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D E C I S I O N
of 9 September 1997

Case Number: T 0145/96 - 3.5.2

Application Number: 88310396.2

Publication Number: 0316118

IPC: H01H 33/66

Language of the proceedings: EN

Title of invention:
Electrode for a vacuum breaker

Patentee:
MITSUBISHI DENKI KABUSHIKI KAISHA

Opponent:
ABB Patent GmbH

Headword:
-

Relevant legal provisions:
EPC Art. 56

Keyword:
"Essential features interrelated by a mathematical relationship must be considered in combination, not individually"

Decisions cited:
T 0204/83

Catchword:
-



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Boards of Appeal

Chambres de recours

Case Number: T 0145/96 - 3.5.2

D E C I S I O N
of the Technical Board of Appeal 3.5.2
of 9 September 1997

Appellant:
(Opponent)

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Representative:

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Respondent:
(Proprietor of the patent)

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Representative:

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Decision under appeal:

Interlocutory decision of the Opposition Division
of the European Patent Office posted 22 December
1995 concerning maintenance of European patent
No. 0 316 118 in amended form.

Composition of the Board:

Chairman: W. J. L. Wheeler
Members: M. R. J. Villemin
B. J. Schachenmann

Summary of Facts and Submissions

I. The appellant filed an opposition against European patent No. 0 316 118 and now contests the decision of the opposition division that, account being taken of the amendments made during the opposition proceedings, the patent and the invention to which it relates met the requirements of the EPC.

II. Amended claim 1 as maintained by the opposition division reads as follows:

"An electrode for a vacuum circuit breaker; said electrode comprising: a central flat part (1) serving to establish electrical contact, tapered parts (2) providing a current-breaking function and spiral slots (6, 7) formed in said electrode and inclined with respect to the radial direction; characterised in that the width (L) of at least one of the spiral slots (6, 7) in millimetres is predetermined and defined by the formula $0.0608 \times I$ where I is the rated circuit breaking current (KA) multiplied by the factor (1 + DC component fraction) and the width (L) lies in the range $0.0608 \times I \times 0.8$ to $0.0608 \times I \times 1.2$ but not including an electrode of 60 mm outside diameter with a slot width of 1 mm, 3 mm, or 5 mm thus derived."

Claims 2 to 8 depend on claim 1.

III. The following documents cited in support of the opposition have been taken into consideration by the board:

D1: Dissertation F. W. Behrens "Über den Einfluß der Elektrodengeometrie auf das Ausschaltverhalten von Vakuumsleistungsschaltern", Fakultät für Maschinenbau und Elektrotechnik der Technischen Universität Carolo-Wilhelmina, Braunschweig, 1984, and

D2: Dissertation F.D. Althoff "Über die Elektrodenerosion beim Schalten großer Wechselströme im Hochvakuum", Fakultät für Maschinenbau und Elektrotechnik der Technischen Universität Carolo-Wilhelmina, Braunschweig, 1970.

With the statement of the grounds of appeal, the appellant referred to the following additional document:

D3: DE-A-2 934 341.

IV. The appellant (opponent) argued essentially as follows:

Section 7 on page 13 of D3 mentioned an electrode with four slots having a width of not less than 1.5 mm. Figure 42 of D2 showed an electrode with an outside diameter of 64 mm and a slot width, as measured on the figure, of 1.5 mm. It followed that D3 disclosed an electrode whose slot width could be more than 1.5 mm, regardless of the value of its diameter. Therefore, the disclaimer in claim 1 of the opposed patent should be extended to further disclaim any electrode having a slot width of 1.5 mm and more, irrespective of the value of the outer diameter. The remaining range of claimed electrodes would then not involve an inventive step.

- V. The respondent's arguments can be summarised as follows:

Section 7 of D3 referred to by the appellant did not relate to all types of electrode, but only to electrodes having a rated breaking current of 8 kA or more. Slots with a width of at least 1.5 mm were claimed in claim 5 of D3 only for electrodes having the features recited in claim 1 of this document and could not be applied to all types of electrodes. Since D3 merely showed one particular type of electrode and failed to disclose the claimed relationship between the optimum slot width and the breaking current, the additional disclaimer requested by the appellant was completely unjustified. The caption of figure 2 of D2 made no mention of the slot width and the reproduction of the illustration did not allow measurement to be made. Even if the slot shown in this figure was taken to be 1.5 mm wide, the electrode shown in D2 would not fall within the scope of claim 1.

- VI. The appellant requested that the decision under appeal be set aside and the European patent No. 0 316 118 be revoked.
- VII. The respondent requested that the appeal be dismissed and the patent be maintained in amended form as decided by the opposition division.

Reasons for the Decision

1. The appeal is admissible.

2. *Admissibility of document D3*

D3 was cited in the European search report and corresponds to laid-open Japanese patent application number 30174/80 mentioned in the opposed patent. Although this document has been referred to for the first time by the appellant in the grounds of appeal, its teaching appears to be relevant to the claimed electrode. The respondent has not objected to the introduction of this document into the appeal proceedings and has discussed it in the reply to the grounds of appeal. The board will therefore consider this document in the appeal procedure.

3. The novelty of the subject-matter of claim 1 of the opposed patent as amended has not been disputed by the appellant. Therefore, the main issue to be considered in the present appeal case is whether this subject-matter involves an inventive step within the meaning of Article 56 EPC.

4. The problem to be solved according to the opposed patent is to improve the current breaking characteristics of an electrode for a vacuum circuit breaker without increasing the diameter of this electrode and to provide it with stable breaking performance over all ranges of breaking current. The solution to this problem rests on the observations made by the applicant that there is a linear relationship

between the slot width and the rated circuit breaking current, regardless of the electrode diameter. In consequence, the opposed patent teaches to provide the electrode with slots having widths as defined in claim 1.

5. D3 discloses a windmill shaped electrode with spiral slots for use in a vacuum circuit breaker and essentially teaches a number of construction design parameters which were found to provide good performance. This known electrode shows all the features of the electrode defined in the prior art portion of claim 1 of the opposed patent. D3 constitutes the prior art closest to the claimed subject-matter.

The problem to be solved according to D3 is to provide an improved electrode which is small sized and easy to be machined.

- 5.1 Apart from the disclaimer, claim 1 of the opposed patent recites in effect the following features in its characterising clause:

- (a) the width L in mm of at least one of the spiral slots lies in the range $0.0608 \times I \times 0.8$ to $0.0608 \times I \times 1.2$, where
- (b) I is the rated breaking current in kA multiplied by the factor $(1 + \text{DC component fraction})$.

Feature (a) indicates that L has to be proportional to I , within certain limits, and feature (b) indicates how I is related to the rated breaking current. Features (a) and (b) cannot be considered separately for

appreciating inventive step because they are both necessary to define the width L of at least one the spiral slots of the claimed electrode, as clearly follows from the wording of claim 1.

- 5.2 Document D3 does not disclose or suggest the above-mentioned combination of features (a) and (b). Section 7 on page 13 of D3 only mentions that the slots 18 of the electrode should have a width not smaller than 1.5 mm with vacuum circuit interrupters having a rated breaking current of 8 kA or more. However, no rough proportionality between L and I is disclosed in D3, since the statement in section 7 on page 13 of D3 that the slots should have a width of 1.5 mm or more by a rated breaking current of 8 kA or more merely means that **any slot width equal to or greater than 1.5 mm is suitable for any rated breaking current equal to or greater than 8kA**. In other words, a constant slot width of 2 mm, for example, may be used for interrupting **any** rated breaking current strength equal to or greater than 8kA. This is exactly what is not provided in claim 1 of the opposed patent, because the claimed electrode is subjected to the specific design condition demanding that a change in the breaking current strength be accompanied by a determined change of the slot width, as calculated according to features (a) and (b).

The reasoning developed above also follows from figure A submitted by the respondent (patentee) with the letter dated 26 July 1996, which illustrates the range of permissible slot widths determined on the basis of the relationship specified in claim 1 between the slot width L and the breaking current I. In particular, as becomes evident from this figure, the value of the slot width according to D3 does not fall within the range specified in claim 1. Furthermore, the

board observes that figure A is derivable from exhibit 2 already filed by the patentee during the opposition procedure with the reply to the grounds of opposition dated 6 January 1995.

- 5.3 For these reasons the board is of the opinion that the subject-matter of claim 1 of the opposed patent qualifies as a "selection invention" vis à vis the teaching of D3, and that an amendment to disclaim all electrodes having a slot width of ≥ 1.5 mm, is not justified.
6. D1 and D2 concern electrodes for a vacuum circuit breaker. These electrodes are of the same kind as that defined in the prior art portion of claim 1 of the opposed patent.
- 6.1 Although section 6.1.2b of D1 deals with the influence of the slot width on the breaking performance, neither this section nor figures 31a and 31b of D1 seem to bring evidence that the slot width and the breaking current strength could be related according to features (a) and (b). On the contrary, figure 31b and the statement on page 71, third paragraph, that the breaking current decreases with increasing slot width teaches away from this feature.
- 6.2 Document D2 makes no mention of the slot width value of the electrode shown on figure 42. The value of 1.5 mm alleged by the appellant cannot be relied on because it has been obtained by measurement carried out on this figure (see decision T 204/83, OJ EPO, 1985, 310). In any case, this value should correspond to a range of breaking current strengths I between 20,56 and 30,84 kA to conform to the range specified in claim 1. The strength $I = 16$ kA mentioned in the caption of figure 42 falls substantially outside this range.

7. Summarising, none of the prior art documents D1, D2 and D3 teaches or suggests the range of permissible slot widths according to features (a) and (b). The teaching of D1 strongly departs from the relationship between L and I specified in claim 1 of the patent in suit. In view of this, the board concludes that the subject-matter of this claim is not obvious to the skilled person and cannot be derived, without inventive step, from the cited documents considered alone or in combination.

Order

For these reasons it is decided that:

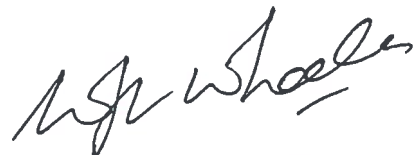
The appeal is dismissed.

The Registrar:



M. Beer

The Chairman:



W. J. L. Wheeler