m resulting in no obvious change in the critical current value as compared with that measured in the linear state. It follows from that description that there is a trend of decreasing improvement with increasing bending radius, with no improvement being obtained at or above 3 m. The board accepts that in cases such as these it is not possible to define the precise limit beyond which no improvement is obtained, with that limit in any given case lying at a bending radius which is close to but less than 3 m.
- 2.3 In the judgement of the board, in this particular case the change from "not more than" to "less than" does not introduce subject matter going beyond the contents of the application as originally filed, nor is the protection conferred by the new claim more extensive than that of claim 1 in the form in which it was granted.
- 2.4 The amendments to the description merely reflect the changed wording of the claim.

2.5 The board is therefore satisfied that the amendments comply with Article 123(2) and (3) EPC.

3. *Novelty*

3.1 Documents A1 and A2 were submitted by the respondent opponent in response to amendments made by the appellant proprietor in respect of requests preceding the request filed at the oral proceedings. These two documents also appear at first sight to be more relevant for determining whether the claimed invention is new and inventive than any of the documents previously cited. For these reasons, documents A1 and A2 are admitted into the proceedings.

3.2 Document A1 discloses a superconductor in which a superconductor structure consisting of a plurality of metal tapes and tapes of ceramics superconducting material are wound helically around a cylindrical former, with tape of insulating material wound helically around the superconductor structure.

3.3 Document A2 relates to a superconductor structure in which a corrugated tube forms the former onto which superconducting tapes are wound, surrounded by tape of insulating material. The corrugations may be circumferential or helical, and serve to provide the required flexibility of the former in order to permit bending of the superconductor structure.

3.4 As pointed out by the appellant proprietor, neither of these documents includes the feature of applying to the superconductor an insulating material having a coefficient of heat contraction of at least two times

the coefficient of heat contraction of said superconducting strands on a surface of said superconducting conductor, wherein the value of said bending as applied is at least 0,75 m and not less than 3,0 m in radius of curvature.

3.5 For the reasons given, the claimed invention is new.

4. *Inventive step*

4.1 Document A1 discloses a ceramic superconductor structure wound around a circular former. Document A1 was considered by the respondent opponent to constitute the nearest prior art for the purposes of deciding whether the invention involves an inventive step.

4.1.1 Taking into account the differences between the superconductor structure claimed in claim 1 and that disclosed in document A1, the objective problem solved by the invention is, as stated in the introductory part of the description in the patent, to provide a process for manufacturing an oxide superconducting conductor having a higher critical value.

4.1.2 In the patent this object is achieved *inter alia* by "...applying bending to the superconductor formed by the superconducting strands on the other former after winding an insulating material having a coefficient of heat contraction of at least two times the coefficient of heat contraction of said superconducting strands on a surface of said superconducting conductor, wherein the value of said bending as applied is at least 0,75 m and not less than 3,0 m in radius of curvature."

- 4.1.3 There is no reference in document A1 to any improvement that could be achieved through the measure of bending the superconductor in a certain way or through winding around the superconductor structure an insulating material with a heat contraction coefficient of at least twice that of the superconducting strands. Hence, document A1 on its own cannot make the invention obvious to the skilled person.
- 4.2 Document A2 shares with the invention as claimed in claim 1 the grooved former surrounded by ceramic superconducting tapes or foils which are in turn surrounded by an insulating layer of synthetic material.
- 4.2.1 Document A2 also refers to differential expansion between the superconductor and the insulating material (column 1, lines 26 to 30). However, this differential expansion is seen as a problem which could lead to undesired relative movement between the conductor and the insulation which damages or even destroys the cable. The document does not mention any particular range of values for the differential expansion.
- 4.3 For the foregoing reasons, the skilled person would not have considered that the measure of using an insulating material with a greater heat contraction coefficient - of at least twice that of the superconductor strands - would, contrary to the adverse effect stated in document A2, lead to an improvement in the current density of the superconducting conductor structure of document A1.



4.4 In the judgement of the board, therefore, the process claimed in claim 1 is to be considered as involving an inventive step as required by Article 56 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 department with the order to maintain the patent in amended form in the following version

claims: 1 to 6, filed in the oral proceedings

description: pages 2, 2a, 3 and 4 filed in the oral proceedings

drawings: Figures 1 and 2 of the patent specification

The Registrar:

The Chair:

S. Sánchez Chiquero

R. G. O'Connell

**Case Number:** T 1021/04 - 3.4.03

**D E C I S I O N**  
of 27 April 2007 correcting errors in the decision of  
Technical Board of Appeal 3.4.03  
of 6 December 2006

**Appellant:** SUMITOMO ELECTRIC INDUSTRIES, LIMITED  
(Patent Proprietor) 5-33, Kitahama 4-chome  
Chuo-ku  
Osaka 541 (JP)

**Representative:** Winter, Brandl, FURNISS, Hübner, Röss, Kaiser  
Polte Partnerschaft Patent- und  
Rechtsanwaltskanzlei  
Alois-Steinecker-Strasse 22  
D-85354 Freising (DE)

**Respondents:** Siemens AG  
(Opponent) Postfach 22 16 34  
D-80506 München (DE)

**Decision under appeal:** Decision of the Opposition Division of the  
European Patent Office posted 8 June 2004  
revoking European patent No. 0650206 pursuant  
to Article 102(1) EPC.

**Composition of the Board:**

**Chairman:** R. G. O'Connell  
**Members:** E. Wolff  
P. Mühlens

Pursuant to Rule 89 EPC, errors of transcription in the decision dated 6 December 2006 in appeal case T 1021/04 are hereby corrected as follows:

Page 1, line 22 and page 5, lines 4 and last: "not" deleted.

Page 4, point 3.2, line 5: "wound" replaces "would".

Registrar:

Chair:

S. Sánchez Chiquero

R. G. O'Connell