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Aktenzeichen / Case Number / N° du recours : T 323/88 - 3.5.1

Anmeldenummer / Filing No / N° de la demande : 82 302 756.0

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Bezeichnung der Erfindung: Al-stabilised superconductor and method of produci
Title of invention: the same
Titre de l'invention :

Klassifikation / Classification / Classement : H01B 12/00

## ENTSCHEIDUNG / DECISION

vom / of / du 6 June 1989

Anmelder / Applicant / Demandeur :

Patentinhaber / Proprietor of the patent /
Titulaire du brevet : AGENCY OF INDUSTRIAL SCIENCE AND TECHNOLOGY, et al

Einsprechender / Opponent / Opposant : SIEMENS AG

Stichwort / Headword / Référence :

EPÜ / EPC / CBE Article 56

Schlagwort / Keyword / Mot clé : "Inventive step (no) - obvious"

**Leitsatz / Headnote / Sommaire**

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Case Number : T 323/88 - 3.5.1

# D E C I S I O N
of the Technical Board of Appeal
of 6 June 1989

Appellant : (Proprietor of the patent)
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Respondent : (Opponent)
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Decision under appeal :
Decision of the Opposition Division of the European Patent Office dated 18 May 1988 revoking European patent No. 0 067 591 pursuant to Article 102(1) EPC.

Composition of the Board :

Chairman : P.K.J. van den Berg
Members : W.B. Oettinger
F. Benussi

## Summary of Facts and Submissions

I. The mention of the grant of European patent No. 67 591 was published on 30 April 1986.

The patent was based on patent application No. 82 302 756.0, filed on 27 May 1982 claiming priority of 28 May 1981, and contained both product and manufacturing process claims.

II. An admissible opposition was based on Article 100(a) EPC and referred, without reasons, also to Article 100(b) EPC. The Opposition Division revoked the patent by a decision dated 18 May 1988.

The reason given for the revocation was that the subject-matter of Claim 1, an intertwisted superconducting cable, and of Claim 4, a method for producing such a cable, lacked an inventive step, having regard to prior art documents

(1) GB-A-2 052 838
and
(2) DE-B-1 665 554,

and that this objection would not be overcome by an amendment of Claim 1 suggested conditionally by the Patentees.

The following further prior art documents cited by the Opponent were, inter alia, mentioned in the decision under appeal without expressing any objections based on these documents:

(3) US-A-3 778 895

(4) Proc. 5th International Cryogenic Engineering Conf., Kyoto 1974, pages 399 - 402

(5) DE-B-2 102 162

(6) loc.cit. (4), pages 485 - 489

(8) Advances in Cryogenic Engineering - Materials, Vol. 26, New York/London 1980, pages 494 - 498

(9) loc.cit. (8), Vol. 23, 1978, pages 70 - 77

(10) loc.cit. (9), pages 57 - 69

and the following prior art document disregarded under Article 114(2) EPC:

(11) Elektrizitätsverwertung, Jg.51 (1976) No. 4, S. 80 - 85.

III. On 16 July 1988, the Proprietors of the Patent lodged an appeal against that decision, requesting that the patent be maintained, and paid the appeal fee that same day.

A Statement of Grounds of Appeal, accompanied by amended claims and an auxiliary request, was filed on 21 September 1988 and supplemented on 24 September 1988 by the Appellants.

IV. The Opponent, as Respondent, filed a contradictory statement in response.

V. In a communication pursuant to Article 11(2) of the Rules of Procedure of the Boards of Appeal, the Board also referred to documents (1) and (2).

In further support of what appeared to be rendered obvious by (2), it drew the parties' attention to (3), (4), (6), (8) and (9) on the one hand and to (5), (10), (11) and the following prior art document, cited in the pre-grant procedure, on the other:

(12) US-A-3 767 842.

VI. In response, the Appellants filed, by telecopy of 8 May 1989 confirmed on 10 May 1989, a new set of claims, and in oral proceedings held, on the conditional requests of both parties, on 6 June 1989, they re-amended Claim 1.

VII. The Appellants request that the decision under appeal be set aside and the patent maintained on the basis of Claims 1 to 8 filed on 10 May 1989 including the amendment made to Claim 1.

The amended Claim 1 reads as follows:

"1. A method for producing an intertwisted superconducting cable wherein aluminium stabilizing wires (1) having a purity above 99.99% and wires (2) of a composite of copper and superconducting material are twisted around a core wire which comprises a non-magnetic metal or an alloy thereof, preferably copper, or is a composite wire of copper and superconducting material, which method comprises the steps of:

(a) twisting the stabilizing wires (1) and composite wires (2) around the core wire so that they alternate in the circumferential direction around the core wire,

(b) immersing the intertwisted cable thus formed in solder to impregnate it and fill the interstices therein with solder and solder the wires together,

(c) radially compressing the impregnated cable by rolling or drawing to improve adhesion between its component wires."

Claims 2 to 8 are dependent upon Claim 1.

VIII. The Respondent requests that the appeal be dismissed.

IX. The parties' arguments forwarded in support of these requests can essentially be summarised as follows:

Appellants:

The problem to be solved arises if the aluminium stabiliser wires in a superconducting cable of the kind known from document (1), Figure 4 (wires 51), are of high purity (99.99%) quality and if the cable is used in a pulsed magnet exerting very strong forces. With high purity, the AC loss is increased and mechanical strength decreased. The additional little wires (52) are not enough to solve these problems. Breakage of the aluminium wires is likely to occur when the cable is reduced by drawing. Document (1) is silent about the purity of the aluminium, about an application in a pulsed magnet, about the problems to be solved there, and about a possible solution by impregnation with solder. It even teaches away from such an impregnation as free space is required for the transmission of a cooling medium.

In the cable of document (2), the aluminium stabiliser is generally in the form of an outside coating (12, 25). If there is a tendency to breakage, this is on the outside of

the cable. There is no teaching to encounter any difficulties caused by the high purity aluminium. Impregnation by solder serves quite a different purpose, namely to improve the contact.

The skilled person would not, for these reasons, combine the relatively recent document (1) with the very much older document (2).

Respondent

Document (1) discloses a method for producing a cable principally of the kind defined in lines 1 to 7 of Claim 1. Although the claimed purity range for the aluminium wires is not mentioned in (1), such a range is part of the general knowledge, documented inter alia by (2), and must, therefore, be regarded as being implicit in (1).

The known method comprises step (a) as claimed, step (c) as claimed, and a soldering step in between steps (a) and (c).

In this soldering step, care must be taken that the interstices between the wires are not filled for the reason that they are necessary as channels for a coolant.

There are, however, applications where such a transparency for a coolant is not necessary. In such a case it is clearly obvious to avoid the inconvenient step of soldering the wires only at their regions of contact (cf. Figure 5) by simply immersing the cable in solder so that the interstices are filled. Such an impregnation with solder is a standard soldering method in comparable cases and known from (2) and also from (5), (11) and (12), for instance.

Document (2) moreover shows that the subsequent pressing step known from (1) can be maintained if the interstices are completely filled with solder.

A further example of this standard soldering method and of its combination with a subsequent pressing step is provided by the following prior art document mentioned in the Search Report:

(13) US-A-4 078 299

(in particular Figures 6 and 7).

Claim 1 is directed to a manufacturing process for a generally applicable superconducting cable, not restricted to the use of this cable in a pulsed magnet. The respective problems arising with this application of the claimed superconducting cable are therefore not relevant. Apart from that, it can be derived from document (2) that an application in an AC magnet is envisaged, and the problems arising from this application are known to the person skilled in the art of superconducting cables who must, as of necessity, be an expert for distortion of materials.

Reasons for the Decision

1. The appeal is admissible.

2. The amendments made to the claims are admissible:

2.1 Claim 1 is based on Claim 4 as granted and complies, therefore, with Article 123(3) EPC.

2.2 As to the original disclosure of its subject-matter, Claim 1 finds its basis essentially in the original Claim 6 as appended to Claim 4, with the further features of the cable specified as disclosed in the original Claim 2 and in the description as filed.

Although the feature "fill the interstices therein" has not been explicitly mentioned in the original application documents, it has to be regarded as being implied by the feature "immersed in and impregnated with solder" in the original Claim 4.

No objection arises therefore against Claim 1 under Article 100(c) EPC.

2.3 In view of the substantive objection (paragraph 3) against Claim 1, it is not relevant whether it complies with Rule 29(1)(a) and (b) EPC.

3. However, the subject-matter of Claim 1 does not, although it is new, involve an inventive step.

For this conclusion, essentially the following considerations were decisive:

3.1 It is not at issue that the general knowledge, documented by, for instance, (2), (3), (4), (6), (8) and (9), suggests to select, if aluminium is used as material for the stabilising wires in a superconducting cable having the constructional features of the wire bundle shown in Figure 4 of document (1), high purity (above 99.99%) aluminium.

3.2 The manufacturing method known from Figure 12 and page 4 lines 113 ff. of document (1) for a cable composed of such wire bundles as described with reference to Figure 4 of that document, includes a wire soldering step (cf. page 2 lines 82 to 85) before the final compressing step. Although this soldering step is said to be carried out by coating the wires with a thin layer of solder and subsequently melting the solder, so that the wires are soldered together in the regions of the lines of contact, there is no teaching in the general description (page 1) and in the claims (page 4) that this soldering must be performed in such a way that there is solder only at the lines of contact between the wires.

It is only for a rope that one derives from Figure 5 and from the description of Figure 7 and 8 (page 3 lines 53 to 56 and 76 to 78) that solder is restricted to the regions of contact (42 to 46) between wire bundles.

Moreover, the document teaches that the free spaces between these wire bundles allow their use as cooling channels.

There is, for these reasons, no "teaching away" from the possibility that the soldering step is performed in such a way that the spaces between wire bundles are not kept free, if cooling is not required, or at least in such a way that the (much smaller) interstices between the wires may be filled with solder (whereas the larger spaces between wire bundles are kept substantially free from it).

3.3 This means that there is not any reason why the skilled person would not consider the applicability of the kind of soldering taught by document (2), namely impregnation by

immersion in solder, in the manufacturing process known from document (1).

On the contrary, there are obvious reasons for considering this step indeed.

In particular, it is known from document (2), column 6 lines 19 to 27, that the consequential filling of the interstices with solder serves the particular purpose of improving, for instance, the thermal contact between the wires, and this is a clear reason for considering the same measure in the manufacturing process known from document (1).

It is further regarded as obvious to the skilled person employing his general knowledge, that the filling of the interstices with solder adds to the mechanical stability of the cable.

The Respondent has submitted, as another reason for employing this measure, that it is simpler than keeping, in the soldering step, the interstices open. None of the Appellants' arguments seems to be apt to refute this submission.

The Appellants have submitted that the problem underlying the claimed invention, to decrease AC loss and increase mechanical strength for the use of the cable in a pulsed magnet, is new. This is, however, not a convincing counter-argument. If the AC loss is decreased this is accomplished, according to the description (column 2 line 55 to column 3 line 9), primarily by the processes mentioned there, which are prior art according to document (1). If the mechanical strength is increased (column 3 lines 10 to 12) this appears to be an obvious advantage of

the feature to fill the interstices with solder according to document (2).

3.4 Under the circumstances, it is not relevant whether other prior art documents on file would lead to the same conclusion.

For this reason, it is not necessary to decide on the question whether document (11) should be disregarded, whether document (12) should be considered in detail, or whether document (13), not discussed in the pre-grant or in the opposition stage, should be regarded as already introduced in the procedure or as relevant enough to justify its introduction.

4. The Appellant has requested the maintenance of the patent as amended. Since the subject-matter of Claim 1 of the amended patent does not involve an inventive step within the meaning of Article 56 EPC, it does not satisfy the requirements of the Convention (in particular Article 52(1)) and the patent cannot be maintained under Article 102(3). Therefore it shall be revoked.

**Order**

**For these reasons it is decided that**

The appeal is dismissed.

The Registrar: The Chairman:

S. Fabiani P.K.J. van den Berg