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Bezeichnung der Erfindung: Electrochromic display device
Title of invention:
Titre de l'invention :

Klassifikation / Classification / Classement : G 02 F1/17, G 09 F9/00

ENTSCHEIDUNG / DECISION
vom / of / du 3 November 1987

Anmelder / Applicant / Demandeur :

Patentinhaber / Proprietor of the patent / Titulaire du brevet : Toppan Printing Co. Ltd.

Einsprechender / Opponent / Opposant : Schott Glaswerke

Stichwort / Headword / Référence :

EPÜ / EPC / CBE Arts. 100(a) and (b), i.e. Arts. 56 and 83 respectively.

Kennwort / Keyword / Mot clé : "Invention disclosed in a sufficiently clear and complete manner" - "Inventive step (yes)"

Leitsatz / Headnote / Sommaire

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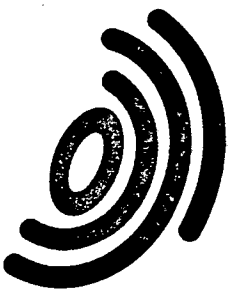

Case Number : T 244/86

D E C I S I O N
of the Technical Board of Appeal 3.4.1
of 3 November 1987

Appellant : (Opponent)
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Decision under appeal : **Decision of Opposition Division of the European Patent Office dated 1 August 1986 rejecting the opposition filed against European patent No. 0 058 995 pursuant to Article 102(2) EPC.**

Composition of the Board :

Chairman : K. Lederer

Member : E. Turrini

Member : R.L.J. Schulte

Summary of Facts and Submissions

I. European patent No. 0 058 995 was granted the 5 December 1984 on the basis of fourteen claims, pursuant to European patent application No. 82 101 432.1 filed on 25 February 1982.

Independent Claim 1 reads as follows:

"An electrochromic display device having at least an electrochromic layer containing a transition metal oxide and a solid proton conductive layer disposed between a transparent electrode and a counter electrode characterized in that the main component by weight of said solid proton conductive layer is a member selected from the group consisting of titanic acid, stannic acid, antimonic acid, zirconic acid, niobic acid, tantalic acid, silicic acid and mixtures thereof."

Claims 2 to 13 are dependent claims.

Independent Claim 14 reads as follows:

"A method of producing an electrochromic display device in accordance with Claim 1, in which method the said solid proton conductive layer is formed by printing or applying and drying an ink which contains, as the main component by weight a member selected from the group consisting of titanic acid, stannic acid, antimonic acid, zirconic acid, niobic acid, tantalic acid, silicic acid, and mixtures thereof, a binder comprising a polyhydric alcohol and/or a water-soluble polymer or an aqueous emulsion type polymer, and a volatile solvent".

II. The grant of the European patent was opposed on the grounds of non-patentability in the light of documents

DE-A-3 023 836 (D1)
DE-A-2 436 174 (D2)

III. The opposition was rejected by a decision dated 1 August 1986 due to the fact that the subject-matter of Claims 1 and 14 is considered novel and involving an inventive step.

IV. On 16 August 1986 the Appellant (Opponent) lodged an appeal against this decision and simultaneously paid the appeal fee. The Statement of Grounds was filed in due time. Together with this statement the Appellant requested that the decision under appeal be set aside and the patent be partly revoked by cancellation of Claim 1.

He supported his request by arguing that the invention is not disclosed in a sufficiently clear and complete manner, due to the fact that there is no indication of the exact composition of every acid.

Moreover, he argued that the solid proton conductive layer of Claim 1 corresponds substantially to the conductive layer formed mainly by a member selected from the group of titanic oxide, zircon oxide, niobic oxide, tantalic oxide, silicic oxide, etc. known from D1, because the acids mentioned in the characterising portion of Claim 1 are in reality oxides or hydrated oxides as can be deduced from example 2 of the invention in suit, i.e. the layer of the invention is merely a frame of oxides, to which additional bond material, e.g. hygroscopic substances, is added to allow high proton conductivity. Moreover according to the Appellant, D2 hints at the problem of the invention consisting in finding a solid proton conductive layer offering improved

whiteness, said problem being solved in D2 by utilising as main component of the conductive layer oxide compounds among others. For all these reasons the subject-matter of Claim 1 is, in view of the Appellant, not inventive.

The Appellant emphasized also that the additional bond material allowing high proton conductivity is not explicitly mentioned in Claim 1 so that the electrochromic display as claimed in Claim 1 cannot solve the problem consisting in too long a response time of display devices with solid electrolytes.

V. The Respondent (Patentee) requested, as main request, that the appeal should be dismissed and the patent maintained unamended and, as auxiliary request, that oral proceedings should be appointed.

The Respondent's arguments can be summarised as follows:

The main component of the solid proton conductive layer is acid so that it is capable of releasing hydrogen atoms, while the corresponding layer known from D1 is mainly formed by oxide compounds so that it allows merely hydrogen atoms to pass therethrough. Further, even if D2 suggests to use a white layer, its composition is clearly distinguished from that of the present invention. Indeed said white layer includes oxides, hydrated alkali salts, hydrated alkali halides and sulphuric acid, which differ substantially from the compounds of the invention in suit.

A combination of the teachings of D1 and D2 can therefore not suggest the display of the present invention.

Reasons for the Decision

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

2. There is no objection to the current version of claims, description and drawings as far as Article 123(2) EPC is concerned, since they are adequately supported by the original disclosure.

3. Feasibility of the invention
The Appellant argued that the electrochromic display device of Claim 1 is not feasible because the conductive layer needs additional substances, e.g. hygroscopic substances, to allow high proton conductivity.

The Board of Appeal cannot follow the Appellant's view. It is true that the oxides disclosed e.g. in D1 do not have the property of releasing hydrogen atoms so that a reasonable proton conductivity is only possible by means of a sufficiently thin layer or of additional substances. In the case of the invention however, due to the utilisation of acids which have the inherent property to release hydrogen atoms, a high proton conductivity can be obtained without the additional substances.

Moreover, the Appellant objected that the acids, such as e.g. the titanic acid, are mentioned in singular in the claim, while the description clearly states that the composition of each acid can vary in the H_2O content (cf. also the catalogues of chemical companies such as Riedel-de-Haen annexed to the Appellant's letter filed on 25 September 1987). In other words, in the Appellant's view it is not possible to understand from the wording of the claim, if an acid contains e.g. one, two or more H_2O groups.

The Board of Appeal is of the opinion that this fact does not lead to lack of feasibility of the invention. It simply means that the claim covers for each acid more than one composition as far as the number of H_2O groups is concerned and examples of different such compositions are given in the description.

Thus, the Appellant failed to prove the alleged non-feasibility of the invention as claimed in Claim 1 of the patent-in-suit. For this, comparative experiments could for example have been offered showing that a device having exclusively the features of Claim 1 has a proton conductivity much lower than a device according to Claim 2, 3 or 4 and similar to that of a device according to document D1. In opposition cases, the onus of proving that an independent claim does not contain all the features necessary to solve the technical problem underlying the invention rests with the opponent (cf. T 219/83, No. 12, OJ 86, 211).

Thus, Article 100(b) EPC is not infringed.

4. Novelty

4.1 D1 (Figure 2 and corresponding description) refers to an electrochromic display device having an electrochromic layer containing a transition metal oxide (5) and a solid proton conductive layer (4) disposed between a transparent electrode (2) and a counter electrode (6).

Contrary to the invention, the main component of the solid proton conductive layer is not acid but is an oxide as e.g. tantalium oxide, zirconium oxide, niobium oxide, etc. (page 6, last paragraph). Moreover, the iridium hydroxide

and nickel hydroxide are alkaly compounds and in any way they are used in an oxidizable film (page 6, first paragraph) which does not correspond to the proton conductive layer of the present invention.

4.2 D2 (unique figure and corresponding description) discloses an electrochromic display device having an electrochromic layer (elektrochromatische Schicht) containing a transition metal oxide (page 5, paragraph 4) and a solid proton conductive layer (ionendurchläss. Isolator) disposed between a transparent electrode (transparente Elektrode) and a counter electrode (Deckelektrode).

The proton conductive layer is white so that a good background contrast can be achieved, but contrary to the invention the materials suggested for the proton conductive layer are hydrated alkalihalide salts.

4.3 The other cited documents of the prior art are not relevant with respect to the present invention.

4.4 For the above reasons, the subject-matter of Claim 1 is deemed to be novel within the meaning of Article 54 EPC.

5. Inventive step.

5.1 Claim 1 is based on D1, which covers the preamble of the claim and which is in the Board's opinion the nearest prior art. Starting from the disclosure of this document, the objective problem underlying the present invention is to obtain a solid proton conductive layer which combines good whiteness as a background of the display together with high proton conductivity, i.e. short response time.

Said problem is solved by choosing as main component of said solid proton conductive layer a member selected from the group of acids as set out in the characterising portion of Claim 1.

5.2 The problem of obtaining a short response time is mentioned in D1 (page 5, paragraph 2) and that of obtaining good contrast by means of a white background in D2 (page 8, lines 7 to 10).

5.3 As far as the solution of these problems is concerned, the skilled man would look at prior art electrochromic display devices with a solid proton conductive layer. He would however not find any hint at realising the main component of the conductive layer having the composition mentioned in the characterising part of Claim 1. In particular the conductive layer of D2 does not contain any acid.

Indeed the conductive layer of the invention offers good contrast due to the white powders utilised (column 3, paragraph 2) together with high proton conductivity due to the capability of the acids of releasing hydrogen atoms.

The Appellant's view that the acids mentioned in Claim 1 are, as deducible from example 2 of the invention, oxides mixed with water, so that there is no substantial difference between the conductive layer of the invention and that described in D1, cannot be shared by the Board.

While in D1 there is no indication as to a possible content of water in the conductive layer, so that hydrogen atoms merely pass therethrough, the compounds present in the conductive layer of the invention contain water chemically integrated or bonded. In particular the composition referred to in example 2 is consistent with the broad meaning of

"acid" utilised throughout the patent specification (e.g. column 7, paragraph 2).

5.4 For the above reasons the subject-matter of Claim 1, which is novel, is also considered to involve an inventive step within the meaning of Article 56 EPC. None of the grounds for opposition mentioned in Article 100 EPC prejudices the maintenance of Claim 1 as granted.

5.5 Claims 2 to 14 have not been subject to opposition. After examination of these claims pursuant to Article 114(1) EPC the Board is satisfied that their maintenance also is not prejudiced by one of the grounds for opposition.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

F.Klein K.Lederer